Special Board of Education Meeting

Wednesday, June 10, 2026 5:30 PM
BOE Auditorium and via Zoom Meeting Platform, 129 Church Street, Bristol, CT 06010

1. **Call To Order And Pledge Of Allegiance**

2. **Discussion and Possible Action of:**

2.1. Approval of the Final Plans and Project Manuals for the Edgewood PK Project
2.2. Appointment of Board Commissioner to School Liaison Assignments
2.3. Appointment of Board Commissioner to Committee Assignments
2.4. Appointment of Board Commissioner to Board Representative Assignments

3. **Adjournment**

BRISTOL PUBLIC SCHOOLS
Bristol, Connecticut

06.10.2026 Sp. Meeting
(**Meeting Date**)

	Information Item
X	**Decision Item**

AGENDA REPORTING FORM

TOPIC: Approval of the Final Plans and Project Manuals for the Edgewood PK Project

BACKGROUND:
As part of the state requirement for the Plan Completion Review on June 17, 2026, the school building committee, the BOE and other local officials must review and approve the final plans and project manuals. These were shared with the BOE Commissioners on June 5, 2026

COST: 30,000,000 **FUNDING SOURCE:** State Grants and Bonds

RECOMMENDATIONS/COMMENTS:
To approve the final plans and project manual(s) as prepared for bidding and dated June 5, 2026 and the professional cost estimate, completed in accordance with Level 3 of ASTM International Standard E1557, Standard Classification of Building Elements and Related Sitework-UNIFORMAT II for this project, dated June 5, 2026.

ATTACHMENTS:

TOPIC PRESENTER: Tara Landon

CONTACT NUMBER: 860-584-7016

SUPERINTENDENT: Iris White
Iris White

Bristol Board of Education, Bristol, CT	
Presented at Board Meeting:	
Agenda Item #:	
Approved:	
Order Filed:	
Referred to:	

Bristol Public Schools

Edgewood Pre-K Academy

Project #: 25064

CONTENTS:

- Cover
- Executive Letter
- Basis of Estimate
- General Summary
- Estimate Detail
- VE Log
- Preliminary Schedule

DATE: June, 5 2026
ESTIMATE LEVEL: 90% CD Estimate
ARCHITECT: QA+M Architecture

D'AMATO JOINT VENTURE DOWNES

June 05, 2026

TO: **Ms. Tara Landon**
Schools Project Manager
Operations and Facilities Manager
Bristol Board of Education
PO Box 450
Bristol, CT 06011-0450
(860) 584-7016
taralandon@bristolk12.org

PROJECT: **Renovations to Edgewood Pre-K Academy**

RE: **90% CONSTRUCTION DOCUMENTS (90% CD) ESTIMATE**

Enclosed herein is our 90% Construction Documents (90% CD) estimate reconciled and reflective of QA+M Drawings dated 05/08/2026.

BUDGET
The total construction cost for this project is estimated at **$29,985,309**. The drawings depict a renovation of 39,923 SF. It's important to note that we have included a Design & Estimate Contingency of 2% and a Construction Contingency of 3%. We have included allowances to cover premium time to expedite the schedule.

SCHEDULE:
The schedule reflects a start date in June of 2026 for early abatement and demolition with construction starting in September of 2026. We have estimated a construction duration of thirteen (13) months with one (a) month of closeout. Please see our proposed schedule included within this deliverable.

QUALIFICATIONS AND ASSUMPTIONS
Please see attached Basis of Estimate including Qualifications and Assumptions.

Sincerely
Downes Construction Company, LLC

Ryan Patrick
Estimating Manager

Basis of Estimate

Edgewood Pre-K Academy
345 Mix Street, Bristol, CT 06010

Documents Utilized

- Drawings labeled RENOVATIONS TO: EDGEWOOD PRE-K ACADEMY, prepared by QA+M Architecture, dated May 8, 2026
- Specifications labeled PROJECT MANUAL EDGEWOOD PRE-K ACADEMY, prepared by QA+M Architecture, dated May 29, 2026

Scope of Work

The project consists of the renovation of the existing Edgewood Pre-K facility in accordance with the **90% Construction Documents dated 05/08/2026**. The work includes all labor, materials, equipment, and coordination required to selectively demolish, modify, and reconstruct portions of the building to support a modern early-childhood education program.

Selective demolition includes removal of interior partitions, finishes, ceilings, flooring, and existing MEP systems as required to accommodate new construction. Hazardous materials abatement is included as identified in the contract documents and as required to safely execute demolition and renovation activities. Demolition and abatement are assumed to be phased to maintain building stability and allow coordinated access for new work.

Renovation work includes localized structural modifications such as infill, reinforcement, and repairs where required by the design. Building envelope improvements include repair and/or replacement of exterior wall assemblies, roofing components, doors, and windows as indicated in the drawings.

Interior construction includes new partitions, doors, frames, hardware, ceilings, flooring, finishes, specialties, and casework to support classrooms, administrative areas, restrooms, and program support spaces. The design incorporates Pre-K requirements including child-scaled fixtures, durable finishes, and secure access provisions.

The estimate includes replacement and/or upgrades to building systems. Mechanical scope includes new HVAC equipment, distribution, and controls integrated with the existing building. Electrical scope includes service and distribution upgrades, new lighting and controls, and a complete **fire alarm system** replacement. Plumbing scope includes new domestic water and sanitary piping, fixture replacements, and reconfiguration of restroom and classroom plumbing layouts. Fire protection scope includes modifications and/or replacement of the existing sprinkler system to meet current code and layout requirements.

Limited sitework is included to support utility connections, drainage adjustments, and exterior improvements immediately adjacent to the building.

General conditions, temporary protections, phasing, and contractor logistics are included with consideration for work inside an existing occupied campus and the constraints typical of renovation projects.

Allowances and contingencies have been carried for remaining design coordination, unforeseen conditions, and refinement of details anticipated in the final Construction Documents.

Exclusions

- Off-site improvements beyond property limits
- Unforeseen subsurface conditions or contaminated soils
- Owner-supplied FF&E (furniture, fixtures, and equipment)
- Technology systems (IT, security, AV)
- Builder's Risk Insurance (by Owner)
- Escalation beyond stated construction duration
- Permitting or impact fees unless otherwise noted
- We recommend the Owner carry a contingency of at least 10% of the construction cost.
- Cost associated to tariffs, while outside of contractor control, can significantly impact total project cost if not proactively managed. Downes Construction will continue to monitor market conditions and provide updated recommendations should these risks escalate.

Assumptions

- Design is at 90% completion; minor scope adjustments may occur in final documents
- Adequate site access and staging areas are available
- Soil conditions are assumed suitable for conventional foundation systems
- Construction duration assumed to be approximately 12 months
- Escalation included based on current market conditions at time of estimate

Estimating Methodology

- Quantities derived from 90% construction drawings and specifications
- Assemblies and systems priced using quantity takeoffs, historical unit costs, and subcontractor input.
- Benchmarking against similar pre-K and educational facility projects
- Costs include labor, materials, equipment, subcontractor costs, and general conditions
- Trade costs organized generally in accordance with CSI divisions
- Allowances included where design details are incomplete
- Contingencies applied to account for design development and market variability

Next Steps

- Confirm final design documents and reconcile any scope changes
- Validate key assumptions with Owner and design team
- Conduct value engineering if required to align with project budget

D'AMATO JOINT VENTURE DOWNES

GENERAL SUMMARY

Edgewood Pre-K Academy REV 1

90% CONSTRUCTION DOCUMENTS

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026 R1

SPEC SECTION	DESCRIPTION	DCC CD 39,923 sf	COST / AREA
TRADE COSTS			
01 00 00	Project Requirements	$ 487,500	$12 /sf
01 74 00	Project Cleanliness	$ 262,070	$7 /sf
02 11 00	Contaminated Soil	$ 112,028	$3 /sf
02 20 11	Hazardous Materials	$ 791,205	$20 /sf
02 41 00	Building Demolition	NA	NA
02 41 19	Selective Demolition	$ 1,205,592	$30 /sf
03 30 00	Cast-in-Place Concrete	$ 336,166	$8 /sf
04 20 00	Unit Masonry	$ 239,840	$6 /sf
05 00 00	Structural Steel	$ 639,709	$16 /sf
05 40 00	Cold Formed Metal Framing	$ 282,534	$7 /sf
05 10 00	Miscellaneous Metals	$ 58,709	$1 /sf
06 00 00	Rough Carpentry	$ 253,713	$6 /sf
06 30 00	Finish Carpentry	$ 605,789	$15 /sf
07 21 00	Thermal & Moisture Protection	$ 110,560	$3 /sf
07 25 00	AVB	$ 78,816	$2 /sf
07 46 00	Siding & Metal Panels	$ 264,418	$7 /sf
07 50 00	Roofing	$ 1,395,773	$35 /sf
07 84 00	Fireproofing & Firestopping	$ 25,846	$1 /sf
07 92 00	Joint Sealants & Expansion Control	$ 51,198	$1 /sf
08 00 00	Doors, Frames & Hardware	$ 418,015	$10 /sf
08 41 00	Storefront & Curtain Wall	$ 804,888	$20 /sf
09 00 00	Drywall & Framing	$ 1,041,773	$26 /sf
09 30 00	Tile	$ 226,022	$6 /sf
09 51 00	Acoustical Ceiling Tile	$ 342,518	$9 /sf
09 61 00	Moisture Mitigation & Self Leveler	$ 193,201	$5 /sf
09 65 00	Resilient Flooring	$ 400,363	$10 /sf
09 67 00	Resinous Flooring	$ 25,358	$1 /sf
09 68 00	Carpet	$ 6,780	$0 /sf
09 80 00	Acoustical Treatment	$ 24,718	$1 /sf
09 91 00	Painting	$ 147,339	$4 /sf
10 11 00	Visual Display	$ 20,150	$1 /sf
10 14 00	Signage	$ 33,717	$1 /sf
10 21 23	Cubical Curtain & Track	$ 7,077	$0 /sf
10 26 00	Wall & Door Protection	$ 185,206	$5 /sf
10 28 00	Toilet Accessories	$ 60,809	$2 /sf
10 41 00	Emergency Cabinets	$ 697	$0 /sf
10 44 00	Fire Protection Specialties	$ 9,163	$0 /sf
10 51 00	Lockers	$ 1,547	$0 /sf
10 75 00	Flag Poles	$ 556	$0 /sf
11 30 00	Residential Appliances	$ 5,064	$0 /sf

D'AMATO JOINT VENTURE DOWNES

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Edgewood Pre-K Academy REV 1

90% CONSTRUCTION DOCUMENTS

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026 R1

SPEC SECTION	DESCRIPTION	DCC CD 39,923 sf	COST / AREA
11 40 00	Food Service Equipment	$ 225,285	$6 /sf
11 52 00	Audio Visual Equipment	NA	NA
12 20 00	Window Treatments	$ 83,913	$2 /sf
12 00 00	Entrance Mats	$ 35,363	$1 /sf
14 00 00	Elevators	NA	NA
21 00 00	Fire Suppression	$ 239,140	$6 /sf
22 00 00	Plumbing	$ 1,269,497	$32 /sf
23 00 00	HVAC	$ 3,434,384	$86 /sf
26 00 00	Electrical, T/D, FA Security	$ 2,692,566	$67 /sf
26 56 00	Site Electrical (PAC's in Site)	$ 417,035	$10 /sf
31 00 00	Sitework	$ 3,302,371	$83 /sf
ALLOWANCES			
A1	Masonry Restoration & Cleaning	w/ Div 04	
A2	Finish Schedule - Unselected Materials	w/ Div 09	
A3	Floor Preparation - Substrate Remediation	w/ Div 09	
A4	Replace Damaged Fire Alarm Devices	NA	
A5	Trade Premium Time to Expedite Schedule	$ 200,000	$5 /sf
A6	Staffing Premium Time to Expedite Schedule	$ 126,900	By Owner
A7	Enviornmental Controls	By Owner	By Owner
	TOTAL TRADE COST	**$ 23,182,883**	$581 /sf
INDIRECT CONSTRUCTION COSTS			
2.0%	Design & Estimating Contingency	$ 463,658	$12 /sf
0.0%	Escalation	$ -	$0 /sf
	General Conditions & Staffing	$ 1,284,870	$32 /sf
	PreConstruction	$ 60,215	$2 /sf
0.75%	General Liability Insurance	$ 199,819	$5 /sf
0.71%	Builder's Risk Insurance	By Owner	
	Local Building Permit	Waived	
0.026%	State Education Fund	$ 6,028	$0 /sf
0.80%	CM Payment & Performance Bond	$ 201,580	$5 /sf
3.0%	Construction Contingency	$ 799,277	$20 /sf
1.85%	CM Fee	$ 492,887	$12 /sf
	TOTAL CONSTRUCTION COST	**$ 26,691,217**	$669 /sf
	RECOMMENDED COST MANAGEMENT	**$ (2,163,780)**	
	APPROVED FUNDING	**$ 24,542,128**	$615 /sf
	OVER / (UNDER)	**$ (14,691)**	$0 /sf

D'AMATO JOINT VENTURE DOWNES

GENERAL SUMMARY

Edgewood Pre-K Academy REV 1

90% CONSTRUCTION DOCUMENTS

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026 R1

SPEC SECTION	DESCRIPTION	DCC CD 39,923 sf		COST / AREA
SOFT COSTS				
Consultants				
	Architect / Engineer	$	2,070,500	$52 /sf
	Environmental	$	75,000	$2 /sf
	Commissioning	$	40,000	$1 /sf
	FF&E Coordinator	$	35,000	$1 /sf
	Legal	$	25,000	$1 /sf
Fees				
	District Bonding fees	$	250,000	$6 /sf
	Builder's Risk Insurance	$	40,000	$1 /sf
	Town Staff Costs			
	State Permit Fees	$	6,500	$0 /sf
	Material Testing / Special Inspections	$	90,000	$2 /sf
	Printing & Mailing Costs	$	15,000	$0 /sf
	Code Review	$	20,000	$1 /sf
	Reimbursable	$	10,000	$0 /sf
	Utilities	$	50,000	$1 /sf
	Moving	$	50,000	$1 /sf
Expenditures				
	Roof Patching, Survey, Estimating, Design	$	253,000	$6 /sf
FF&E & Technology				
	FF&E	$	450,000	$11 /sf
	Technology	$	200,000	$5 /sf
	Playground Equipment	$	350,000	$9 /sf
	Playground Surfacing		w/ Above	
Contingencies				
5%	Owner Contingency (5%)	$	1,427,872	$36 /sf
	OWNER SOFT COSTS	**$**	**5,457,872**	$137 /sf
	TOTAL PROJECT COST	**$**	**29,985,309**	$751 /sf
	APPROVED FUNDING	**$**	**30,000,000**	751.45
	OVER / (UNDER)	**$**	**(14,691)**	$0 /sf

Edgewood Pre-K Academy REV 1

90% CONSTRUCTION DOCUMENTS

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026 R1

SPEC SECTION	DESCRIPTION		DCC CD 39,923 sf	COST / AREA
PROPOSED ALTERNATES				
1	Structural Mods, Knee wall & Brick Ven under Storefronts at A-wing (VE 5)		NA	
2	Deleted		Deleted	
3	Underdrains at Playground		TBD	
4	Rooftop Screens & Structural Mods	$	981,000	$25 /sf
5	Deleted		Deleted	
6	Bit. Patch & Conc. Curb at Willow Brook Entr. (VE13)		$87,749	$2 /sf
7	Deleted		Deleted	
8	Deleted		Deleted	
9	Deleted		Deleted	
10	Deleted		Deleted	
11	Conc ILO of 6' Bitumious (VE 7)		$40,573	$1 /sf
12	Dumpster, Driveway & Pad (VE 8)		$34,053	$1 /sf
13	Primary & Secondary Duct Banks (VE 10)		$28,078	$1 /sf
14	Remove Roof Monitor Bump Out (VE 11)		$401,081	$10 /sf
16	Site Cameras (VE 17)		TBD	
17	Change Playground Area from 2" layer to 3.5" of Bitumious (VE 19)	$	27,000	$1 /sf
18	Light Duty Stamped & Colored Conc. (VE 20)		$24,914	$1 /sf
19	Add Generator (VE 34)	$	209,015	$5 /sf
20	Full Height Walls ILO Curtains & Tracks (VE 39)	$	30,000	$1 /sf
	TOTAL COST OF ALTERNATES	**$**	**1,863,462**	46.68

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
01 50 00 - PROJECT REQUIREMENTS					
			TOTAL PROJECT REQ'S		**$ 487,500**
01 74 00 - PROJECT CLEANLINESS					
PROGRESS CLEANING					
Daily Clean-up (1 Full Time) - Broom Clean (end of each workday)	12	mos	$ 15,922	$ 191,064	
Field Office Clean-up	12	mos	$ 1,592	$ 19,106	
FINAL CLEANING					
Final Cleaning - Professional Cleaners	39,923	sf	$ 1.00	$ 39,923	
Second Cleaning after FF&E	39,923	sf	$ 0.30	$ 11,977	
			TOTAL CLEANING		**$ 262,070**
02 11 00 - CONTAMINATED SOIL					
CONTAMINATED SOIL					
Polluted Soils Loadout & Export Excess	988	cy	$ 113	$ 112,028	
Topsoil Export - Clean per Environmental Report	1,260	cy		w/ Sitework	
			TOTAL CONTAMINATED SOIL		**$ 112,028**
02 80 00 - HAZARDOUS ABATEMENT					
EXT. & INT. ABESTOS (Qtys. per ACM Table in Specification 020800 Pgs.2,3&4)					
#1 - Mudded Pipe Fitting on Doimestic Water Pipe (Exp.above Ceiling)	190	ea	$ 125	$ 23,750	
#2 - Mudded Pipe Fitting on Doimestic Water Pipe (in Masonry Walls)	200	ea	$ 125	$ 25,000	
#3 - Air Cell Pipe Insulation (in CMU Wall)	48	lf	$ 90	$ 4,320	
#4 - Roof Drain Pipe Fitting Insulation	4	ea	$ 250	$ 1,000	
#5 - Interior Caulk at Interior Doors,Window, Column & Masonry Joints	2,155	sf	$ 35	$ 75,425	
#6 - Interior Glazing Compound at Window, Sidelight & Transoms	178	loc	$ 150	$ 26,700	
#6 - Interior Window Glazing Compound at Black Metal Sashes	11	ea	$ 150	$ 1,650	
#7 - Fire Door Core Insulation at White Wood Doors	37	ea	$ 350	$ 12,950	
#7 - Fire Door Core Insulation at Doors w/Window Glazing	17	ea	$ 350	$ 5,950	
#8 - Duct Flange Sealant (Black)	10	lf	$ 50	$ 500	
#9 - Expansion Joint Caulking (Beige & White)	130	lf	$ 85	$ 11,050	
#10 - Pipe Flange Gaskets	30	ea	$ 250	$ 7,500	
#11 - Pipe Valve Packings	12	ea	$ 250	$ 3,000	
#12 - Edge Flashing Cement (Top Layer)	1,570	sf	$ 20	$ 31,400	
#13 - Tar at Roof Drain Pans	95	sf	$ 20	$ 1,900	
#14 - Cement Board at Raised Wall to Roof 2	210	sf	$ 20	$ 4,200	
#15 - Silver Paint at Raised Skylight Bases, Exp.Joints & Roof/Wall Jct.	1,300	sf	$ 20	$ 26,000	
#16 - Caulking at Top of Cement Board	65	lf	$ 85	$ 5,525	
#17 - Caulking at Wood Soffit (Beige)	35	lf	$ 85	$ 2,975	
Shaded Area - Mudded Pipe Fitting Insulation in Pipe Tunnels	115	ea	$ 125	$ 14,375	
Hatched Area - 9"x 9" Vinyl Floor Tile	24,650	sf	$ 12	$ 295,800	
Universal Waste Abatement (per Eagle Report)					
Light Tubes Disposal	5,644	lf	$ 3	$ 16,932	
Round/U-Shaped Light Tubes Disposal	42	ea	$ 5	$ 210	
Compact Fluorescent Light Tubes Disposal	2	ea	$ 5	$ 10	
PCB/DEHP Capacitors	287	ea	$ 5	$ 1,435	
Lead Acid/Nickel Cadmium Batteries	94	ea	$ 5	$ 470	
E-Waste Disposal	6	cy	$ 250	$ 1,500	
Universal Waste Removal Labor	12	days	$ 800	$ 9,600	
Chlorofluorocarbons Waste Abatement (per Eagle Report)					
AC Units and Refrigerators	20	ea	$ 100	$ 2,000	
Chlorofluorocarbons Waste Removal Labor	6	days	$ 800	$ 4,800	
PCB (Non-Asbestos Waste Abatement (per Eagle Report)					
Residual Original Caulk (PCB Bulk Product Waste) at Window/Door Frames	310	lf	$ 85	$ 26,350	
LEAD COMPLIANCE (per Eagle Report)					
Dispose of contaminated wood soffit areas	1	ls	$ 75,000	$ 75,000	
LABOR					
Operations Supervisor	1	ls	$ 64	w/ Above	
Equipment Operators	1	ls	$ 66	w/ Above	
Laborers	1	ls	$ 69	w/ Above	
Standby Abatement Personnel	1	ls	$ 102	w/ Above	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
SMALL TOOLS & EQUIPMENT					
Hepa Vacuuming	1	ls	$ 500	w/ Above	
Hoses (dust suppression)	1	ls	$ 15	w/ Above	
Level C PPE (Pb)	1	ls	$ 23	w/ Above	
Poly (10-mil sheeting 28'x100')	1	ls	$ 110	w/ Above	
Speedi-Dry (50 lb bag)	1	ls	$ 14	w/ Above	
17C DOT 55 gal Drums (haz items)	1	ls	$ 50	w/ Above	
Fixed Scaffolding	1	ls	$ 25,000	w/ Above	
Mini Pop-Up Containments-Spot Removals	1	ls	$ 650	w/ Above	
TRANSPORTATION / HAULING / HAULING					
Box truck	1	ls	$ 36	w/ Above	
Acm Disposal (Includes Transportation)	1	ls	$ 60	w/ Above	
Hazardous Waste Disposal (Includes Trans)	1	ls	$ 250	w/ Above	
Construction Debris Disposal (Includes Trans)	1	ls	$ 30	w/ Above	
MISCELLANEOUS ITEMS					
Mobilization (1 Per Work Area)	1	ls	$ 500	w/ Above	
Temp Electrical Connection (Licensed Electrician)	1	ls	$ 275	w/ Above	
Temp Generator	1	ls	$ 275	w/ Above	
Emergency Response	1	ls	$ 800	w/ Above	
Confined Space Work Premium				Deleted	
Hazmat Quantity Contingency (10%)	1	ls	$ 71,927.70	$ 71,928	
				TOTAL HAZMAT	**$ 791,205**
02 41 19 - SELECTIVE DEMOLITION					
EXTERIOR WORK					
Note D05 - Remove Existing Exterior Door & Frame (Double)	7	ea	$ 119.52	$ 837	
Note D05 - Remove Existing Exterior Door & Frame (Single)	30	ea	$ 99.60	$ 2,988	
Note D07 - Remove Exist. Ext. (4") Metal Panel/Alum.Storefront	8,936	sf	$ 6.97	$ 62,302	
Note D07 - Remove Exist. Ext. Alum. Clearstory Windows	40	sf	$ 6.97	$ 279	
Note D08 - Remove Existing Exterior Lights, Cameras, Devices, Etc.	1	ls		in Electrical	
Note D10 - Remove Exist. Built-up Roofing to Decking	39,923	sf	$ 5.98	$ 238,580	
Note D10 - Remove Exist. Perim. Roof Blocking (2&3pc.- 2x6)	2,022	lf	$ 7.97	$ 16,111	
Note D11 - Remove Existing Skylights & Curb	16	ea	$ 597.60	$ 9,562	
Note D12 - Remove Exist.Exterior Wood Soffit/Fascia (See Lead Paint Removal)	4,221	sf		in Hazmat	
Note D12 - Remove Exist.Sub Framing at Lead Contaminated Exterior Soffit/Fascia	4,221	sf	$ 4.48	$ 18,919	
Note D17 - Remove Exist. Entrance Slabs	380	sf	$ 3.98	$ 1,514	
Note D19 - Remove Existing Exterior Louvers	2	ea	$ 298.80	$ 598	
Note D20 - Remove Exist. Expansion Joints at Roof	404	lf	$ 29.88	$ 12,072	
Note D20 - Remove Exist. Expansion Joints at Masonry	40	lf	$ 29.88	$ 1,195	
Note D21 - Remove Existing HVAC Fans & Vents - Patch Penetrations	40	ea	$ 398.40	in HVAC	
Note D22 - Remove Existing Exterior Signage Removal Allowance	1	allow	$ 2,988.00	$ 2,988	
Note D27 - Remove Existing Roof Hatch	1	ea	$ 300.00	$ 300	
Note D32 - Remove Exist. & Support Chimney & Flues- Above Roof Line	10	vlf	$ 896.40	$ 8,964	
Remove Exist. Roof Deck Structure (per Dwg. S1.2A) for New Roof Monitor	860	sf	$ 21.91	$ 18,844	
Remove Exist. Roof Joists at Deck (per Dwg. S1.2A) for New Roof Monitor	220	lf	$ 23.90	$ 5,259	
INTERIOR WORK					
Note D01 - Remove Exist. Flooring (Assume Single Layer VCT or Carpet Tile)	15,273	sf	$ 1.58	$ 24,187	
Note D01 - Remove Exist. Flooring (9"x9") VAT	24,650	sf	$ -	in Hazmat	
Note D05 - Remove Existing Interior Door & Frame (Single)	87	ea	$ 99.60	$ 8,665	
Note D05 - Remove Existing Interior Door & Frame (Double)	10	ea	$ 119.52	$ 1,195	
Note D06 - Remove Existing Plumbing Fixtures	92	ea	$ 79.68	in Plumbing	
Note D07 - Remove Existing Interior Aluminum Storefront	3,273	sf	$ 6.97	$ 22,819	
Note D09 - Remove Existing Drywall & Furring (2") at Ext. Masonry Backup	5,090	sf	$ 3.98	$ 20,279	
Note D09 - Remove Existing Interior (8") Masonry Walls	21,632	sf	$ 7.97	$ 172,364	
Note D09 - Remove Existing Interior (12") Masonry Walls	2,201	sf	$ 8.96	$ 19,730	
Note D10 - Remove Exist. Trimwork at Stage	90	lf	$ 5.98	$ 538	
Note D13 - Remove Exist. Base Cabinets & Countertop	964	lf	$ 19.92	$ 19,203	
Note D13 - Remove Exist. Interior Cubby/Enclosure	325	lf	$ 19.92	$ 6,474	
Note D13 - Remove Exist. Wall Cabinets	263	lf	$ 19.92	$ 5,239	
Note D14 - Remove Exist. Lights, Devices, Pipe & Wiring	1	ls		in Electrical	
Note D15 - Remove Exist. Ceilings (Type A) - Suspended Tectum	1,654	sf	$ 3.11	$ 5,140	
Note D15 - Remove Exist. Ceilings (Type B) - Drywall + Glued (12"x12") ACT	10,627	sf	$ 1.99	$ 21,169	
Note D15 - Remove Exist. Ceilings (Type C) - Acoustic (12"x12")	5,366	sf	$ 1.49	$ 8,017	
Note D15 - Remove Exist. Ceilings (Type D) - Suspend. Aluminum (12"x12")	817	sf	$ 2.99	$ 2,441	
Note D15 - Remove Exist. Ceilings (Type F) - Suspended Drywall	952	sf	$ 3.98	$ 3,793	
Note D15 - Remove Exist. Ceilings (Type E) - Drywall + Rockface (12"x12")	2,417	sf	$ 4.48	$ 10,833	
Note D15 - Remove Exist. Ceilings (Type G) - Suspended Acoustic	17,588	sf	$ 1.99	$ 35,035	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Note D18 - Remove Existing Fire Extinguisher Cabinets	7	ea	$ 59.76	$ 418	
Note D20 - Remove Exist. Expansion Joints at Floors	30	lf	$ 19.92	$ 598	
Note D25 - Remove Existing Basketball Backboard & Supports	1	ea	$ 1,195.20	$ 1,195	
Note D25 - Remove Existing Wall Pads @Basketball Backboard	900	sf	$ 2.99	$ 2,689	
Note D26 - Remove Exist. Wood Soffit Above Classrm Cabinets	964	sf	$ 5.98	$ 5,761	
Note D26 - Remove Exist. Plywood at Multipurpose Fascia	288	sf	$ 5.98	$ 1,721	
Note D26 - Remove Exist. Wood Fascia at Multi-purpose Room	80	sf	$ 5.98	$ 478	
Note D28 - Remove Exist. Int. Classroom Wire Glass T-somes	528	sf	$ 4.98	$ 2,629	
Note D29 - Remove Existing Fin Tube Radiation	561	lf	$ -	in HVAC	
Note D29 - Remove Existing Exhaust Fans	30	ea	$ -	in HVAC	
Note D29 - Remove Existing Unit Ventilators	14	ea	$ -	in HVAC	
Note D30 - Remove Blinds	662	lf	$ 2.99	$ 1,978	
Note D31 - Remove Existing Stage Platform	860	sf	$ 7.97	$ 6,852	
Remove Existing Toilet Partitions	16	ea	$ 29.88	$ 478	
Remove Exist. Tabletops (2'-6"w x 5'-6"L)	7	ea	$ 119.52	$ 837	
Remove Exist. Bench Seats (1'-0"w x 5'-6"L)	10	ea	$ 119.52	$ 1,195	
Sawcut Existing Slab-on-Grade for New Radon Pits & Sanitary	3,699	lf	$ 14.94	$ 55,263	
Sawcut Existing Slab-on-Grade for New Shearwalls/Columns	501	lf	$ 14.94	$ 7,485	
Remove Existing Slab-on-Grade for Radon Pits & Sanitary	11,844	sf	$ 15.84	$ 187,566	
Remove Existing Slab-on-Grade for New Shearwall Haunches	477	sf	$ 15.84	$ 7,554	
Remove Existing Slab-on-Grade for New Isolated Footings	639	sf	$ 15.84	$ 10,119	
Sawcut & Remove Existing Slab-on-Grade for Tunnel Access	7	ea	$ 796.80	$ 5,578	
Remove MEP Debris to Dumpster (4men/2weeks)	39,923	sf	$ 0.68	$ 27,039	
Demolition Dumpsters	68	loads	$ 846.60	in Above	
Trash Chute Allowance (1 install per floor)				N / A	
INTERIOR (Patching & Protection)					
Temporary Structural Support (S1) at New Roof Monitor	1	allow	$ 19,529.41	$ 19,529	
Protect Floor Openings	7	ea	$ 199.20	$ 1,394	
Temp Weather Protections at Façade Removals	8,976	sf	$ 4.98	$ 44,700	
Temp Fire Extinguishers	12	ea	$ 348.60	$ 4,183	
Temp Existing Roof Protection	39,923	sf	in Soft Costs Roof Patching		
Xray Slabs for Cutouts	1	ls	$ 19,920.00	$ 19,920	
Patch Floors at Demolished Partitions	2,600	sf		in Floor Prep.	
Patch Walls at Demolished Partitions	1,040	sf		in Masonry	
			TOTAL SELECTIVE DEMO		**$ 1,205,592**
03 30 00 - CAST-IN-PLACE CONCRETE					
SPREAD FOOTINGS					
Form, Place, Strip	116	sf	$ 38.42	$ 4,457	
Concrete materials - 4,000 psi	4	cy	$ 214.99	$ 860	
Reinforcement	1	ls	$ 1,692.47	$ 1,692	
Pump Rental	1	ea	$ 2,012.67	$ 2,013	
PIERS					
Form, Place, Strip	53	sf	$ 54.89	$ 2,909	
Concrete materials - 4,000 psi	2	cy	$ 214.99	$ 430	
Reinforcement	1	ls	$ 1,326.53	$ 1,327	
Install Anchor Bolts (Assumed 4 / plate @ 6 Columns)	6	ea	$ 173.82	$ 1,043	
Grout Baseplates	6	ea	$ 146.38	$ 878	
Pump Rental	1	ea	$ 2,012.67	$ 2,013	
SUMP PIT & UNDERPINNING - MECHANICAL ROOM					
Form, Place & Strip - Spread Footing 8" Thick	9	sf	$ 161.93	$ 1,530	
Form, Place & Strip - Walls - 8" Thick 4.5' Tall	117	sf	$ 25.16	$ 2,944	
Concrete materials - 4,000 psi	5	cy	$ 214.99	$ 1,025	
Keyway	13	lf	$ 5.95	$ 77	
Install Waterstop	31	lf	$ 11.44	$ 355	
Reinforcement	1	ls	$ 1,600.99	$ 1,601	
Underpinning Delegated Design & Supervision	1	ls	$ 3,888.11	$ 3,888	
Underpinning Grout	1	cy	$ 343.07	$ 343	
Underpinning Install	1	ls	$ 5,855.04	$ 5,855	
Pump Rental	2	ea	$ 2,012.67	$ 4,025	

JOINT VENTURE DOWNES

Edgewood Pre-K Academy REV 1

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026

90% CONSTRUCTION DOCUMENTS

ESTIMATE DETAIL

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
SLAB ON GRADE - STANDARD 4" THICK					
Concrete materials - 3,500 psi	110	cy	$ 233.29	$ 25,662	
Reinforcement - WWM 6x6	8,947	sf	$ 4.57	$ 40,926	
Place & Finish	8,947	sf	$ 6.86	$ 61,389	
Vapor Barrier	8,947	sf	$ 1.83	$ 16,370	
Doweling @ 1.75' o.c.	1,423	ea	$ 13.72	$ 19,527	
Pump Rental	4	ea	$ 2,012.67	$ 8,051	
Control Joints	579	lf	$ 4.12	$ 2,384	
SLAB ON GRADE - 4" THICK W / 8" HAUCH					
Concrete materials - 4,000 psi	11	cy	$ 233.29	$ 2,566	
Reinforcement - WWM 6x6	420	sf	$ 4.57	$ 1,921	
Reinforcement - Rebar @ Haunches	1	ls	$ 1,600.99	$ 1,601	
Place & Finish	420	sf	$ 6.86	$ 2,882	
Vapor Barrier	420	sf	$ 1.83	$ 768	
Doweling @ 1' o.c.	212	ea	$ 13.72	$ 2,909	
Pump Rental	1	ea	$ 2,012.67	$ 2,013	
Control Joints	40	lf	$ 4.12	$ 165	
SLAB ON GRADE - 8" THICK @ MECHANICAL ROOM					
Concrete materials - 3,500 psi	9	cy	$ 233.29	$ 2,100	
Reinforcement - WWM 6x6	367	sf	$ 4.57	$ 1,679	
Reinforcement - Rebar	1	ls	$ 1,509.50	$ 1,510	
Place & Finish	367	sf	$ 6.86	$ 2,518	
Vapor Barrier	367	sf	$ 1.83	$ 671	
Doweling @ 1' o.c.	85	ea	$ 13.72	$ 1,166	
Pump Rental	1	ea	$ 2,012.67	$ 2,013	
Waterstop Strip	85	lf	$ 11.44	$ 972	
Control Joints	51	lf	$ 4.12	$ 210	
SLAB ON DECK - 5" THICK @ TUNNELS					
Concrete materials - 3,500 psi	9	cy	$ 233.29	$ 2,100	
Reinforcement - WWM 6x6	602	sf	$ 4.57	$ 2,754	
Reinforcement - Rebar	1	ls	$ 777.62	$ 778	
Form, Place & Finish (Incl. forming materials + misc. deck, angles, etc.)	602	sf	$ 39.06	$ 23,517	
Doweling @ 1' o.c.	362	ea	$ 13.72	$ 4,968	
Pump Rental	1	ea	$ 2,012.67	$ 2,013	
Control Joints	30	lf	$ 4.12	$ 124	
SLAB ON GRADE - 5" THICK @ ELECTRICAL & DATA ROOMS					
Concrete materials - 3,500 psi	5	cy	$ 233.29	$ 1,166	
Reinforcement - WWM 6x6	438	sf	$ 4.57	$ 2,004	
Reinforcement - Rebar	1	ls	$ 526.04	$ 526	
Place & Finish	438	sf	$ 6.86	$ 3,005	
Vapor Barrier	438	sf	$ 1.83	$ 801	
Doweling @ 1.75' o.c.	68	ea	$ 13.72	$ 933	
Pump Rental	1	ea	$ 2,012.67	$ 2,013	
Control Joints	38	lf	$ 4.12	$ 154	
MISCELLANEOUS					
Misc Housekeeping Pads (Detail 1 / S0.2)	1	ls	$ 8,691.08	$ 8,691	
Edge Form Depressed Slabs	1	ls	$ 3,384.95	$ 3,385	
Winter Conditions	1	ls	$ 4,574.25	$ 4,574	
Curing & Sealing	1	ls	$ 4,757.22	$ 4,757	
Layout	1	ls	$ 3,339.20	$ 3,339	
As-Built Survey - Per Local AHJ	1	ls	$ 1,097.82	$ 1,098	
MEP Coordination	1	ls	$ 3,201.98	$ 3,202	
Misc. Concrete Patching / Grinding	1	ls	$ 18,297.00	$ 18,297	
Radon Pits	2	ea	$ 365.94	$ 732	
SITE CONCRETE				in Site	
				TOTAL CIP CONCRETE	**$ 336,166**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
04 20 00 - MASONRY					
EXTERIOR EXISTING WALLS					
Note D23 - Clean Existing Brick Veneer (100%)	4,485	sf	$ 1.00	$ 4,467	
Note D23 - Repoint Existing Brick Veneer (25%)	1,121	sf	$ 24.90	$ 27,913	
Note D23 - Repair Existing Damaged Brick Veneer (25%)	1,121	sf	$ 44.82	$ 50,243	
Sealer for Existing Brick Veneer (100%)	4,485	sf		N / A	
Exterior Brick Veneer (9'-6") at Exterior Wall Type (F1)	412	sf	$ 39.89	$ 16,435	
Exterior Brick Veneer at Exterior Wall Type (F2)	950	sf	$ 39.89	$ 37,895	
Exterior Brick Veneer (2'-2") at Exterior Wall Type (F3)	1,610	sf	$ 39.89	$ 64,223	
Cutout & Patch for New Window Openings Exterior Brick Veneer	2	ea	$ 597.60	$ 1,195	
Infill Existing Brick Veneer for Removed Louvers	20	sf	$ 94.62	$ 1,892	
INTERIOR EXISTING WALLS					
Cutout, Remove, Support Exist, Patch & Repair Interior (12") Masonry Walls	380	mhrs	$ 93.62	$ 35,577	
			TOTAL UNIT MASONRY		**$ 239,840**
05 12 00 - STRUCTURAL STEEL					
SUBCONTRACTOR QUOTE					
Steeltech Building Products	**1**	**ls**		**TBD**	
STRUCTURAL STEEL COLUMNS	2.22	tons	$ 9,213.00	$ 20,453	
HSS - 8x8x3/8	70	lf		w/ Above	
HSS - 10x8x1/2	34	lf		w/ Above	
STRUCTURAL STEEL - BEAMS	6.01	tons	$ 9,213.00	$ 55,370	
Structural Steel: Relocate/Lower Existing Beam at Monitor Roof Deck	40	lf		w/ Above	
W6x15 Beam at Monitor Roof Tie-in Deck	91	lf		w/ Above	
C6x8.25 Beam at Monitor Roof Tie-in Deck	91	lf		w/ Above	
W10x19 Beam at Monitor Roof Tie-in Deck	37	lf		w/ Above	
W10x22 Beam at Monitor Roof	206	lf		w/ Above	
W14x26 Beam at Monitor Roof	102	lf		w/ Above	
W14x38 Beam at Monitor Roof	23	lf		w/ Above	
C4x7.25 Beam at Monitor Roof	159	lf		w/ Above	
MISC. FRAMING					
RTU Support Angle L1 (L5x5x5/16) at Deck - 643lf	3.31	tons	$ 14,690.00	$ 48,624	
Beam & Joist Reinforcing (R2) - 21loc	441	lf	$ 49.80	$ 21,962	
Beam & Joist Reinforcing (R1) - 18loc	90	lf		w/ Alt	
Beam & Joist Reinforcing (R2) - 157loc	2,360	lf		w/ Alt	
Beam & Joist Reinforcing (R3) - 21loc	128	lf		w/ Alt	
Exterior Kneewall Support Angle (8x8x1/2") at Tunnel - 212lf (Detail F1/S3.0)	2.80	tons	$ 14,690.00	$ 41,132	
Exterior Kneewall Support (Tubesteel - HSS 8x3x5/16") - 712lf (Details F1,F3,F4&F5/S3.0)	7.55	tons	$ 9,213.00	$ 69,558	
Ext. Kneewall Support (Channel Supports C6x10.5 @32") - 290ea (Details F1,F3,F4&F5/S3.(	290.00	ea	$ 776.88	$ 225,295	
CONNECTIONS					
Connections & Bridging - 15%	3.28	tons	$ 9,213.00	$ 30,251	
Moment Connections	20	ea	$ 1,219.10	$ 24,382	
Base Plates w/(4) - 3/4" dia Anchor Rods	6	ea	$ 189.24	$ 1,135	
DECKING					
Deck Infill for Skylights - Detail 1/A1.4	504	sf	$ 49.80	$ 25,099	
Deck Infill for Skylights - Detail 1/A1.4	48	sf	$ 49.80	$ 2,390	
Deck Infill for Chimney	60	sf	$ 49.80	$ 2,988	
Metal Roof Deck (20 Gauge - 1-1/2" Type B) Monitor Roof	1,102	sf	$ 11.95	$ 13,171	
Metal Roof Deck (20 Gauge - 1-1/2" Type B) at Low Roof	296	sf	$ 11.95	$ 3,538	
MISCELLANEOUS					
Crane / Rigging	2	mos	$ 14,690.00	$ 29,380	
Fire Watch	1	ls	$ 4,980.00	$ 4,980	
Perimeter Roof B Reinforcement R1, R4, R7	1	ls	$ 20,000.00	$ 20,000	
			TOTAL STRUCTURAL STEEL		**$ 639,709**
05 40 00 - COLD FORMED METAL FRAMING					
EXTERIOR WALLS					
Exterior CFMF (Type F1 - 6 Mtl Stud)	251	sf	$ 20.44	$ 5,130	
Exterior CFMF (Type F2 - 8 Mtl Stud)	1,002	sf	$ 22.59	$ 22,634	
Monitor Bumpout - 8 Mtl Stud (F2)	513	sf	$ 22.59	$ 11,588	
Exterior CFMF (Type F3 - 8 Mtl Stud)	6,823	sf	$ 22.59	$ 154,127	
Exterior Soffit for Metal Panels	3,577	sf	$ 24.90	$ 89,055	
			TOTAL CFMF		**$ 282,534**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
05 50 00 - METAL FABRICATIONS					
EXTERIOR					
Roof Ladder - Low to High Roof (Detail 1/A1.5)	1	ea	$ 5,976.00	$ 5,976	
Alternate Roof Screen Support/Kicker (HSS4x4x5/16)	1,068	lf	$ 219.12	see Alt	
Alternate Roof Screen (RFS6)	61	sf	$ 59.76	see Alt	
Alternate Roof Screen (RFS7)	227	sf	$ 59.76	see Alt	
Alternate Roof Screen (RFS4)	232	sf	$ 59.76	see Alt	
Alternate Roof Screen (RFS5)	236	sf	$ 59.76	see Alt	
Alternate Roof Screen (RFS1)	776	sf	$ 59.76	see Alt	
Alternate Roof Screen (RFS2)	70	sf	$ 59.76	see Alt	
Alternate Roof Screen (RFS3)	771	sf	$ 59.76	see Alt	
INTERIOR					
Open Grate Stair #1 at Mechanical Room #141	1	flgt	$ 15,936.00	$ 15,936	
Open Grate Stair #2 at Mechanical Room #141	1	flgt	$ 15,936.00	$ 15,936	
Guardrails at Pan Stairs #1 & #2	25	lf	$ 292.08	$ 7,302	
Wall Rails at Pan Stairs #1 & #2	18	lf	$ 144.61	$ 2,603	
Roof Ladder at Custodian #145	1	ea	$ 10,956.00	$ 10,956	
			TOTAL METAL FABRICATIONS		**$ 58,709**
06 10 00 - ROUGH CARPENTRY					
BLOCKING					
Roof Expansion Joint (Flush w/6pc 2x4) - Det.12/A1.3	188	lf	$ 31.87	$ 5,992	
Roof Expansion Joint (Offset w/6pc 2x4) - Det.13/A1.3	238	lf	$ 31.87	$ 7,586	
Roof Curb (w/2pc 2x6) - Det.6&7/A1.3	526	lf	$ 27.89	$ 14,669	
Roof Parapet Extension (w/1pc 2x8+ Plywd.) - Det.2,3&4/A1.4	201	lf	$ 15.94	$ 3,203	
Roof Parapet Extension (w/1pc 2x8) - Det.1,2&3/A6.3	121	lf	$ 15.94	$ 1,928	
Roof Blocking at Monitor(w/5pc 2x6) - Det.4/A6.3	118	lf	$ 27.89	$ 3,291	
Roof Expansion Joint (w/3pc 2x4 + 1pc 2x8) - Det.4&5/A1.4	152	lf	$ 23.90	$ 3,633	
Roof Hatch (w/5pc 2x6) - Det.10/A1.3	20	lf	$ 15.94	$ 319	
Roof Cap (w/1pc 2x8) - Det.6&7/A1.4	1,271	lf	$ 13.94	$ 17,723	
Exterior Window 1x & 2x Sills	720	lf	$ 27.89	$ 20,079	
Exterior Curtain Wall & Storefront (perimeter)	2,150	lf	$ 27.89	$ 59,959	
Interior Storefront (perimeter)	280	lf	$ 12.07	$ 3,380	
Interior Doors	3,260	lf	$ 7.97	$ 25,976	
Base Cabinet in-wall blocking (assume 2 pieces)	210	lf	$ 9.56	$ 2,008	
Upper Cabinet in-wall blocking (assume 2 pieces)	350	lf	$ 9.56	$ 3,347	
Full Height Cabinet in-wall blocking (assume 3 pieces)	140	lf	$ 14.34	$ 2,008	
Workstations/Counters in-wall blocking (assume 2 pieces)	542	lf	$ 9.56	$ 5,182	
Misc. Interior Wall Blocking (20% of wall area)	44,370	sf		w/Drywall	
TEMPORARY PROTECTIONS					
Temp Doors	4	ea	$ 1,106.56	$ 4,426	
Relocate / Remove Temp Doors	4	ea	$ 251.49	$ 1,006	
Floor Protection					
Temporary Floor Protection Maintenance	1	ls	$ 9,960.00	$ 9,960	
ENCLOSURES					
Temp Window/Storefront Enclosures	8,976	sf		w/Demo	
EQUIPMENT					
Lift Rental	1	ls	$ 4,980.00	$ 4,980	
SAFETY					
Wood Safety Rails, Plywood Covers, Etc	39,923	sf	$ 0.50	$ 20,080	
MISC.					
General Trades Primary Subcontractor GC's	15%	ea	$ 219,852.49	$ 32,978	
* Chain of custody and certification for FSC is excluded				Excluded	
			TOTAL ROUGH CARPENTRY		**$ 253,713**
06 20 00 - FINISH CARPENTRY					
INTERIOR					
Casework / Millwork - Materials					
Base Cabinets at Classrooms (Elev. 2/A7.3)	156	lf	$ 323.70	$ 50,497	
Base Cabinets at Breakroom (Elev. 10 & 11/A7.9)	20	lf	$ 323.70	$ 6,474	
Base Cabinets at OP/PT Room (Elev. 2/A7.9)	7	lf	$ 323.70	$ 2,266	
Base Cabinets at Nurse Room (Elev. 10/A7.7)	13	lf	$ 323.70	$ 4,208	
Base Cabinets at Reception (Elev. 18/A7.6)	5	lf	$ 323.70	$ 1,619	
Countertops at Classrooms (Elev. 2/A7.3)	308	lf	$ 164.34	$ 50,617	
Countertops at Classrooms (Elev. 7/A7.5)	29	lf	$ 164.34	$ 4,766	
Countertops at Breakroom (Elev. 10 & 11/A7.9)	21	lf	$ 164.34	$ 3,451	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Countertops at OP/PT Room (Elev. 2/A7.9)	7	lf	$ 164.34	$ 1,150	
Countertop at Nurse Room (Elev. 10/A7.7)	14	lf	$ 164.34	$ 2,301	
Countertops at Reception (Elev. 18/A7.6)	5	lf	$ 164.34	$ 822	
Wall Cabinets at Classrooms (Elev. 2/A7.3)	286	lf	$ 249.00	$ 71,214	
Wall Cabinets at Classrooms (Elev. 7/A7.5)	28	lf	$ 249.00	$ 6,972	
Wall Cabinets at Breakroom (Elev. 10 & 11/A7.9)	19	lf	$ 249.00	$ 4,731	
Wall Cabinets at OP/PT Room (Elev. 2/A7.9)	6	lf	$ 249.00	$ 1,494	
Wall Cabinets at Nurse Room (Elev. 10/A7.7)	10	lf	$ 249.00	$ 2,490	
Full Height Storage Cabinets at Classrooms (Elev. 2/A7.3)	36	ea	$ 921.30	$ 33,167	
Full Height Storage Cabinets at Breakroom (Elev. 10/A7.9)	1	ea	$ 921.30	$ 921	
Full Height Storage Cabinets at OP/PT Room (Elev. 2/A7.9)	2	ea	$ 921.30	$ 1,843	
Full Height Storage Cabinets at Nurse Room (Elev. 10/A7.7)	1	ea	$ 921.30	$ 921	
Full Height Storage Cabinets at Reception (Elev. 17/A7.6)	4	ea	$ 921.30	$ 3,685	
Cubby Units 48"w x 15"dp - Eight Section (Elevs.1B,1C,2B&2C/A7.1)	158	lf	$ 622.50	$ 98,355	
Corkboard above Corridor Cubby Units (Elevs.1B,1C,2B&2C/A7.1)	476	sf	$ 11.95	Div 10	
Mailbox/Cubby at Reception (Elev. 18/A7.6)	5	lf	$ 796.80	$ 3,984	
Reception Desk at Reception (Elev. 7&9/A6,10)	14	lf	$ 1,494.00	$ 20,916	
Window Sills - Solid Surface	720	lf	$ 54.78	$ 39,442	
Install Cabinetry	1,255	mhrs	$ 112.80	$ 141,522	
Install Countertops	251	mhrs	$ 112.80	$ 28,284	
Install Window Sills	157	mhrs	$ 112.80	$ 17,678	
Miscellaneous					
* Chain of custody and certification for FSC is excluded				Excluded	
			TOTAL FINISH CARPENTRY		**$ 605,789**
07 10 00 - DAMP / WATERPROOFING	1	ls	$ 2,639.40	N/A	
			OTAL DAMP / WATERPROOFING		**$ -**
07 21 00 - THERMAL INSULATION					
SPRAY FOAM					
Spray Foam Insulation at Existing Ext. Masonry Walls (Typical Detail 8/A6.0 - Type D1)	5,375	sf	$ 8.47	$ 45,505	
Spray Foam Insulation at Metal Panels (Typical Detail 1/A6.3)	4,465	sf	$ 8.47	$ 37,801	
RIGID					
Rigid Insulation - 3" Verticle at Conc Foundation	0	sf		NA	
Rigid Insulation - 3" Horizontal at Conc Slab-on-Grade	0	sf		NA	
Rigid Insulation - 3" at Masonry Walls	2,992	sf	$ 5.48	$ 16,390	
Rigid Insulation - 2" at Sloped Metal Panel Walls	1,725	sf	$ 4.98	$ 8,588	
Rigid Insulation - 1.5" at Metal Panel Soffits	508	sf	$ 4.48	$ 2,277	
BATT					
Batt Insulation - In-wall Drywall Partitions				w/ Gyp Drywall	
			TOTAL THERMAL INSULATION		**$ 110,560**
07 25 00 - AIR & VAPOR BARRIERS					
FLUID APPLIED					
Fluid Applied Air & Vapor Barriers at Masonry	2,992	sf	$ 8.12	$ 24,287	
Fluid Applied Air & Vapor Barriers at Existing	4,485	sf	$ 8.12	$ 36,407	
Fluid Applied Air & Vapor Barriers at Metal Panels	2,233	sf	$ 8.12	$ 18,122	
			TOTAL AIR & VAPOR BARRIERS		**$ 78,816**
07 30 00 - SIDING				N/A	
				TOTAL EIFS	**$ -**
07 46 00 - EXTERIOR PANELS					
EXTERIOR					
Metal Composite Panel System at Soffits - Sloped 1'-6"	245	sf	$ 63.74	$ 15,585	
Metal Composite Panel System at Soffits - Sloped 2'-3"	1,480	sf	$ 63.74	$ 94,341	
Metal Composite Panel System at Soffits - Flat 7'	508	sf	$ 53.78	$ 27,322	
Metal Composite Panel System - Vertical (Insulated)	1,344	sf	$ 94.62	$ 127,169	
			TOTAL EXTERIOR PANELS		**$ 264,418**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
07 50 00 - ROOFING					
SUBCONTRACTOR QUOTE					
Greenwood Industries	**1**	**ls**		**TBD**	
DEMOLITION					
Selective Demo: Note D10 - Remove Exist. Built-up Roofing to Decking				w/ Demo	
MEMBRANE ROOFING - SINGLE-PLY					
Patch Existing Roof Allowance	1	allw	$ 37,350.00	in Soft Costs	
EPDM Roofing (Type 1) - 1/2"Cov.Bd+Tapered+5"Rigid+VB+5/8"Sub.Bd	38,843	sf	$ 29.88	$ 1,160,629	
EPDM Roofing (Type 2) Sloped at Monitor 1/2"C.B.+5"Rgd+VB+5/8"S.B.	1,132	sf	$ 29.88	$ 33,824	
EPDM Roofing (Type 3) shown on A1.2B - Assembly Not Listed	2,465	sf	$ 29.88	$ 73,654	
Roofing - Sloped Crickets	7,115	sf	$ 7.97	in Above	
Walkway Pads	375	ea	$ 8.96	$ 3,362	
Roof Hatch (w/5pc 2x6) - Det.10/A1.3	1	EA	$ 3,486.00	$ 3,486	
Roof Drains - Det.8/A1.3	43	EA	$ 946.20	$ 40,687	
Roof Curb (w/2pc 2x6) - Det.6&7/A1.3	526	LF	$ 13.94	$ 7,335	
Roof Parapet Extension - Det.2,3&4/A1.4	201	LF	$ 15.94	$ 3,203	
Roof Parapet Extension - Det.1,2&3/A6.3	121	LF	$ 15.94	$ 1,928	
Roof Cap - Det.6&7/A1.4	1,271	LF	$ 13.94	$ 17,723	
Box Gutter (5") Roof Monitor	28	LF	$ 22.91	$ 641	
Roof Scuppers (SC)	55	EA	$ 896.40	$ 49,302	
Roof Expansion Joint - Det.12/A1.3	188	LF		in Exp.Jts	
Roof Expansion Joint - Det.13/A1.3	238	LF		in Exp.Jts	
Roof Expansion Joint - Det.4&5/A1.4	152	LF		in Exp.Jts	
FLASHING & SHEET METAL					
Cap Flashing at EPDM Roof				w/ Above	
MISCELLANEOUS					
Temp Roof Rails				w/ Above	
Metal Gutters 6"				w/ Above	
Downspouts				w/ Above	
Infill of Demoed Skylight				w/ Above	
Roof Hatch				w/ Above	
Roof Ladder & Safety				w/ Above	
Roof Drains at Buildings				w/ Above	
Set Mechanical Curbs & Flashing				w/ Above	
Roof Perimeter Blocking (assume 3 pcs)				w/ Above	
Roof Coping 0.040 Prefinished Aluminum				w/ Above	
Patch Existing Roof				w/ Above	
Roof Walkway Pads (30"Square)				w/ Above	
Roof Scuppers				w/ Above	
Ridge Vent				w/ Above	
Temp Roofing at New HVAC Units				w/ Above	
Fall Protection				w/ Above	
Vacuuming roofout of sequence				w/ Above	
				TOTAL ROOFING	**$ 1,395,773**
07 62 00 - SHEET MTL FLASHING & TRIM					
EXTERIOR					
Cap flashing				w/ Roofing	
				TOTAL FLASHING & TRIM	**$ -**
07 81 00 - APPLIED FIREPROOFING				N/A	
				TOTAL FIREPROOFING	**$ -**
07 84 00 - PENETRATION FIRESTOPPING					
FIRESTOPPING					
Firestopping	39,923	sf	$ 0.25	$ 9,941	
Fire-Resistive Joint Systems - Smoke 1 Hr / 2 Hr	39,923	sf	$ 0.40	$ 15,905	
				TOTAL FIRESTOPPING	**$ 25,846**
07 92 00 - JOINT SEALANTS & EXPANSION CONTROL					
JOINT SEALANTS					
Foundations				w/ Trades	
Millwork / Casework	550	lf		w/ Trades	
Door Frames	111	ea	$ 79.68	$ 8,844	
Windows	37	ea	$ 273.90	$ 10,134	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	Qty	Unit	Unit Price	Subtotal	Total
Misc Joint Sealants - Reno	39,923	sf	$ 0.45	$ 17,893	
Roof Expansion Joint - Det.12/A1.3	188	LF	$ 25.10	$ 4,719	
Roof Expansion Joint - Det.13/A1.3	238	LF	$ 25.10	$ 5,974	
Roof Expansion Joint - Det.4&5/A1.4	152	LF	$ 23.90	$ 3,633	
				TOTAL JOINT SEALANTS	**$ 51,198**
08 10 00 - DOORS & FRAMES					
SUBCONTRACTOR QUOTE					
Acoustics Inc. - Installation of HM Drs & Hardware (Frames Included w/ Drywall Quote)	**1**	**ls**		**TBD**	
EXTERIOR DOORS & FRAMES					
Frames - Material					
HM-1 Frame - Single 3668 (141, 150)	2	ea	$ 747.00	$ 1,494	
Doors - Material					
Fiberglass Doors - E, 3668 (141, 150)	2	ea	$ 1,145.40	$ 2,291	
Labor					
Unload, Catalogue, Distribute	2	hrs	$ 112.80	w/ Drywall	
Frame Installation - Drywall	2	hrs	$ 112.80	w/ Drywall	
Door Installation	2	hrs	$ 112.80	w/ Above	
INTERIOR DOORS & FRAMES					
Frames					
HM-1 Frame Type - 3040	16	ea	$ 448.20	$ 7,171	
HM-1 Frame Type - 3068	24	ea	$ 532.86	$ 12,789	
HM-3 Frame Type - 3068	27	ea	$ 747.00	$ 20,169	
HM-1 Frame Type - 3070	1	ea	$ 547.80	$ 548	
HM-3 Frame Type - 3070	2	ea	$ 771.90	$ 1,544	
HM-1 Frame Type - 3072	3	ea	$ 597.60	$ 1,793	
HM-1 Frame Type - 5468	10	ea	$ 572.70	$ 5,727	
HM-1 Frame Type - 6068	22	ea	$ 627.48	$ 13,805	
HM-1 Frame Type - 60610	2	ea	$ 647.40	$ 1,295	
HM-1 Frame Type - 6072	2	ea	$ 667.32	$ 1,335	
Doors					
Door Type A - WD-1 3068	45	lvs	$ 522.90	$ 23,531	
Door Type A - WD-1 30610	1	lvs	$ 547.80	$ 548	
Door Type A - WD-1 3070	2	lvs	$ 572.70	$ 1,145	
Door Type A - WD-1 3072	1	lvs	$ 597.60	$ 598	
Door Type B - WD-1 3040	18	lvs	$ 448.20	$ 8,068	
Door Type C - WD-1 3068	6	lvs	$ 522.90	$ 3,137	
Door Type D - WD-1 30610	1	lvs	$ 547.80	$ 548	
Door Type D - WD-1 3072	2	lvs	$ 597.60	$ 1,195	
Door Type F - WD-1 6068	44	lvs	$ 522.90	$ 23,008	
Door Type F - WD-1 5468	6	lvs	$ 498.00	$ 2,988	
Door Type G - WD-1 3070	2	lvs	$ 572.70	$ 1,145	
Door Type J - WD-1 6072	4	lvs	$ 597.60	$ 2,390	
Door Type ? - ??-? 3668 - 138 Kitchen	2	lvs	$ 672.30	$ 1,345	
Door Rating Premium	31	lvs	$ 996.00	$ 30,876	
Labor					
Unload, Catalogue, Distribute	273	hrs	$ 112.80	$ 30,794	
Frame Installation - Drywall	218	hrs		w/ Drywall	
Door Installation	288	hrs	$ 112.80	$ 32,486	
MISC.					
Privacy Shutter for Interior Door Vision Panels (6" x 2'-10")	6	ea	$ 298.80	$ 1,793	
Door Hardware - See hardware section				w/ Hardware	
				TOTAL DOORS & FRAMES	**$ 235,552**
08 30 00 - SPECIALTY DOORS					
INTERIOR					
Access Doors	1	ls	$ 2,500.00	$ 2,500	
				TOTAL SPECIALTY DOORS	**$ 2,500**
08 41 00 - ENTRANCE & STOREFRONTS					
EXTERIOR					
Exterior Storefront	5,326	sf	$ 94.62	$ 503,946	
SF01 w/GL-1	1	ea		in Above	
SF02 w/GL-1	2	ea		in Above	
SF03 w/GL-1	6	ea		in Above	
SF04 w/GL-1	2	ea		in Above	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
SF05 w/GL-1	1	ea		in Above	
SF06 w/GL-1	1	ea		in Above	
SF07 w/GL-1	1	ea		in Above	
SF08 w/GL-1	1	ea		in Above	
SF09 w/GL-1	1	ea		in Above	
SF10 w/GL-1	1	ea		in Above	
SF11 w/GL-1	1	ea		in Above	
SF12 w/GL-1	2	ea		in Above	
SF13 w/GL-1	1	ea		in Above	
SF14 w/GL-1	1	ea		in Above	
SF15 w/GL-1	1	ea		in Above	
SF16 w/GL-1&5	1	ea		in Above	
SF17 w/GL-1&5	4	ea		in Above	
SF18 w/GL-1	1	ea		in Above	
SF19 w/GL-1	1	ea		in Above	
SF20 w/GL-2	1	ea		in Above	
SF21 w/GL-1&2	1	ea		in Above	
SF22 & Double Door w/GL-1&3 S.G.Lv3	1	ea		in Above	
SF24 & Double Door w/GL-1&3 S.G.Lv3	1	ea		in Above	
SF26 & Double Door w/GL-1&3 S.G.Lv3	1	ea		in Above	
SF28 & Double Door w/GL-1&3 S.G.Lv3	1	ea		in Above	
SF29 & Double Door w/GL-1&3 S.G.Lv3	1	ea		in Above	
School Guard (Level 3) Premium	400	sf	$ 201.19	$ 80,477	
Aluminum Door Assemblies (per leaf)	10	leaf	$ 4,581.60	$ 45,816	
Door Hardware	5	set	$ 3,286.80	$ 16,434	
INTERIOR					
Interior Storefront	552	sf	$ 74.70	$ 41,234	
SF25 & Double Door w/GL-3 S.G. Lv3				in Above	
SF27 & Double Door w/GL-3 S.G.Lv3				in Above	
SF30 - w/GL-4 -Bullet Resist.- Lev4	1	ea	$ 4,980.00	$ 4,980	
SF31 & Wood Doors w/GL-3				in Above	
SF32 & Single Door w/GL-3				in Above	
SF33 w/GL-2				in Above	
SF34 w/GL-1				in Above	
SF35 & Single Door w/GL-2				in Above	
SF23 & Double Door w/GL-1&3 S.G.Lv3				in Above	
School Guard (Level 3) Premium	360	sf	$ 124.50	$ 44,820	
Aluminum Door Assemblies (per leaf)	8	leaf	$ 4,581.60	$ 36,653	
Door Hardware	6	set	$ 3,286.80	$ 19,721	
MISCELLANEOUS					
Caulking & Backer Rod				w/ Sealants	
				TOTAL ENT. & STOREFRONT	**$ 794,081**
08 44 00 - METAL FRAMED CURTAINWALL				N/A	
				TOTAL CURTAINWALL	**$ -**
08 50 00 - WINDOWS				N/A	
				TOTAL WINDOWS	**$ -**
08 71 00 - DOOR HARDWARE					
EXTERIOR					
Door Hardware - Materials					
Door Hardware	2	lvs	$ 1,195.20	$ 2,390	
Door Hardware - Closer premium	2	lvs	$ 176.04	$ 352	
Door Hardware - Mag hold premium	2	lvs	$ 226.34	$ 453	
Door Hardware - Panic premium	2	lvs	$ 653.87	$ 1,308	
Door Premium - Rated	2	lvs	$ 175.30	$ 351	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Door Hardware - Labor					
Door Hardware installation				w/ Doors & Frames	
INTERIOR					
Door Hardware - Materials					
Door Hardware	134	lvs	$ 1,095.60	$ 146,810	
Door Hardware - Closer premium	1	ls	$ 10,000.00	$ 10,000	
Door Hardware - Mag hold premium	1	ls	$ 3,000.00	$ 3,000	
Door Hardware - Panic premium	1	ls	$ 5,000.00	$ 5,000	
Door Premium - Rated	1	ls	$ 10,000.00	$ 10,000	
Door Hardware - Labor					
Door Hardware installation				w/ Doors & Frames	
Privacy Shutter for Interior Door Vision Panels (6" x 2'-10")	6	ea	$ 49.80	$ 299	
				TOTAL DOOR HARDWARE	**$ 179,963**
08 80 00 - GLASS & GLAZING					
MIRRORS					
Vision Lite - Door Type C - 1/4" Tempered	12	sf	$ 30.88	$ 371	
Glass Door - Door Type D - 1/4" Tempered	33	sf	$ 30.88	$ 1,019	
Glass Door - Door Type J - 1/4" Tempered	44	sf	$ 30.88	$ 1,359	
HM-3 Borrowed Lights	261	sf	$ 30.88	$ 8,059	
Framed Mirrors				w/ Toilet Access	
				TOTAL GLASS & GLAZING	**$ 10,807**
08 90 00 - LOUVERS & VENTS					
LOUVERS					
Louvers - misc not shown					
				TOTAL LOUVERS	**$ -**
09 21 00 - GYPSUM BOARD ASSEMBLIES					
SUBCONTRACTOR QUOTE					
Acoustics Inc.	**1**	**ls**		**TBD**	
EXTERIOR WALLS					
Type F1 - 5/8 Gyp,Mineral Wool Insu,l5/8 Gyp Spray Applied Barrier, 2" Rigid	251	sf	$ 19.68	$ 4,940	
Type F2 - 5/8 Gyp,Mineral Wool Insu,l5/8 Gyp Spray Applied Barrier, 2" Rigid	1,002	sf	$ 22.84	$ 22,886	
Monitor Bumpout - 5/8 Gyp,Mineral Wool Insu,l5/8 Gyp Spray Applied Barrier, 2" Rigid	513	sf	$ 22.84	$ 11,717	
Type F3 - 5/8 Gyp,Mineral Wool Insu,l5/8 Gyp Spray Applied Barrier, 2" Rigid	6,823	sf	$ 22.84	$ 155,839	
Exterior Soffit for Metal Panels	3,577	sf	$ 27.19	w/ CFMF	
INTERIOR PARTITIONS					
Type A1 - 3 5/8 Mtl Stud, (2) 5/8 Gyp, snd batt, (2) 5/8 Gyp	1,671	sf	$ 18.44	$ 30,805	
Type A2 - 6 Mtl Stud, (2) 5/8 Gyp, snd batt, (2) 5/8 Gyp	999	sf	$ 31.54	$ 31,510	
Type A3 - 8 Mtl Stud, (2) 5/8 Gyp, snd batt, (2) 5/8 Gyp	1,151	sf	$ 44.59	$ 51,326	
Type B1 - 3 5/8 Mtl Stud, 5/8 Gyp, snd batt, 5/8 Gyp	4,672	sf	$ 15.93	$ 74,443	
Type B2 - 6 Mtl Stud, 5/8 Gyp, snd batt, 5/8 Gyp	11,127	sf	$ 21.37	$ 237,806	
Type B3 - 8 Mtl Stud, 5/8 Gyp, snd batt, 5/8 Gyp	299	sf	$ 26.10	$ 7,805	
Type C1 - 3 5/8 Mtl Stud, 5/8 Cement Board, 5/8 Cement Board	159	sf	$ 13.05	$ 2,075	
Type C2 - 6 Mtl Stud, 5/8 Cement Board, 5/8 Cement Board	945	sf	$ 17.40	$ 16,445	
Type D1 - 2 1/2 Mtl Stud, 5/8 Gyp, Closed Cell Spray Foam	5,375	sf	$ 10.88	$ 58,460	
Type E1 - 2 1/2 Mtl Stud, 5/8 Gyp, snd batt	13,618	sf	$ 8.70	$ 118,491	
Type E2 - 3 5/8 Mtl Stud, 5/8 Gyp, snd batt	4,354	sf	$ 11.96	$ 52,091	
CEILINGS					
Suspended Gypsum Ceilings	2,684	sf	$ 19.03	$ 51,086	
Gypsum Soffits	513	sf	$ 17.40	$ 8,927	
MISCELLANEOUS					
HM Frame Installation	111	hrs	$ 129.16	$ 14,337	
In-wall Blocking	8,874	sf	$ 3.49	$ 30,971	
Misc. Joint Sealants & Firestopping	8,874	lf	$ 4.89	$ 43,432	
Lifts & Equipement	1	ls	$ 16,380.00	$ 16,380	
Phasing Coordination					
				TOTAL GYP. BOARD ASSEM.	**$ 1,041,773**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	Qty	Unit	Unit Price	Subtotal	Total
09 30 00 - TILE					
09 30 00 - TILE					
Floor Tile					
PFT-1 - Porcelain Floor Tile	1,600	sf	$ 18.92	$ 30,278	
PFT-2 - Porcelain Floor Tile	1,300	sf	$ 18.92	$ 24,601	
PFT-3 - Porcelain Floor Tile	140	sf	$ 23.18	$ 3,245	
Attic Stock (1.5%)	46	sf	$ 20.34	$ 928	
Wall Tile					
PWT-1 - Porcelain Wall Tile	60	sf	$ 28.39	$ 1,703	
PWT-2 - Porcelain Wall Tile	60	sf	$ 28.39	$ 1,703	
PWT-3 - Porcelain Wall Tile	160	sf	$ 23.66	$ 3,785	
PWT4 - Porcelain Wall Tile	515	sf	$ 19.87	$ 10,233	
CWT-1 - Ceramic Wall Tile	2,250	sf	$ 18.92	$ 42,579	
CWT-2 - Ceramic Wall Tile	1,650	sf	$ 18.92	$ 31,225	
CWT-3 - Ceramic Wall Tile	250	sf	$ 18.92	$ 4,731	
CWT-4 - Ceramic Wall Tile	55	sf	$ 23.66	$ 1,301	
CWT-5 - Ceramic Wall Tile	90	sf	$ 15.14	$ 1,363	
Attic Stock (1.5%)	76	sf	$ 21.76	$ 1,662	
Miscellaneous					
Schluter Floor	1	ls	$ 1,000.00	$ 1,000	
Crack Suppression, Waterproofing Membrane	3,040	sf	$ 5.68	$ 17,259	
Saddles	7	ea	$ 141.93	$ 994	
T-1 Schluter Floor Reducer	345	lf	$ 11.35	$ 3,917	
T-2 Schluter Wall Reducer	1,130	lf	$ 11.35	$ 12,830	
Epoxy Grout @ Floors & Walls	8,130	sf	$ 2.84	$ 23,078	
Temporary Floor Protection	3,040	sf	$ 0.95	$ 2,876	
Expansion Joints	1	ls	$ 4,731.00	$ 4,731	
				TOTAL TILE	**$ 226,022**
09 51 00 - ACOUSTICAL CEILINGS					
09 51 13 - ACOUSTICAL CEILINGS					
Acoustical Panel Ceilings					
ACT1: 24"x24"	34,000	sf	$ 6.29	$ 214,020	
ACT2: 24"x24"	900	sf	$ 8.43	$ 7,584	
ACP1 - Acoustical Ceiling Panels	546	sf	$ 94.62	$ 51,663	
Attic Stock / Punch List (2.5%)	886	sf	$ 7.36	$ 6,519	
Acoustical Ceiling Clouds					
ACC1 - Rough Tree Crown Shape	12	ea	$ 733.31	$ 8,800	
ACC2 - Rough Tree Crown Shape	9	ea	$ 733.31	$ 6,600	
ACC3 - Smooth Circular Shape	3	ea	$ 567.72	$ 1,703	
ACC4 - Smooth Circular Shape	7	ea	$ 473.10	$ 3,312	
ACC5 - Smooth Circular Shape	13	ea	$ 473.10	$ 6,150	
ACC6 - Smooth Circular Shape	6	ea	$ 473.10	$ 2,839	
Attic Stock / Height Adjustments (1 of each)	6	ea	$ 575.61	Deleted	
Ceiling Trim					
2" Extruded Aluminum Trim	40	lf	$ 24.60	$ 984	
4" Extruded Trim	620	lf	$ 26.49	Deleted	
8" Extruded Trim	500	lf	$ 42.58	$ 21,290	
6" Curved Extruded Trim	70	lf	$ 80.43	$ 5,630	
24" Bent Trim	40	lf	$ 35.72	$ 1,429	
Attic Stock / Height Adjustments (7.5%)	95	lf	$ 41.96	$ 3,997	
				TOTAL ACOUSTICAL CEILING	**$ 342,518**
09 61 10 - VAPOR MITIGATION					
09 05 61 - FLOOR MOISTURE MITIGATION & LEVELING					
Existing Slab Preparation				$ (25,041)	
Shot Blast, Gridnd, Moisture Mitigation, Self Leveler, Skimming	38,288	sf	$ 5.70	$ 218,242	
				TOTAL VAPOR MITIGATION	**$ 193,201**
09 65 00 - RESILIENT FLOORING					
09 65 00 - RESILIENT FLOORING					
Floors				$ (50,227)	
HVT-1	21,000	sf	$ 10.88	$ 228,507	
SV-1	185	sy	$ 85.16	$ 15,754	
SV-2	120	sy	$ 85.16	$ 10,219	
SV-3	120	sy	$ 85.16	$ 10,219	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
SV-4	30	sy	$ 85.16	$ 2,555	
SV-5	75	sy	$ 85.16	$ 6,387	
SV-6	80	sy	$ 85.16	$ 6,813	
SV-7	475	sy	$ 85.16	$ 40,450	
SV-8	230	sy	$ 85.16	$ 19,586	
SV-9	130	sy	$ 85.16	$ 11,071	
SV-10	60	sy	$ 85.16	$ 5,109	
SV-BL	800	lf	$ 9.46	$ 7,570	
V-RED	225	lf	$ 7.57	$ 1,703	
Attic Stock (3%)	115	sy	$ 86.74	$ 9,988	
Wall Base & Accessories					
RB-1	5,355	lf	$ 3.31	$ 17,734	
RB-2	315	lf	$ 7.57	$ 2,384	
RB-3	252	lf	$ 3.08	$ 775	
RB-4	126	lf	$ 3.08	$ 387	
Attic Stock (3%)	181	lf	$ 4.26	$ 773	
Transition Strips, Expansion Joints, Thresholds, etc.	1	allw	$ 19,920.00	$ 19,920	
Miscellaneous					
Temporary Floor Protection	34,545.00	sf	$ 0.95	$ 32,686	
			TOTAL RESILIENT FLOORING		**$ 400,363**
09 67 00 - RESINOUS FLOORING					
09 67 00 - RESINOUS FLOORING					
Epoxy Resinous Flooring				$ (5,514)	
RES1 - Sherwin Williams Hybri-Flex w/ Quartz, Non-Slip	861	sf	$ 34.86	$ 30,014	
Temporary Floor Protection	861	sf	$ 1.00	$ 858	
			TOTAL RESINOUS FLOORING		**$ 25,358**
09 68 00 - CARPET					
09 68 13 - CARPET TILE					
Carpet					
CPT1 - Carpet Tile	120	sf	$ 53.93	$ 6,472	
Attic Stock (3%)	4	sf	$ 53.93	$ 194	
Miscellaneous					
Temporary Floor Protection	120	sf	$ 0.95	$ 114	
			TOTAL CARPET		**$ 6,780**
09 80 00 - ACOUSTICAL TREATMENT					
09 84 30 - SOUND ABSORBING TREATMENT					
Acoustical Wall Panels				$ (1,511)	
AWP1 - Acoustical Wall Panels	6	ea	$ 1,135.44	$ 6,813	
AWP2 - Acoustical Wall Panels	5	ea	$ 1,135.44	$ 5,677	
AWP3 - Acoustical Wall Panels	2	ea	$ 1,135.44	$ 2,271	
AWP4- Acoustical Wall Panels	8	ea	$ 1,135.44	$ 9,084	
Attic Stock / Size Adjustments (10%)	61	sf	$ 39.15	$ 2,384	
			TOTAL ACOUSTICAL TREAT.		**$ 24,718**
09 91 00 - PAINTING					
EXTERIOR					
Doors & Frames					
HM / FRP Doors	2	ea	$ 99.60	$ 199	
HM / FRP Frames	2	ea	$ 174.30	$ 349	
INTERIOR					
Doors & Frames					
HM / FRP Doors	134	ea	$ 99.60	$ 13,346	
HM / FRP Frames	109	ea	$ 174.30	$ 18,999	
Wall Finish					
P1 - SuperPaint Interior Latex - Eggshell (Whesthighland White)	21,993	sf	$ 1.15	$ 25,191	
P2 - Pro Industrial Multi Surface Acrylic - Semi Glass (TBD)	-	sf		Excluded	
P3 - Scuff Tuff Interior Water Based Enamel (Gossamer Veil)	12,299	sf	$ 1.15	$ 14,087	
P4 - Scuff Tuff Interior Water Based Enamel (Sunbeam Yellow)	1,552	sf	$ 1.15	$ 1,778	
P5 - Scuff Tuff Interior Water Based Enamel (Dockside Blue)	2,025	sf	$ 1.15	$ 2,319	
P6 - SuperPaint Interior Latex - Eggshell (Sunbeam Yellow)	4,136	sf	$ 1.15	$ 4,737	
P7 - SuperPaint Interior Latex - Eggshell (Dockside Blue)	4,438	sf	$ 1.15	$ 5,083	
P8 - SuperPaint Interior Latex - Eggshell (inky Blue)	1,805	sf	$ 1.15	$ 2,067	
P9 - SuperPaint Interior Latex - Eggshell (A Drift of Mist)	5,201	sf	$ 1.15	$ 5,957	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
P10 - SuperPaint Interior Latex - Eggshell (TBD) (Room 116 shown as P11 on finish plan)					
P11 - SuperPaint Interior Latex - Eggshell (TBD)	1,123	sf	$ 1.15	$ 1,286	
P12 - SuperPaint Interior Latex - Eggshell (Hinting Blue)	903	sf	$ 1.15	$ 1,034	
P13 - Pro Industrial Waterbased Catalyzed Epoxy	903	sf	$ 1.15	$ 1,034	
P14 - Scuff Tuff Interior Water Based Enamel (Dancing Green)	885	sf	$ 1.15	$ 1,014	
P15 - Scuff Tuff Interior Water Based Enamel (Jetstream)	888	sf	$ 1.15	$ 1,017	
P16 - Scuff Tuff Interior Water Based Enamel (TBD)	1,029	sf	$ 1.15	$ 1,179	
P17 - Pro Industrial Multi-Surface Acrylic - Exposed Structrual Steel Beams & (32) Columns	220	sf	$ 2.19	$ 482	
P18 - Waterbased Catalyzed Epoxy (Westhighland White)	5,766	sf	$ 4.27	$ 24,637	
CK1 Cork Wall Tile w/ Alum Trim	274	sf	$ 9.96	$ 2,729	
VWC - Vinyl Wallcovering	848	sf	$ 6.97	$ 5,912	
Custom Vignette Scenes	214	sf	$ 6.97	$ 1,492	
Floor Finish					
Sealed Concrete	1,376	sf	$ 3.14	$ 4,315	
Ceilings					
EXP1 - Dryfall - Eggshell (Dockside Blue)	1,555	sf	$ 2.01	$ 3,129	
PGB1 - Flat Finish (Westhighland White)	1,518	sf	$ 1.49	$ 2,268	
PGB2 - Flat Finish (Sunbeam Yellow)	510	sf	$ 1.49	$ 762	
PGB3 - Flat Finish (Dockside Blue)	626	sf	$ 1.49	$ 935	
			TOTAL PAINTING		**$ 147,339**
10 11 00 - VISUAL DISPLAY SURFACES					
TACK BOARDS					
Map Rail - 10ft	17	ea	$ 194.22	$ 3,302	
WHITE BOARDS					
White Boards 4x6 W/Maprail & Tray	18	ea	$ 597.60	$ 10,757	
MONITORS					
Monitor brackets for Large TV's			By Owner (Install Only)		
Monitor - 60"			By Owner (Install Only)		
Monitor - 70"			By Owner (Install Only)		
Monitor - 80"			By Owner (Install Only)		
SMART BOARDS					
Smart Boards 60"	19	ea	By Owner (Install Only)		
LABOR					
Installation	54	ea	$ 112.80	$ 6,091	
			TOTAL VISUAL DISPLAY SURF.		**$ 20,150**
10 14 00 - SIGNAGE					
EXTERIOR					
Building Sign - Site Signage (2 Large Post Mounted) - 10				NA	
Aluminum Dimensional Signage	1	allw	$ 4,400.00	$ 4,400	
INTERIOR					
Room ID - 1	42	ea	$ 152.39	$ 6,400	
Room ID w/Insert - 2	9	ea	$ 152.39	$ 1,371	
Interior Carbon Monoxide - 3	3	ls	$ 152.39	$ 457	
Assistive Listening - 4	1	ea	$ 152.39	$ 152	
Toilet - 5	18	ls	$ 152.39	$ 2,743	
Faculty Toilet - 6	8	ea	$ 152.39	$ 1,219	
Interior HA/Exit - 7	5	ls	$ 152.39	$ 762	
Typical Paper Insert - 8	38	ea	$ 152.39	$ 5,791	
Window ID/Refl. Vinyl Sign - 9	18	ls	$ 152.39	$ 2,743	
Directional Sign - 11,12,13	3	ea	$ 152.39	$ 457	
Installation	145	ea	$ 49.80	$ 7,221	
			TOTAL SIGNAGE		**$ 33,717**
10 21 23 - CUBICAL CURTAIN & TRACK					
Cubical Curtain & Track	201	lf	$ 35.21	$ 7,077	
			'AL CUBICAL CURTAIN & TRACK		**$ 7,077**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
10 26 00 - WALL & DOOR PROTECTION					
WALL & DOOR PROTECTION					
Wall Paneling - Koroseal	4,793	sf	$ 27.00	$ 129,411	
VWP-3	250	sf	$ 27.00	$ 6,750	
Corner Guards	109	ea	$ 49.80	$ 5,428	
4" Thermoplastic Rubber Chair Rail (CR1 / CR2)	150	lf	$ 29.88	$ 4,482	
FRP at Kitchen	1,947	sf	$ 20.10	$ 39,135	
			TOTAL WALL & DOOR PROT.		**$ 185,206**
10 28 00 - TOILET ACCESSORIES					
TOILET ACCESSORIES - MATERIALS					
36" grab bar	25	ea	$ 55.33	$ 1,383	
42" grab bar	25	ea	$ 60.36	$ 1,509	
18" grab bar	25	ea	$ 50.30	$ 1,257	
ADA Mirror	34	ea	$ 179.28	$ 6,096	
Toilet tissue dispenser (multi)	25	ea	$ -	by Owner	
Stainless shelf & Mirror	7	ea	$ 211.25	$ 1,479	
Paper towel dispenser	41	ea	$ -	by Owner	
Soap dispenser	41	ea	$ -	by Owner	
Sanitary napkin disposal	4	ea	$ 136.93	$ 548	
Trash Receptacles (Wall Mounted)	41	ea	$ 348.60	$ 14,293	
Mop & Broom Bracket	1	ea	$ 152.07	$ 152	
Robe Hooks	26	ea	$ 31.44	$ 818	
TOILET ACCESSORIES - LABOR					
Accessories Installation	295	ea	$ 112.80	$ 33,275	
			TOTAL TOILET ACCESSORIES		**$ 60,809**
10 41 00 - EMRG ACCESS CABINETS					
EMERGENCY ACCESS CABINETS					
Nurse Med Cabinet	1	ea	$ 697.20	$ 697	
			TOTAL EMERG. ACCESS CABS.		**$ 697**
10 44 00 - FIRE PROTECTION SPECIALTIES					
FIRE EXTINGUISHERS					
Fire Extinguishers & Cabinets (ea)	8	ea	$ 697.20	$ 5,578	
Fire Extinguishers	8	ea	$ 448.20	$ 3,586	
			TOTAL FIRE PROT. SPEC.		**$ 9,163**
10 51 00 - LOCKERS					
LOCKERS - MATERIAL					
Metal Lockers	2	ea	$ 547.80	$ 1,096	
LOCKERS - LABOR					
Installation	4	hrs	$ 112.80	$ 451	
			TOTAL LOCKERS		**$ 1,547**
10 75 00 - FLAGPOLES					
FLAGPOLES -MATERIAL					
Flag & poles class room	20	ea	$ 22.84	$ 457	
FLAGPOLES -LABOR					
Installation	20	ea	$ 4.98	$ 100	
			TOTAL FLAG POLES		**$ 556**
11 30 00 - RESIDENTIAL APPLIANCES					
RESIDENTIAL APPLIANCES					
Refrigerator	1	ea	$ 2,490.00	$ 2,490	
Under Cabinet Refrigerator	1	ea	$ 1,250.00	$ 1,250	
Microwave	1	ea	$ 647.40	$ 647	
Unloading and setup	6	hrs	$ 112.80	$ 677	
			TOTAL RES. APPLIANCES		**$ 5,064**

JOINT VENTURE DOWNES

Edgewood Pre-K Academy REV 1

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026

90% CONSTRUCTION DOCUMENTS

ESTIMATE DETAIL

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	Qty	Unit	Unit Price	Subtotal	Total
11 40 00 - FOOD SERVICE EQUIPMENT					
FOOD SERVICES EQUIPMENT (based on Crabtree McGrath Assoc. - 5/18/2026 Budget)					
Item #1 - Mop Sink Cabinet	1	ea	$ 6,800.00	$ 6,800	
Item #2 - Mop Bucket (by Owner)				by Owner	
Item #3 - Staff Lockers (by GC)				W/ Div 10	
Item #4 - Office Desk (by Owner)	-	ea		w/ FFE	
Item #5 - Walk-in Cooler	1	ea	$ 24,500.00	$ 24,500	
Item #6 - Mechanical Refrigeration System	1	ls	$ -	w/ Above	
Item #7 - Cooler Evaporator Coil	1	ls	$ -	w/ Above	
Item #8 - Cooler Condensing Unit	1	ls	$ -	w/ Above	
Item #9 - Mobile Shelving Unit	6	ea	$ 420.00	$ 2,520	
Item #10 - Bun Pan Rack (Existing)				ETR	
Item #11 - Storage Shelving	4	ea	$ 315.00	$ 1,260	
Item #12 - Dunnage Rack	2	ea	$ 225.00	$ 450	
Item #13 - Spare Number				N / A	
Item #14 - Reach-in Freezer (Existing)				ETR	
Item #15 - Utility Cart	1	ea	$ 850.00	$ 850	
Item #16 - Hand Sink	2	ea	$ 1,075.00	$ 2,150	
Item #17 - Waste Bin (by Owner)				by Owner	
Item #18 - Reach-in Freezer	1	ea	$ 9,480.00	$ 9,480	
Item #19 - Prep Table w/Sinks	1	ea	$ 6,850.00	$ 6,850	
Item #20 - Wall Shelf	2	ea	$ 1,325.00	$ 2,650	
Item #21 - Waste Barrel (by Owner)				by Owner	
Item #22 - Can Opener	1	ea	$ 175.00	$ 175	
Item #23 - Spare Number				N / A	
Item #14 - Spare Number				N / A	
Item #25 - Ceiling Mounted Utensil Rack	1	ea	$ 1,400.00	$ 1,400	
Item #26 - Countertop Six - Pan Steamer	1	ea	$ 24,500.00	$ 24,500	
Item #27 - Water Filter Assembly	1	ea	$ 1,375.00	$ 1,375	
Item #28 - Burner Range - Six (Existing)				ETR	
Item #29 - Double Convection Oven	1	ea	$ 18,600.00	$ 18,600	
Item #30 - Exhaust Hood	1	ea	$ 19,500.00	$ 19,500	
Item #31 - Stainless Steel Wall Flashing	1	ls	$ 2,145.00	$ 2,145	
Item #32 - Fire Suppression System	1	ls	$ 5,500.00	$ 5,500	
Item #33 - Hood Auto Start Control System	1	ls	$ 4,800.00	$ 4,800	
Item #34 - Hood Auto Start Control Interface	1	ls	$ -	w/ Above	
Item #35 - Room Temperature Sensor	1	ea	$ -	w/ Above	
Item #36 - Insulated Food Carrier (Existing)				ETR	
Item #37 - Cook's Table w/Sink	1	ea	$ 7,520.00	$ 7,520	
Item #38 - Hot Holding Cabinet (Existing)				ETR	
Item #39 - Water Filter Assembly	1	ea	$ 650.00	$ 650	
Item #40 - Milk Cooler	1	ea	$ 5,375.00	$ 5,375	
Item #41 - Heated Serving Counter (Existing)				ETR	
Item #42 - Mobile Work Table	1	ea	$ 1,750.00	$ 1,750	
Item #43 - Insulated Food Carrier	5	ea	$ 2,450.00	$ 12,250	
Item #44 - Three Compartment Sink	1	ea	$ 9,500.00	$ 9,500	
Item #45 - Wall Shelf	1	ea	$ 725.00	$ 725	
Item #46 - Pre-Rinse Assembly w/Add-on Faucet	1	ea	$ 875.00	$ 875	
Item #47 - Ventless Warewasher	1	ea	$ 32,450.00	$ 32,450	
Item #48 - Clean Dishtable	1	ea	$ 1,650.00	$ 1,650	
Item #49 - Wall Shelf	1	ea	$ 435.00	$ 435	
Delivery, Supervision & Set in Place	1	ls	$ 16,600.00	$ 16,600	
			TOTAL FOODSERVICE	**$**	**225,285**
11 52 00 - AUDIO-VISUAL EQUIPMENT				N/A	
			TOTAL AV EQUIPMENT	**$**	**-**
12 20 00 - WINDOW TREATMENT					
WINDOW TREATMENT					
RS1 - Manual Roller Shades (Storefront Windows)	4,762	sf	$ 17.50	$ 83,335	
RS1 - Manual Roller Shades (Doors)	33	sf	$ 17.50	$ 578	
			TOTAL WINDOW TREATMENT	**$**	**83,913**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
12 48 13 - ENTRANCE MATS & FRAMES					
12 48 13 - ENTRANCE FLOOR MATS & FRAMES					
Entry Mats					
EM1 - Entrance Foot Grilles w/o drain	70	sf	$ 177.89	$ 12,452	
EM2 - Entrance Foot Loose Lay Mats	147	sf	$ 88.94	$ 13,075	
EM3 - Entrance Foot Mats	51	sy	$ 96.51	$ 4,944	
EM4 - Entrance Foot Mats	11	sy	$ 96.51	$ 1,105	
Miscellaneous					
Temporary Floor Protection	781	sf	$ 1.00	$ 778	
			TOTAL ENTRY MAT & FRAME		**$ 32,353**
14 20 00 - ELEVATORS				N/A	
			TOTAL ELEVATORS		**$ -**
21 00 00 - FIRE PROTECTION					
SUBCONTRACTOR QUOTE					
Blackwater Services Group, LLC	**1**	**ls**		**TBD**	
DEMOLITION					
Demolition of Existing Systems	39,923	sf		N / A	
FIRE PROTECTION GENERAL CONDITIONS					
Hydraulic calculations	1	ls	$ 2,490.00	$ 2,490	
Testing & inspection	1	ls	$ 1,992.00	$ 1,992	
Coordination and management	1	ls	$ 7,968.00	$ 7,968	
Permits and fees	1	ls	$ 2,988.00	$ 2,988	
Seismic Restraints and Fasteners	1	ls	$ 3,486.00	$ 3,486	
Coring & patching / firestopping	1	ls	$ 3,984.00	$ 3,984	
Shop Drawings	1	ls	$ 1,992.00	$ 1,992	
Record Drawings	1	ls	$ 1,992.00	$ 1,992	
FIRE PROTECTION SPRINKLER SYSTEM					
6" Double Check Valve Assembly, OS&Y Valves	1	ea	$ 7,171.20	$ 7,171	
Alarm Check Valve	1	ea	$ 5,577.60	$ 5,578	
Sprinkler Test & Drain Valve	1	ea	$ 1,494.00	$ 1,494	
Floor Control Valve Assembly - Not Required					
Alarm Bell	1	ea	$ 498.00	$ 498	
Storz FDC	1	ea	$ 1,394.40	$ 1,394	
Sprinkler Head	371	ea	$ 99.60	$ 36,952	
Sprinkler Head - Dry Barrel, sidewall	1	ea	$ 1,792.80	$ 1,793	
6" Sprinkler Main Pipe	120	lf	$ 74.70	$ 8,964	
3" Sprinkler Main Pipe	800	lf	$ 54.78	$ 43,824	
Sprinkler Branch Piping	3,500	lf	$ 29.88	$ 104,580	
			TOTAL FIRE PROTECTION		**$ 239,140**
22 00 00 - PLUMBING					
SUBCONTRACTOR QUOTE					
P&D Mechanical, Inc.	**1**	**ls**		**TBD**	
PLUMBING GENERAL CONDITIONS					
Testing & disinfection	1	ls	$ 3,093.00	$ 3,093	
Coordination & management	1	ls	$ 41,240.00	$ 41,240	
Permits and fees	1	ls	$ 15,465.00	$ 15,465	
Seismic restraints / bracing	1	ls	$ 8,248.00	$ 8,248	
Coring & patching / firestopping	1	ls	$ 8,763.50	$ 8,764	
Hoisting & rigging / floor loading	1	ls	$ 7,732.50	$ 7,733	
Shop drawings & submittals	1	ls	$ 3,608.50	$ 3,609	
Record drawings / as builts	1	ls	$ 3,093.00	$ 3,093	
Access panels - furnish only	1	ls	$ 2,577.50	$ 2,578	
DEMOLITION					
Demolition of Existing Plumbing Systems	39,923	sf	$ 1.03	$ 41,161	
DOMESTIC WATER PIPING					
Domestic water pipe (Type L Cu.) - Main	3,000	lf	$ 57.74	$ 173,208	
Fixture Rough-in	102	ea	$ 360.85	$ 36,807	
Pipe insulation	3,000	lf	$ 14.43	$ 43,302	
Misc. valves, tags and fittings	1	ls	$ 46,655.56	$ 46,656	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
SANITARY WASTE & VENT PIPE (UNDERGROUND)					
Sanitary Waste & Vent Pipe	1,375	lf	$ 59.80	$ 82,222	
Grease Waste Heat Trace & Insulation	450	lf	$ 61.86	$ 27,837	
SANITARY WASTE & VENT PIPE (ABOVE GROUND)					
Sanitary Waste & Vent Pipe	1,200	lf	$ 63.92	$ 76,706	
Fixture Rough-in	102	ea	$ 360.85	$ 36,807	
Floor Drain	33	ea	$ 1,649.60	$ 54,437	
Kitchen Floor Sink	5	ea	$ 1,855.80	$ 9,279	
STORM DRAINAGE SYSTEM (UNDERGROUND)					
Storm Pipe	1,200	lf	$ 82.48	$ 98,976	
STORM DRAINAGE SYSTEM (ABOVE)					
Storm Pipe, 4" and less	1,400	lf	$ 61.86	$ 86,604	
Roof Drains	43	ea	$ 1,443.40	$ 62,066	
RADON					
Radon stacks, 6"	80	lf	$ 82.48	$ 6,598	
Under slab radon pipe - assume if required by Civil					
GAS PIPING					
Natural Gas Pipe (Sched 40 Black Steel)	150	lf	$ 77.33	$ 11,599	
Valves, Tags & Fittings	1	ls	$ 1,546.50	$ 1,547	
Gas Meter Assembly (Meter by Others)	1	ea	$ 2,577.50	$ 2,578	
Gas Connection to Boilers and Kitchen Equipment	1	ls	$ 3,093.00	$ 3,093	
PLUMBING EQUIPMENT					
Gas Fired Water Heater - 199,900btu/hr	1	ea	$ 12,372.00	$ 12,372	
Thermostatic Mixing Valve	1	ea	$ 3,608.50	$ 3,609	
Hot Water Recirculation Pump	1	ea	$ 3,608.50	$ 3,609	
Expansion Tank	1	ea	$ 1,855.80	$ 1,856	
Water service entrance	1	ea	$ 5,155.00	$ 5,155	
Water meter assembly	1	ea	$ 3,711.60	$ 3,712	
Reduced pressure backflow preventer	1	ea	$ 4,124.00	$ 4,124	
Duplex submersible effluent pump - for floor drain waste only; 30GPM	1	ea	$ 12,887.50	$ 12,888	
Grease Interceptor, Interior - assume	1	ea	$ 7,217.00	$ 7,217	
Grease Interceptor, Exterior	1	ea	$ 20,620.00	$ 20,620	
KITCHEN PLUMBING CONNECTIONS					
Kitchen plumbing rough-in and connections	1	ls	$ 20,620.00	$ 20,620	
PLUMBING FIXTURES					
WC-1A: Water Closet, ADA Wall Mounted	7	ea	$ 2,010.45	$ 14,073	
WC-2A: Water Closet, child height floor mounted	19	ea	$ 1,958.90	$ 37,219	
HS-01: Classroom Sink	21	ea	$ 1,830.03	$ 38,431	
S-01: Breakroom Sink	1	ea	$ 1,830.03	$ 1,830	
JS-01: Janitors Sink	2	ea	$ 1,494.95	$ 2,990	
Lav-1A: Lavatory; ADA Wall hung	6	ea	$ 1,881.58	$ 11,289	
Lav-2A: Lavatory; Undermount S.S Sink	20	ea	$ 1,881.58	$ 37,632	
Hose Bibb	10	ea	$ 463.95	$ 4,640	
HYD-01: Freeze Proof Wall Hydrant	10	ea	$ 618.60	$ 6,186	
EWC- 01 thru 03: Water Cooler	6	ea	$ 4,020.90	$ 24,125	
			TOTAL PLUMBING		**$ 1,269,497**
23 00 00 - HVAC					
SUBCONTRACTOR QUOTE					
P&D Mechanical, Inc.	**1**	**ls**			**TBD**
HVAC GENERAL REQUIREMENTS					
Commissioning Support	1	ls	$ 11,952.00	$ 11,952	
Coordination & management	1	ls	$ 99,600.00	$ 99,600	
Permits and fees	1	ls	$ 34,860.00	$ 34,860	
Rigging / Floor Loading	1	ls	$ 39,840.00	$ 39,840	
Coring & patching / firestopping	1	ls	$ 8,466.00	$ 8,466	
Shop drawings & submittals	1	ls	$ 4,183.20	$ 4,183	
Record drawings / as builts	1	ls	$ 4,183.20	$ 4,183	
Equipment start up and inspection	1	ls	$ 9,960.00	$ 9,960	
Access panels - furnish only	1	ls	$ 3,984.00	$ 3,984	
DEMOLITION					
Demolition of Existing HVAC Systems	39,923	sf	$ 1.49	$ 59,645	
TESTING & BALANCING					
Testing & balancing (Water / Air)	39,923	sf	$ 1.00	$ 39,763	
INSULATION					
Insulation - Duct	18,000	sf	$ 5.98	$ 107,568	
Insulation - Duct Firewrap	200	sf	$ 19.92	$ 3,984	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Insulation - Pipe	8,658	lf	$ 13.94	$ 120,727	
AUTOMATIC TEMPERATURE CONTROLS FOR HVAC					
Building Management System	39,923	sf	$ 7.97	$ 318,106	
REFRIGERANT PIPING					
FCU to CU; Hardcopper	2,300	lf	$ 54.78	$ 125,994	
CU to BC; Hardcopper	100	lf	$ 54.78	$ 5,478	
BC to FCU; Lineset	1,200	lf	$ 51.79	$ 62,150	
HYDRONIC PIPING					
<3" Hot Water Pipe	3,958	lf	$ 57.77	$ 228,646	
Valves, Tags, & Fittings	1	ls	$ 39,647.17	$ 39,647	
Condensate Piping					
Condensate Pipe	1,100	lf	$ 41.83	$ 46,015	
HVAC AIR DISTRIBUTION					
Ductwork - Galvanized	24,300	lbs	$ 17.93	$ 435,650	
Ductwork - Welded Black Steel (Kitchen Grease Exhaust)	300	lbs	$ 31.87	$ 9,562	
Vent, 6"	100	lf	$ 273.90	$ 27,390	
Ductliner	1,000	sf	$ 11.95	$ 11,952	
RGD's	184	ea	$ 249.00	$ 45,816	
Motorized dampers	2	ea	$ 996.00	$ 1,992	
Louvers	2	ea	$ 1,494.00	$ 2,988	
Sound Attenuator	18	ea	$ 4,980.00	$ 89,640	
Misc. Ductwork Accessories	39,923	sf	$ 1.00	$ 39,763	
EXHAUST FANS					
KEF-1 - Kitchen Hood Upblast Fan (2,200 Cfm)	1	ea	$ 10,956.00	$ 10,956	
EF-1 - Inline exhaust fans (300 Cfm)	1	ea	$ 1,494.00	$ 1,494	
CF-1 - Ceiling destratification fan (7,632 Cfm)	1	ea	$ 6,474.00	$ 6,474	
CENTRAL HEATING EQUIPMENT					
Gas Fired Condensing Boiler (999 MBH)	2	ea	$ 39,840.00	$ 79,680	
Boiler Condensate Neutralizer Kit	2	ea	$ 796.80	$ 1,594	
Expansion Tank	1	ea	$ 5,478.00	$ 5,478	
Air Separator	1	ea	$ 6,474.00	$ 6,474	
Glycol Fill Station	1	ea	$ 7,868.40	$ 7,868	
BP-01: Boiler Pump (67 GPM / 1 HP)	2	ea	$ 5,179.20	$ 10,358	
HWP-01&02: In-Line System Pump (180 GPM / 7.5 HP)	2	ea	$ 13,446.00	$ 26,892	
CENTRAL COOLING EQUIPMENT					
RTU-1 DX Heat Pump Cooling/Heating w/ Energy Recovery	1,800	cfm	$ 48.80	$ 87,847	
RTU-2 DX Heat Pump Cooling/Heating w/ Energy Recovery	1,050	cfm	$ 48.80	$ 51,244	
RTU-3 DX Heat Pump Cooling/Heating w/ Energy Recovery	2,200	cfm	$ 48.80	$ 107,369	
DOAS-01 DX Heat Pump Cooling/Heating w/ Energy Recovery	1,900	cfm	$ 48.80	$ 92,728	
DOAS-02 DX Heat Pump Cooling/Heating w/ Energy Recovery	2,700	cfm	$ 48.80	$ 131,771	
DOAS-03 DX Heat Pump Cooling/Heating w/ Energy Recovery	1,140	cfm	$ 48.80	$ 55,637	
DOAS-04 DX Heat Pump Cooling/Heating w/ Energy Recovery	1,000	cfm	$ 48.80	$ 48,804	
DOAS-05 DX Heat Pump Cooling/Heating w/ Energy Recovery	1,000	cfm	$ 48.80	$ 48,804	
DOAS-06 DX Heat Pump Cooling/Heating w/ Energy Recovery	2,330	cfm	$ 48.80	$ 113,713	
Roof Curbs & Dunnage - incl above	9	ea			
HVAC TERMINAL EQUIPMENT					
Heat pump	75	tons	$ 2,490.00	$ 186,750	
FCU's - less than 1,100cfm	10	ea	$ 4,780.80	$ 47,808	
FCU's - less than 1,000cfm	2	ea	$ 4,581.60	$ 9,163	
FCU's - less than 900cfm	1	ea	$ 4,382.40	$ 4,382	
FCU's - less than 800cfm	6	ea	$ 4,183.20	$ 25,099	
FCU's - less than 500cfm	1	ea	$ 3,187.20	$ 3,187	
FCU's - less than 400cfm	26	ea	$ 2,988.00	$ 77,688	
Branch controllers	2	ea	$ 5,478.00	$ 10,956	
DX Split System with ACCU & FCU-07; 385cfm	1	ea	$ 7,470.00	$ 7,470	
DX Split System with ACCU & FCU-12; 775cfm	1	ea	$ 9,462.00	$ 9,462	
Cabinet Unit Heater	5	ea	$ 1,992.00	$ 9,960	
Unit Heater	1	ea	$ 1,494.00	$ 1,494	
Elec. Unit Heater	1	ea	$ 1,394.40	$ 1,394	
Finn tube	810	lf	$ 129.48	$ 104,879	
				TOTAL HVAC	**$ 3,434,384**

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
26 00 00 - ELECTRICAL					
ELECTRICAL GENERAL REQUIREMENTS					
Coordination and management	1	ls	$ 74,700.00	$ 74,700	
Permits and fees				Waived	
Firestopping	1	ls	$ 4,980.00	$ 4,980	
Testing and studies	1	ls	$ 9,960.00	$ 9,960	
Temporary power and lighting,	39,923	sf	$ 1.29	$ 51,692	
Lightning protection system				NIC	
Commissioning support	1	ls	$ 7,470.00	$ 7,470	
DEMOLITION					
Cut, cap and make-safe for Existing Electrical Systems	39,923	sf	$ 1.25	$ 49,704	
SERVICE AND DISTRIBUTION (NORMAL POWER)					
Gear package	1	ls	$ 98,054.06	$ 98,054	
Labor:					
1600A main switchboard	1	ls	$ 19,920.00	$ 19,920	
400A panelboard MLO	2	ea	$ 1,752.96	$ 3,506	
225A panelboard MLO	3	ea	$ 896.40	$ 2,689	
100A panelboard MLO	3	ea	$ 747.00	$ 2,241	
Metering and sub-metering on MSB and each panelboard	10	ea	$ 996.00	$ 9,960	
100A feed	130	lf	$ 35.86	$ 4,661	
225A feed	90	lf	$ 81.67	$ 7,350	
400A feed	60	lf	$ 159.36	$ 9,562	
PV system				NIC	
SERVICE AND DISTRIBUTION (GENERATOR)					
150kW diesel generator in WP SA enclosure	1	ea	$ 89,640.00	$ 89,640	
400A ATS	1	ea	$ 14,940.00	$ 14,940	
Labor:					
400A doubletub panelboard	1	ea	$ 3,505.92	$ 3,506	
400A feed	60	lf	$ 159.36	$ 9,562	
Controls	30	lf	$ 29.88	$ 896	
GROUNDING SYSTEM					
Building / Equipment Grounding System	1	ls	$ 7,470.00	$ 7,470	
EQUIPMENT CONNECTIONS					
20A equipment	13	ea	$ 1,195.20	$ 15,538	
50A equipment	2	ea	$ 2,639.40	$ 5,279	
DOAS 110A	290	lf	$ 44.82	$ 12,998	
DOAS 50A	100	lf	$ 26.89	$ 2,689	
DOAS 50A	210	lf	$ 26.89	$ 5,647	
DOAS 70A	100	lf	$ 34.86	$ 3,486	
DOAS 70A	380	lf	$ 34.86	$ 13,247	
DOAS 70A	240	lf	$ 34.86	$ 8,366	
EPO feed and connections	2	ea	$ 747.00	$ 1,494	
HP-100A	210	lf	$ 37.85	$ 7,948	
HP-30A	230	lf	$ 17.93	$ 4,123	
HP-40A	50	lf	$ 20.92	$ 1,046	
HP-45A	170	lf	$ 21.91	$ 3,725	
HP-60A	60	lf	$ 26.89	$ 1,614	
HP-60A	80	lf	$ 26.89	$ 2,151	
HP-60A	90	lf	$ 26.89	$ 2,420	
HP-60A	120	lf	$ 26.89	$ 3,227	
HP-60A	340	lf	$ 26.89	$ 9,143	
HP-60A	300	lf	$ 26.89	$ 8,068	
HP-70A	330	lf	$ 34.86	$ 11,504	
HP-70A	70	lf	$ 34.86	$ 2,440	
HP-80A	190	lf	$ 36.85	$ 7,002	
HP-80A	350	lf	$ 36.85	$ 12,898	
HP-80A	300	lf	$ 36.85	$ 11,056	
HP-80A	260	lf	$ 36.85	$ 9,582	
Kitchen equipment wiring allowance	1	ea	$ 7,470.00	$ 7,470	
RTU - 35A	150	lf	$ 24.90	$ 3,735	
RTU - 70A	140	lf	$ 34.86	$ 4,880	
RTU - 80A	110	lf	$ 36.85	$ 4,054	
Disconnect switches	1	ea	$ 24,900.00	$ 24,900	
Destratification Fans feed and connection	1	ea	$ 996.00	$ 996	
EPO feed and connection	2	ea	$ 796.80	$ 1,594	
FCU 20A feed and connection	48	ea	$ 547.80	$ 26,294	
Motorized door feed and connection (2 doors/push buttons)	4	ea	$ 1,992.00	$ 7,968	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Kitchen equipment feed and connection	1	ea	$ 14,940.00	$ 14,940	
Projector screen feed and connection	1	ea	$ 1,494.00	$ 1,494	
CUH/UH feed and connection	5	ea	$ 996.00	$ 4,980	
LIGHTING CONTROLS					
Lighting & Controls Budget	1	ls	$ 594,843.00	$ 594,843	
Labor:					
LS	19	ea	$ 59.76	$ 1,135	
OS	76	ea	$ 59.76	$ 4,542	
S	2	ea	$ 14.94	$ 30	
S ELV	2	ea	$ 59.76	$ 120	
S ORLO	41	ea	$ 59.76	$ 2,450	
S OS	36	ea	$ 59.76	$ 2,151	
S3	4	ea	$ 16.93	$ 68	
Lighting controls	39,923	sf		in Above	
INTERIOR LIGHTING					
A2 - 2x2	103	ea	$ 89.64	$ 9,233	
A4 - 2x4	3	ea	$ 89.64	$ 269	
B4 - 4'	2	ea	$ 89.64	$ 179	
B6 - 6'	235	ea	$ 89.64	$ 21,065	
C - DL	51	ea	$ 89.64	$ 4,572	
C1 - DL	4	ea	$ 89.64	$ 359	
D4 - 4'	7	ea	$ 89.64	$ 627	
D8 - 8'	6	ea	$ 89.64	$ 538	
Exit sign	17	ea	$ 89.64	$ 1,524	
F2	19	ea	$ 89.64	$ 1,703	
F3	1	ea	$ 89.64	$ 90	
G - 4' utility	22	ea	$ 89.64	$ 1,972	
H4	4	ea	$ 89.64	$ 359	
J1	27	ea	$ 298.80	$ 8,068	
J2	24	ea	$ 298.80	$ 7,171	
J3	22	ea	$ 298.80	$ 6,574	
K2 - 2x2	16	ea	$ 89.64	$ 1,434	
M	3	ea	$ 89.64	$ 269	
WP - ext sconce	6	ea	$ 149.40	$ 896	
BRANCH POWER					
Double duplex receptacle	98	ea	$ 51.79	$ 5,076	
Duplex receptacle	215	ea	$ 26.89	$ 5,782	
Controlled receptacles	150	ea	$ 64.74	$ 9,711	
Floor box	1	ea	$ 747.00	$ 747	
GFI duplex receptacle	78	ea	$ 36.85	$ 2,874	
Special purpose outlet	5	ea	$ 74.70	$ 374	
WP device plate	15	ea	$ 22.91	$ 344	
LIGHTING & BRANCH CIRCUITRY					
Device plate	576	ea	$ 5.18	$ 2,983	
Device box	1,300	ea	$ 26.89	$ 34,960	
3/4" EMT	6,000	lf	$ 10.46	$ 62,748	
1" RGS at rooftop penetrations	10	loc	$ 996.00	$ 9,960	
#12 THHN	27,000	lf	$ 1.54	$ 41,683	
MC cable	23,000	lf	$ 5.48	$ 125,994	
LV cabling	4,500	lf	$ 2.49	$ 11,205	
TELECOMMUNICATIONS					
Telecommunication Infrastructure					
MDF fit out	1	ea	$ 7,470.00	$ 7,470	
IDF fit out	1	ea	$ 4,980.00	$ 4,980	
Rack	3	ea	$ 2,191.20	$ 6,574	
Cable tray 18"	45	lf	$ 74.70	$ 3,362	
Hilti sleeve	8	ea	$ 498.00	$ 3,984	
Device box w/1" conduit stub	57	ea	$ 149.40	$ 8,516	
WAP ceiling box	30	ea	$ 64.74	$ 1,942	
Conduit to floor box	60	lf	$ 14.94	$ 896	
Chief PAC box	20	ea	$ 448.20	$ 8,964	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Telecommunication System					
1 port data device	5	ea	$ 29.88	$ 149	
2 Port data device	4	ea	$ 59.76	$ 239	
4 Port data device	48	ea	$ 119.52	$ 5,737	
WAP (2 port)	30	ea	$ 498.00	$ 14,940	
Cat 6 cabling	40,000	lf	$ 2.49	$ 99,600	
Backbone cabling	200	lf	$ 14.94	$ 2,988	
Network switches/PBX				By Owner	
AUDIO VISUAL					
Audio Visual Infrastructure					
Audio Visual Systems package, allow	1	ls	$ 293,820.00	$ 293,820	
Rough-in:					
A: AV box w/ 2-1.25"	18	ea	$ 338.64	$ 6,096	
B: AV box w/: 1"	18	ea	$ 159.36	$ 2,868	
C: AV in floor box: 2-1"	2	ea	$ 717.12	$ 1,434	
D: AV box w/ 2-1"	1	ea	$ 318.72	$ 319	
E: EV box w/ 1"	1	ea	$ 159.36	$ 159	
ALS: AV box w/ 1"	1	ea	$ 159.36	$ 159	
ANT: AV box w/ 1"	2	ea	$ 159.36	$ 319	
MIC: AV box w/ 1"	2	ea	$ 159.36	$ 319	
CS	18	ea	$ 159.36	$ 2,868	
Labor:					
10k Lumen projector - Epson EB-PU2010W	1	ea	$ 996.00	$ 996	
161" electric screen - Draper 140031	1	ea	$ 996.00	$ 996	
ALS	1	ea	$ 119.52	$ 120	
ANT	2	ea	$ 119.52	$ 239	
MIC	2	ea	$ 119.52	$ 239	
Speech reinforcement system	18	ea	$ 3,486.00	$ 62,748	
S1 - speaker flush mounted	84	ea	$ 74.70	$ 6,275	
CS	18	ea	$ 159.36	$ 2,868	
ID-75" smart sbid mx275 v4	18	ea	$ 298.80	$ 5,378	
Mon 65"	2	ea	$ 298.80	$ 598	
LV cabling	6,350	lf	$ 2.49	$ 15,812	
CALL FOR AID					
Based on Pacific Electronics	8	loc	$ 896.40	$ 7,171	
Indicator light/dome light	8	loc	$ -	w/ Above	
Pull cord	8	loc	$ -	w/ Above	
Master Clock / PA System					
Master Clock and PA Smarts and Parts budget - ESC	1	ls	$ 65,238.00	$ 65,238	
Labor:					
Head end	1	ls	$ 2,490.00	$ 2,490	
Clock - wireless - Sapling wireless round clock	44	ea	$ 89.64	$ 3,944	
Speaker PA - 8" S810T725PG8U	39	ea	$ 89.64	$ 3,496	
Speaker PA - VC	15	ea	$ 89.64	$ 1,345	
Speaker PA: 2x2 - CSD2x2U	24	ea	$ 89.64	$ 2,151	
Speaker PA: horn - FMH15T	6	ea	$ 89.64	$ 538	
Speaker PA: PS pendant speaker - OCS1	2	ea	$ 89.64	$ 179	
VC device	1	ea	$ 74.70	$ 75	
PE device, allow not on schedule	20	ea	$ 89.64	$ 1,793	
Device box w/ 3/4" stub	21	ea	$ 109.56	$ 2,301	
LV cabling	4,500	lf	$ 2.49	$ 11,205	
SECURITY SYSTEM					
Head end	1	ea	$ 29,880.00	$ 29,880	
CCTV camera (PTZ)	10	ea	$ 1,494.00	$ 14,940	
CCTV camera (PTZ) WP	1	ea	$ 1,792.80	$ 1,793	
CCTV camera	4	ea	$ 996.00	$ 3,984	
CCTV camera WP	15	ea	$ 1,494.00	$ 22,410	
CR/KP	10	ea	$ 647.40	$ 6,474	
Door secured double	6	ea	$ 1,792.80	$ 10,757	
Door secured single	1	ea	$ 1,195.20	$ 1,195	
LD	1	ea	$ 249.00	$ 249	
Sensor motion	7	ea	$ 249.00	$ 1,743	
Panic button	4	ea	$ 249.00	$ 996	
Video door intercom	2	ea	$ 2,490.00	$ 4,980	
Video door intercom master station	1	ea	$ 3,486.00	$ 3,486	
Unknown device on security plans	42	ea	$ -	Assumes NIC	
Device box w/conduit stub	98	ea	$ 159.36	$ 15,617	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
LV cabling	14,700	lf	$ 2.49	$ 36,603	
Testing and programming	1	ls	$ 9,960.00	$ 9,960	
Bi-Directional Amplification System					
BDA sytem	39,923	sf	$ 1.49	See Add Alt	
BDA Infrastructure	1	ls	$ 5,000.00	$ 5,000	
BDA Testing	1	ls	$ 6,000.00	$ 6,000	
FIRE ALARM SYSTEM:					
Fire alarm control panel	1	ea	$ 7,470.00	$ 7,470	
Fire alarm remote annunciator	1	ea	$ 2,788.80	$ 2,789	
Duct smoke detector	2	ea	$ 547.80	$ 1,096	
FP equipment connection	3	ea	$ 249.00	$ 747	
GAP	1	ea	$ 2,788.80	$ 2,789	
Device removed and reused per demo plans	164	ea	$ 74.70	$ 12,251	
Initiating device	9	ea		w/ Above	
Signaling device	86	ea		w/ Above	
Allowance for new devices damaged from removal/storage etc	1	ls	$ 4,980.00	$ 4,980	
Interface with AV systems	1	ea	$ 1,195.20	$ 1,195	
Interface with BMS	1	ea	$ 1,195.20	$ 1,195	
Interface with generator control panel	1	ea	$ 1,195.20	$ 1,195	
Interface with security system	1	ea	$ 1,195.20	$ 1,195	
Magnetic door holder	2	ea	$ 249.00	$ 498	
Monitoring/control module	10	ea	$ 249.00	$ 2,490	
Remote test switch/remote alarm indicator	2	ea	$ 448.20	$ 896	
Device box	121	ea	$ 26.89	$ 3,254	
3/4" EMT	2,000	lf	$ 10.46	$ 20,916	
#14 THHN	7,000	lf	$ 1.44	$ 10,109	
FAMC cable	3,000	lf	$ 5.98	$ 17,928	
Testing and programming	1	ls	$ 7,470.00	$ 7,470	
			TOTAL ELECTRICAL		**$ 2,692,566**
26 56 00 - SITE ELECTRICAL					
SITE POWER DISTRIBUTION:					
Primary power riser	1	ea	$ 2,500.00	$ 2,500	
Primary service duct bank	280	lf	$ 80.00	$ 22,400	
Pad mounted utility transformer				By Utility Co	
Transformer pad grounding	1	ls	$ 2,500.00	$ 2,500	
Secondary service duct bank 1600A	230	lf	$ 845.00	$ 194,350	
Generator pad electrical	1	ls	$ 2,125.00	$ 2,125	
Generator duct bank 400 & controls	240	lf	$ 190.00	$ 45,600	
Comm riser	2	loc	$ 2,500.00	$ 5,000	
Comm ductbank	500	lf	$ 160.00	$ 80,000	
EV charger - dual port	1	ea	$ 7,500.00	$ 7,500	
EV charger 40A (X2)	460	lf	$ 16.00	$ 7,360	
SITE LIGHTING					
SL3 - 2 head	7	ea	$ 650.00	$ 4,550	
SL4 - 2 head	3	ea	$ 650.00	$ 1,950	
SL5	2	ea	$ 500.00	$ 1,000	
SL5 - pedestrian pole	6	ea	$ 500.00	$ 3,000	
Pole base	18	ea	$ 650.00	$ 11,700	
Lighting circuitry	1,700	lf	$ 15.00	$ 25,500	
			TOTAL SITE ELECTRICAL		**$ 417,035**
31 00 00 - SITEWORK, LANDSCAPING & UTILITIES					
MOBILIZATION / SITE LAYOUT					
Mobilization / Demobilization	1	ls	$ 25,015.50	$ 25,016	
6' H Chain Link Fence Enclosure (put up, maintain & remove)	3,420	lf	$ 26.52	$ 90,686	
Temp Double Gate	4	ea	$ 1,651.02	$ 6,604	
Temp Single Gate	4	ea	$ 625.39	$ 2,502	
Scrim	3,120	lf	$ 6.75	$ 21,073	
Custom Design Scrim	300	lf	$ 25.77	$ 7,730	
Fence & Scrim Maintenance	3,420	lf	$ 7.75	$ 26,521	
Temporary Pavement & Prep	2,500	sf	$ 15.01	$ 37,523	
Site Safety	1	ls	$ 12,507.75	$ 12,508	
General Dewatering (Localized Pumping Only)	1	ls	$ 20,012.40	$ 20,012	
Site Ground Maintenance	12	mos.	$ 550.34	$ 6,604	
Site Logistics	1	ls	$ 37,523.25	$ 37,523	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
GPS Layout	1	ls	$ 18,511.47	$ 18,511	
Construction Signage	1	ls	$ 4,802.98	w/ PR's	
EROSION CONTROL					
Haybales & Silt Fence at Site Perimeter	3,420	lf	$ 15.76	$ 53,898	
Haybales & Silt Fence at Loam Stockpile Area	1,144	lf	$ 15.76	$ 18,029	
Tree Protection	8	ea	$ 475.29	$ 3,802	
Inlet Protection (Silt Sacks)	15	ea	$ 350.22	$ 5,253	
Maintain Erosion Control	12	mos.	$ 125.08	$ 1,501	
Site Sweeping, Dust & Traffic Control	1	ls	$ 15,509.61	$ 15,510	
Anti-track Pads & Maintenance	4	ea	$ 4,502.79	$ 18,011	
Concrete Washout Area	4	ea	$ 3,101.92	$ 12,408	
Water Source				NA	
GENERAL SITEWORK & REMOVALS					
Clear & Grubb Swale	11,780	sf	$ 0.65	$ 7,662	
Remove Large Tree(s)	6	ea	$ 2,501.55	$ 15,009	
Remove Small Tree(s)	7	ea	$ 1,000.62	$ 7,004	
Strip Topsoil, Stockpile (Assumed 12")	6,298	cy	$ 3.75		
Screen Topsoil	6,298	cy	$ 11.51	$ 72,473	
Export Tailings @ 20%	1,260	cy	$ -	ontmainated Soil	
Demo Planting Beds Around Building	1	ls	$ 17,510.85	$ 17,511	
Pavement Demo - Road / Parking (Including load and export)	1,123	cy	$ 75.90	$ 85,209	
Pavement Demo - Sidewalks / Play Areas (Including load and export)	635	cy	$ 75.90	$ 48,169	
Demo Concrete Sidewalks / Pads (Incl. integral curb, load and export)	327	cy	$ 83.85	$ 27,455	
Sawcut Road	1,837	lf	$ 24.01	$ 44,105	
Demo Fencing	1,251	lf	$ 9.01	$ 11,266	
Demo Flagpole,Signs, Metal Containers	1	ls	$ 15,009.30	$ 15,009	
Demo Drainage Pipe	109	lf	$ 29.02	$ 3,163	
Demo Drainage Structure	5	ea	$ 3,051.89	$ 15,259	
Demo Water Line	100	lf	$ 32.02	$ 3,202	
Cap Water Line	1	ls	$ 1,000.62	$ 1,001	
Demo Sanitary Line	12	lf	$ 38.02	$ 456	
Flow Fill Sanitary Line	8	cy	$ 1,000.62	$ 7,593	
Cap Sanitary Lateral	1	ls	$ 4,002.48	$ 4,002	
Demo Parts & Accessories	1	ls	$ 3,252.02	$ 3,252	
Demo UG Electric Pathways	90	lf	$ 15.01	$ 1,351	
Demo Existing Playgound	1	ls	$ 3,201.98	$ 3,202	
Remove & Dispose of UG Propane Tank & Bollards	1	ls	$ 11,006.82	$ 11,007	
EARTH MOVING & GRADING					
Gravel Base at Pavement & Concrete Sidewalks	2,619	cy	$ 55.03	$ 144,145	
EXTERIOR IMPROVEMENTS					
Pavement					
Heavy Duty Bituminous - Bus Access Drive (4.5") (B2)	68,445	sf	$ 6.15	$ 421,195	
Standard Duty Bituminous - Parking Area (3.5") (B1)	13,125	sf	$ 5.00	$ 65,666	
Line Striping	1	ls	$ 21,063.05	$ 21,063	
Curbing					
Precast Concrete Curb - CC	3,318	lf	$ 55.03	$ 182,603	
Concrete Curb FICC, ICC, MCC				ered in Sidewalks	
Wheel Stops	4	ea	$ 275.17	$ 1,101	
Site Concrete					
Concrete Sidewalks Light Duty (C1)	15,878	sf	$ 13.01	$ 206,543	
HD Concrete Pavement (C2)	6,316	sf	$ 22.01	$ 139,033	
Heavy Duty Stamped / Colored Concrete Walks (C4)	2,314	sf	$ 31.02	$ 71,785	
Concrete Pads	130	sf	$ 41.28	$ 5,366	
Detectable Warning Strips	586	sf	$ 45.03	$ 26,370	
Joint Sealer	3,500	lf	$ 6.50	$ 22,764	
Salt guard Sealing	1	ls	$ 6,203.84	$ 6,204	
Frost Pads @ Doorways	360	sf	$ 22.51	$ 8,105	
Landscaping					
Mulch in Islands (M)	29	cy	$ 50.03	$ 1,474	
Topsoil - 8" Place & Spread (Assume Reusing Existing)	4,751	cy	$ 22.01	$ 104,579	
Plantings w/ Mulch	1	ls	$ 85,052.70	$ 85,053	
Turf Mix (Finish Rake & Seed)	192,401	sf	$ 0.40	$ 77,008	
Mow Strip (S1)	1,181	lf	$ 28.52	$ 33,686	
Chain Link Fence & Gates 4' Tall (Black Vinyl)	1,529	lf	$ 64.04	$ 97,904	
Steel Dumpster Enclosure w/ Composite Panels	69	lf	$ 675.42	$ 46,604	
Benches	9	ea	$ 1,260.78	$ 11,347	
Bike Racks	4	ea	$ 745.46	$ 2,982	

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
Flag Pole - 35' Tall	1	ea	$ 7,254.50	$ 7,254	
Trash Receptacles	12	ea	$ 1,951.21	$ 23,415	
Bollards	7	ea	$ 1,000.62	$ 7,004	
Removable Bollards	16	ea	$ 4,202.60	$ 67,242	
Bollards w/ Sign Post	10	ea	$ 1,375.85	$ 13,759	
Signage - Traffic & Directional	32	ea	$ 566.48	$ 18,127	
SITE UTILITIES					
Water Systems					
Protect Existing Water Main	98	lf	$ 14.18	$ 1,390	
Tapping Sleeves & Gate Valves Install	1	ls	$ 18,511.47	$ 18,511	
Domestic Water Service (4") (T&B Included)	145	lf	$ 100.06	$ 14,509	
Excavated = Polluted Soil Disposal	48	cy	$ -	e	
Fire Service (6") DIP (T&B Included)	149	lf	$ 105.07	$ 15,655	
Excavated = Polluted Soil Disposal	50	cy	$ -	ted Soil Removal	
Tapping Sleeve 8"x8"x4"	1	ea	$ 2,176.35	$ 2,176	
Tapping Sleeve 8"x8"x6"	1	ea	$ 1,826.13	$ 1,826	
Gate Valve 6"	1	ea	$ 4,102.54	$ 4,103	
Gate Valve 4"	1	ea	$ 3,502.17	$ 3,502	
Conc. Thrust Block	6	ea	$ 1,000.62	$ 6,004	
Sanitary Sewer					
New Sanitary Line (8" SDR 35 Pipe)	6	lf	$ 113.07	$ 678	
New Sanitary Line (6" SDR 35 Pipe)	67	lf	$ 81.05	$ 5,430	
Excavate & Core Existing Sanitary Manhole	1	ls	$ 5,753.57	$ 5,754	
1000 Gal. Grease Interceptor (T&B + set, mat w/ plumbing)	1	ea	$ 3,952.45	$ 3,952	
6"X6" Wye	1	ea	$ 425.26	$ 425	
6"X8" Wye	1	ea	$ 625.39	$ 625	
Storm Drainage					
CCB 6-6'	2	ea	$ 7,204.46	$ 14,409	
CCB Replace Top & Grate Only	7	ea	$ 2,501.55	$ 17,511	
Hydroworks Hydrodynamic Separator	4	ea	$ 15,009.30	$ 60,037	
12" RCP	27	lf	$ 100.06	$ 2,702	
15" RCP	108	lf	$ 125.08	$ 13,508	
Jet & Vacuum Existing Storm System Piping & Structures	2	ea	$ 10,006.20	$ 20,012	
Interior Under Slab Storm Piping (T&B)		lf			
Gas					
Protect Existing Gas Service	260	lf	$ 15.01	$ 3,902	
Site Electrical					
T1	529	lf	$ 66.54	$ 35,200	
Excavated	261	cy	$ -	w/ Above	
Sand	144	cy	$ -	w/ Above	
Polluted Soil Disposal	118	cy	$ -	ted Soil Removal	
T2	181	lf	$ 54.53	$ 9,871	
Excavated	74	cy	$ -	w/ Above	
Sand	41	cy	$ -	w/ Above	
Polluted Soil Disposal	34	cy	$ -	ted Soil Removal	
T3	36	lf	$ 34.52	$ 1,243	
Excavated	7	cy	$ -	w/ Above	
Sand	3	cy	$ -	w/ Above	
Polluted Soil Disposal	4	cy	$ -	ted Soil Removal	
T4	232	lf	$ 28.52	$ 6,616	
Excavated	21	cy	$ -	w/ Above	
Sand	9	cy	$ -	w/ Above	
Polluted Soil Disposal	13	cy	$ -	ted Soil Removal	
T5	719	lf	$ 28.52	$ 20,504	
Excavated	69	cy	$ -	w/ Above	
Sand	29	cy	$ -	w/ Above	
Polluted Soil Disposal	40	cy	$ -	ted Soil Removal	
T6	99	lf	$ 34.52	$ 3,418	
Excavated	24	cy	$ -	w/ Above	
Sand	10	cy	$ -	w/ Above	
Polluted Soil Disposal	14	cy	$ -	ted Soil Removal	
T7	165	lf	$ 28.52	$ 4,705	
Excavated	15	cy	$ -	w/ Above	
Sand	6	cy	$ -	w/ Above	
Polluted Soil Disposal	9	cy	$ -	ted Soil Removal	

JOINT VENTURE DOWNES

Edgewood Pre-K Academy REV 1

Drawings Dated: 05/08/2026

Estimate Date: 05/27/2026

Revised 06/01/2026

90% CONSTRUCTION DOCUMENTS

ESTIMATE DETAIL

ESTIMATE DETAIL	AREA 1				39,923 sf
DESCRIPTIONS	**Qty**	**Unit**	**Unit Price**	**Subtotal**	**Total**
T8	76	lf	$ 28.52	$ 2,167	
Excavated	7	cy	$ -	w/ Above	
Sand	3	cy	$ -	w/ Above	
Polluted Soil Disposal	4	cy	$ -	ted Soil Removal	
Transformer Pad	1	ls	$ 5,003.10	$ 5,003	
Light Pole Bases	12	ea	$ 2,601.61	$ 31,219	
Site Bases - Lighted Bollards	6	ea	$ 1,100.68	$ 6,604	
EV Station Base	1	ea	$ 795.49	$ 795	
SITE ENTRY SIGN					
Form, Place & Strip	150	sf	$ 6.00	eleted per Design	
Concrete materials - 4,000 psi	6	cy	$ 235.15	eleted per Design	
Reinforcement Material	1	ls	$ 425.26	eleted per Design	
PLAYGROUND					
Excavate & Base Prep	3,500	sf	$ 3.00	$ 10,507	
Pour-in-Place Rubber Surface	3,500	sf	$ -	$ -	
MISCELLANEOUS					
Video UG Utilities	1	ls	$ 7,504.65	$ 7,505	
As-Builts / A-2 Survey	1	ls	$ 20,012.40	$ 20,012	
Relocate Existing Shed A & B (Incl. base prep)	2	ea	$ 4,502.79	$ 9,006	
Interior T&B for MEP's & Base Prep for SOG	2,251	lf	$ 65.04	$ 146,406	
Interior Excavation Polluted Soil Disposal	655	cy	w/ Contaminated Soil Removal		
				TOTAL SITEWORK	**$ 3,302,371**

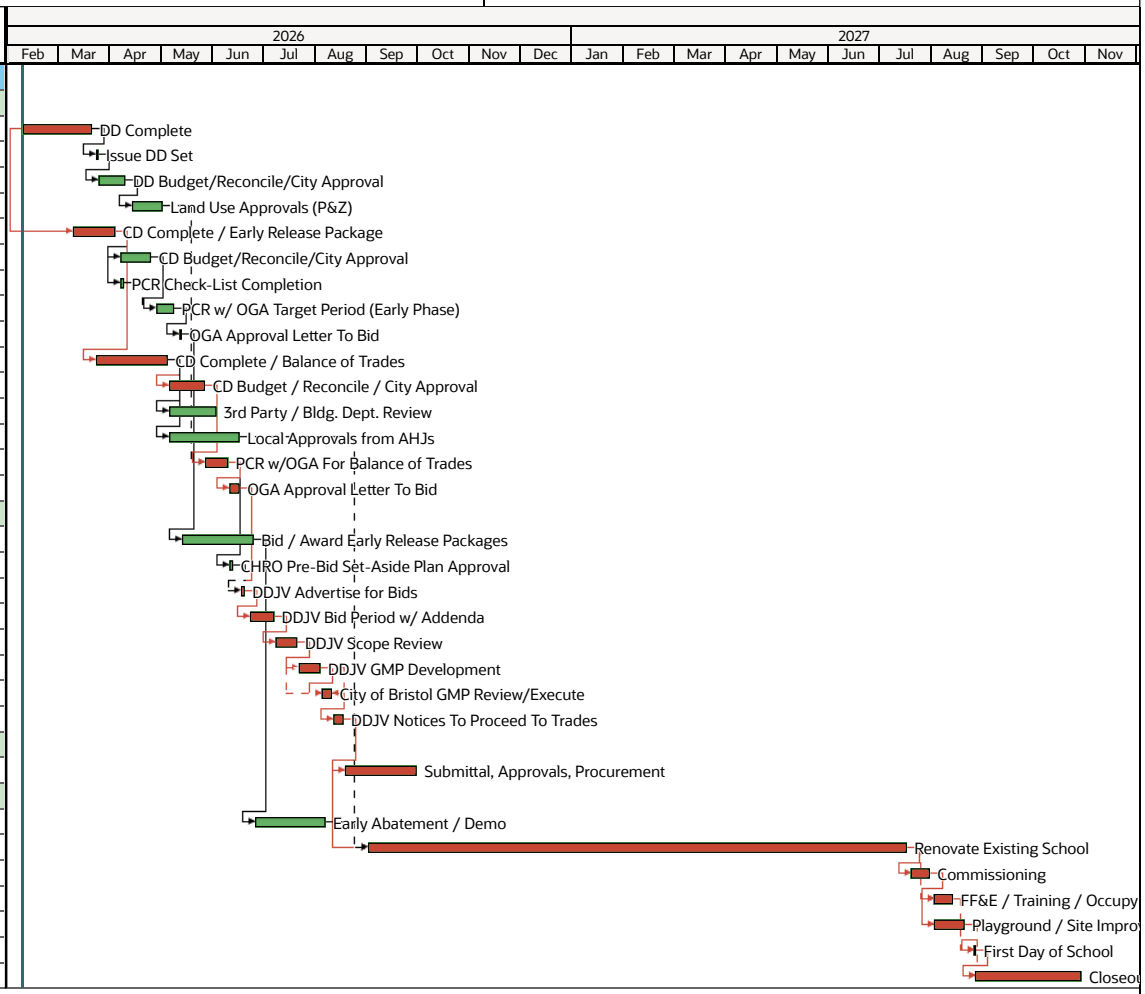
ALLOWANCES

1	Masonry Restoration & Cleaning	w/ Div 04	
2	Finish Schedule - Unselected Materials	TBD	
3	Floor Preparation - Substrate Remediation	w/ Div 09	
4	Replace Damaged Fire Alarm Devices	TBD	
5	Premium Time to Expedite Schedule	$ 200,000	
6	Staffing Premium Time to Expedite Schedule	$ 126,900	
7	Enviornmental Controls	By Owner	
		TOTAL ALLOWANCES	**$ 326,900**
		TOTAL TRADE COST	**$ 23,182,883**

Preliminary Schedule

RENOVATIONS TO EDGEWOOD PRE-K SCHOOL	CITY OF BRISTOL	RFQ CONCEPTUAL BASELINE SCHEDULE

ID	Name	Planned Duration	Start	Finish
Renovation At E…	Renovation At Edgewood Pre-K Aca…			
Preconstruction	Preconstruction			
A1085	DD Complete	30d	09-Feb-26	20-Mar-26
A1090	Issue DD Set	1d	23-Mar-26	23-Mar-26
A1095	DD Budget/Reconcile/City Approval	13d	24-Mar-26	09-Apr-26
A1100	Land Use Approvals (P&Z)	15d	13-Apr-26	01-May-26
A1605	CD Complete / Early Release Package	20d	09-Mar-26	03-Apr-26
A1610	CD Budget/Reconcile/City Approval	14d	06-Apr-26	24-Apr-26
A1630	PCR Check-List Completion	3d	06-Apr-26	08-Apr-26
A1640	PCR w/ OGA Target Period (Early Ph…	10d	27-Apr-26	08-May-26
A1650	OGA Approval Letter To Bid	2d	11-May-26	12-May-26
A4620	CD Complete / Balance of Trades	30d	23-Mar-26	04-May-26
A4630	CD Budget / Reconcile / City Approval	15d	05-May-26	26-May-26
A4631	3rd Party / Bldg. Dept. Review	20d	05-May-26	02-Jun-26
A4633	Local Approvals from AHJs	30d	05-May-26	16-Jun-26
A4640	PCR w/OGA For Balance of Trades	10d	27-May-26	09-Jun-26
A4715	OGA Approval Letter To Bid	5d	10-Jun-26	16-Jun-26
Bid/Award	Bid/Award			
A1700	Bid / Award Early Release Packages	30d	13-May-26	24-Jun-26
A1705	CHRO Pre-Bid Set-Aside Plan Approval	3d	10-Jun-26	12-Jun-26
A1710	DDJV Advertise for Bids	3d	17-Jun-26	19-Jun-26
A1720	DDJV Bid Period w/ Addenda	10d	22-Jun-26	06-Jul-26
A1730	DDJV Scope Review	10d	07-Jul-26	20-Jul-26
A1740	DDJV GMP Development	10d	21-Jul-26	03-Aug-26
A1750	City of Bristol GMP Review/Execute	5d	04-Aug-26	10-Aug-26
A1760	DDJV Notices To Proceed To Trades	5d	11-Aug-26	17-Aug-26
Major Procure…	Major Procurement Items			
A4650	Submittal, Approvals, Procurement	30d	18-Aug-26	29-Sep-26
Construction	Construction			
A4660	Early Abatement / Demo	30d	25-Jun-26	06-Aug-26
A4670	Renovate Existing School	220d	01-Sep-26	16-Jul-27
A4675	Commissioning	10d	19-Jul-27	30-Jul-27
A4680	FF&E / Training / Occupy Building	10d	02-Aug-27	13-Aug-27
A4690	Playground / Site Improvements	15d	02-Aug-27	20-Aug-27
A4695	First Day of School	1d	26-Aug-27	26-Aug-27
A4705	Closeout	44d	27-Aug-27	29-Oct-27



D'AMATO DOWNES JV | **EDGEWOOD PRE-K SCHOOL**

CONSTRUCTION MANAGER | **STATE PROJECT NO. XX-XXXX**

Date	Revision	Checked	Approved
20-Mar-26	DRAFT - PRECON	FJT	FJT

]

D'AMATO JOINT VENTURE DOWNES

CUT BOOK

of

FOODSERVICE EQUIPMENT

for

Edgewood Pre-K Academy

Bristol, CT

February 26th, 2026

PLEASE NOTE:
Cut sheets within this book are provided specifically for use by the owner or operator for their approval, and for use by the design engineers during the Construction Document development phase.
Cut sheets are not intended for use as bid documents.
All bids shall be based on the foodservice equipment drawings and specifications.

F O O D F A C I L I T I E S P L A N N E R S

100 Conifer Hill Drive, Danvers, Massachusetts 01923 978.352.8500 mail@crabtree-mcgrath.com

PROJECT: **Edgewood Pre-K Academy**

DATE: **February 26th, 2026**

Note:

1. The materials in this equipment cut book are intended for the Owner/Operator's review and approval. They will also be used by design engineers during the Construction Document development phase. *These materials are not intended for use as bid documents*.
2. The following document mentions various contractors in related trades. These contractors typically act as sub-contractors to the General Contractor or are directly engaged by the Owner, depending on the project. It is important to note that the work of these contractors is not included under the Foodservice Equipment Contract (Section 114000).

ARCHITECTURAL

- Walls, Floors, and Ceilings in foodservice areas must be durable, corrosion-resistant, and nonabsorbent. They should have a smooth, easily cleanable surface. The materials selected must be able to withstand the heavy moisture levels, especially in areas like warewashing. Materials that do not handle moisture or detergents properly should be avoided.
- **Walls:**
  - Suitable wall finishes include:
    - Ceramic tile
    - Glazed block
    - Concrete block with flush joints
    - Fiberglass Reinforced Plastic (FRP) panels (smooth finish)
    - Smooth finish epoxy paint
  - Minimum wall finish requirement:
    - Epoxy paint over two layers of waterproof gypsum board on metal studs. This may fail to meet inspectors' requirements in moist areas such as potwashing, dishwashing, or vegetable preparation zones.
  - Corner guards:
    - To protect exposed corners from damage, we recommend using rugged corner guards that extend from the coved floor to at least 48" above the floor.

100 Conifer Hill Drive, Danvers, Massachusetts 01923 978.352.8500 mail@crabtree-mcgrath.com

- Non-combustible construction:
  - Walls behind or beside cooking equipment must be of non-combustible construction. The 2021 edition of NFPA-96, Chapters 5 & 6, significantly expands on the requirements for walls and grease duct enclosures. These must meet the latest NFPA 96 code requirements, as outlined by the Architectural and Engineering teams.

- **Ceilings**
  - Ceilings in foodservice areas are strongly recommended to be sound-deadened and easy to clean. Suitable ceiling options for sound control and code compliance include:
    - Vinyl-faced ceiling tiles (FRP-coated or mylar-coated)
    - Fiberglass Reinforced Plastic (FRP) panels
    - Epoxy-coated drywall or gypsum board
    - Painted metal or aluminum panels
    - Acoustical Ceiling Tiles (ACT): Look for those rated for use in commercial kitchens (washable, sealed edges, moisture/mold-resistant).
    - Sound-deadening drywall (with insulation in the plenum space).
  - It is also recommended that ceilings be accessible for maintenance. Where possible, light fixtures should be installed flush with the ceiling.
  - Closure panels:
    - Closure panels will be specified for major foodservice equipment items that join the building, such as exhaust ventilators or walk-in refrigerated rooms. Drawing Details will be provided in the foodservice design drawings.

- **Floors**
  - Floors in foodservice areas must handle standing water, heat, heavy equipment, falling items, and food chemicals. They must also be non-combustible and slip-resistant. For facilities built to last 50 years or more, it's crucial to select durable flooring materials. The traditional high-quality material for foodservice is quarry tile with waterproof grout. Avoid very dark or very light finishes, as they tend to show dirt more easily. Textured finishes may be considered for enhanced slip resistance, though they can become noisy when carts are rolled over them and may cause mops to wear out more rapidly.
  - Epoxy is a viable alternative to quarry tile in foodservice areas for the following reasons:
    - Seamless Surface: No grout lines mean fewer places for bacteria, mold, or water to infiltrate, making it easier to clean and sanitize.
    - Slip Resistance: Textured aggregates can be added to enhance slip resistance in wet zones.
    - Chemical & Stain Resistance: Epoxy resists kitchen chemicals, oils, and cleaning agents.
    - Durability: High-quality, commercial-grade epoxy is designed to withstand heavy foot traffic, carts, and moderate equipment loads, often reinforced with quartz or urethane topcoats for added strength.

- Epoxy Care:
  - Before installation, review all documentation on product-specific installation, cleaning, and maintenance. Ensure the flooring can withstand temperatures ranging from -4°F to +140°F and can handle the weight of foodservice equipment as specified in the equipment cut book submittal.
- Sanitary Floor Coving:
  - All floor materials in the kitchen and servery zones must cove up where they meet walls, including in walk-in cooler/freezer areas.
  - Epoxy flooring that cannot be applied to walk-in cooler/freezer walls for a standard turn-up may employ an angled cant base.

- **Protection Against Pests**
  - To prevent the entry of insects and rodents, outer openings in foodservice areas must be protected by:
    - Filling or closing holes and gaps along floors, walls, and ceilings.
    - Tight-fitting windows.
    - Solid, self-closing, tight-fitting doors.
- **Walk-In Refrigerated Rooms**
  - Walk-in refrigerated rooms should ideally be installed with the floor flush with the adjoining building floor and made of the same material. Finished flooring for these rooms must be installed by the Flooring Contractor.
  - A 7" deep recess (measured from the finished floor surface) is necessary to accommodate the room's installation.
  - Special attention should be paid to flooring and ceiling details to ensure compliance with food code requirements, including a coved base at both the interior and exterior of insulated wall panels, as well as a properly closed ceiling from the top of the walk-in to the finished ceiling material.

VENTILATION

- **Exhaust Fans and Ductwork:**
  - Fans and ductwork for ventilators and dishwasher connections must be provided by the HVAC Contractor in accordance with NFPA 96. The required air volumes and static pressure will be provided by our team.
  - Ductwork for connecting ventilators to the exhaust blower must be at least 16-gauge carbon steel or 18-gauge stainless steel (welded watertight construction, properly pitched for drainage). Long horizontal runs should be avoided whenever possible.

- **Solid Fuel Exhaust Systems:**
    - Solid fuel (e.g., wood or charcoal) equipment must not share an exhaust hood with traditional gas or electric cooking equipment. These systems require dedicated hoods, ductwork, and fans.
- **Non-Cooking Exhaust Systems:**
    - Non-cooking exhaust systems (like dishwashers) must not be connected to grease ductwork. These require separate exhaust systems.
- **Direct-Vented Warewashers:**
    - Direct-vented warewashers will commonly be provided with stainless steel ductwork risers by the Kitchen Equipment Contractor (KEC) to a point 3" above the finished ceiling. The KEC shall provide a balancing damper for each duct riser. HVAC Contractor shall make the connection to the two straight ducts above the ceiling.
- **Make-Up Air:**
    - Conditioned make-up air must be supplied by a controlled means in proper quantity; a minimum of 75% of air exhausted through the hood or ventilator. Clean transfer air from adjacent spaces is an acceptable source of make-up air. The kitchen should operate at negative pressure to prevent kitchen odors from reaching adjacent areas. Exhaust and make-up air blowers should be interlocked to a control point located in the kitchen and a positive damper should be installed in the duct to prevent unwanted gravity caused air infiltration after the system has been shut down.

ELECTRICAL

- **Ground Fault Circuit Interrupter (GFCI) Receptacles:**
    - GFCI receptacles are required for all non-dwelling kitchen circuits per the National Electrical Code (NEC); however, GFCI outlets for equipment like refrigerated cases and ovens can cause nuisance tripping problems, so standard non-GFCI outlets may be preferred.
    - Foodservice equipment cannot block access to GFCI receptacles. We strongly recommend that the Electrical Contractor provide GFCI protection at the circuit breaker panel. This will also limit nuisance tripping that is common with commercial foodservice equipment.
    - The foodservice equipment plans will not distinguish between GFCI and non-GFCI receptacles.
    - Equipment specified by our office to include mounted receptacles will be specified with GFCI receptacles unless otherwise noted.
- **Electrical Connections:**
    - Foodservice equipment having integral motors, electrical heating units, lighting fixtures, receptacles and the like shall be internally wired to a junction box mounted on the equipment by the Kitchen Equipment Contractor (KEC).

- The Electrical Contractor shall furnish and install switches and receptacles not integral with the specified equipment and not called for in the "Item Specifications" of the project. The Electrical Contractor will furnish, install and connect all wiring and conduit from the junction box mounted on the items of equipment to the building electrical distribution system.

- The Electrical Contractor shall mount and wire all motor starters and other electrical devices furnished under the Kitchen Equipment specifications that are not an integral part of the equipment furnished. The most common applications of remote electrical components would be the remote refrigeration systems for the refrigerated rooms, light fixtures for the refrigerated rooms, control systems for the exhaust ventilators, or the remote control panel and solenoid valves associated with a food waste disposer.

- Electrical Contractor shall provide disconnects for equipment if the code requires. Dishwashing and cooking areas of the kitchen are wet and steamy areas and care should be exercised in the selection and locating of disconnects in these areas to comply with applicable codes.

- All conduit and flexible conduits that are exposed to water, steam, splashing, or weather should be liquid tight.

- All pieces of kitchen equipment that are shown on our plans with cords and plugs shall be provided with the proper cord and plug by the KEC.

- **Fire Suppression:**

  - The fixed-pipe fire suppression system shall be provided and installed by the KEC. Sources of heat and fuel must be shut-off to all equipment located under the kitchen exhaust ventilator per NFPA 96 2011, paragraphs 10.4. This requirement includes electrical components subject to exposure in the event of a system discharge

  - Shut-down of electrical equipment with the suppression system is accomplished by means of contactors or a shunt trip provided and installed by the Electrical Contractor for the required pieces.

  - The mechanical control head of the fire suppression system will be provided with appropriate "dry contacts" for the Electrical Contractor to utilize to activate (or deactivate) associated components. All inter-wiring is to be provided and installed by the Electrical Contractor.

- **Refrigerated Rooms:**

  - Wiring within the room must be kept to a minimum. Such wiring should be run in moisture-proof conduit and should be sealed internally and externally with brine putty or silicone to prevent moisture from entering and condensing in the light fixtures, boxes and conduit. Room manufacturers recommend use of a seal-off fitting mounted exterior to the box.

  - The freezer drainline heat tape, provided by the KEC, shall be plugged into a full time live duplex outlet provided by the Electrical Contractor located in the vicinity of the evaporator coil.

- **Lighting:**
    - Lighting for kitchen exhaust ventilators shall be furnished as part of the ventilator by the KEC and the wiring shall terminate in a single junction box. Electrical Contractor shall make the final connection to the hood control package, or provide a remote switch if called for in the specification and drawings.
    - Lighting for refrigerated rooms shall be furnished with the room assembly by the KEC. Refrigerated room light fixtures shall be mounted in the rooms and wired by the Electrical Contractor. Electrical Contractor shall make the final connection to the light controller in the assembly door panel. All conduit for light fixtures to be run on top of the assembly ceiling panels (not inside of refrigerated compartments).
    - General kitchen and serving area lighting is recommended to be at least 70 foot candles of illumination and in the warm white color spectrum to prevent distortion of food colors. All fixtures should have lens covers, be flush with the ceiling, and avoid surfaces where dust can accumulate.
    - Minimum lighting requirements:
        - At least 108 lux (10 foot candles) at a distance of 75 cm (30 inches) above the floor, in dry food storage areas
        - At least 540 lux (50 foot candles) at a surface where a Food Employee is working with food or working with utensil or equipment such as knives, slicers, grinders, or saws, or where employee safety is a factor.

PLUMBING

- **Water Temperature:**
    - The trend toward providing lower temperature hot water systems throughout buildings is increasing, with some systems delivering temperatures as low as 105°F. While this is acceptable in warewashing areas due to the use of booster heaters to maintain the required 180°F rinse water, a minimum temperature of 120°F is recommended for pot-washing sinks to ensure effective detergent action. If any equipment requires water temperatures above 120°F, consideration should be given to providing a second system.
- **Plumbing Connections:**
    - Exposed mechanical connections to fixtures in kitchens and foodservice areas, including exposed piping, should be chrome-plated. This helps maintain sanitary, easily cleanable surfaces that are consistent with the rest of the kitchen and its equipment. The Kitchen Equipment Contractor (KEC) shall provide all water faucets and sink outlets with lever-type wastes (usually 2" IPS size) and vacuum breakers for any equipment items designed to introduce water at less than 2" above the flood level of the chamber or tank.
    - Whenever possible, utility connections for equipment should exit from walls. All connecting piping should be neatly assembled, raised at least 12" off the floor, and should minimize exposed horizontal runs that are difficult to clean. The plumbing should be installed in a sanitary manner, off the floor, and supported using materials other than steel running thread.

- Interconnecting piping must not be reduced in size to less than the inlet size of the equipment or faucet.

- **Condensate Drains:**
  - Condensate drains in walk-in refrigerated rooms shall be provided and installed under the Kitchen Equipment specifications.

- **Fire Suppression System:**
  - All piping for the wet chemical fire suppression system shall be installed by the KEC. In gas-fired kitchens, the Plumbing Contractor shall be responsible for mounting the gas shut-off valve (provided by the KEC) at an appropriate location on the gas line.
  - NFPA 10 requires Class K fire extinguishers for appliances using combustible cooking media (vegetable or animal oils/fats). These will be provided as part of the fire suppression system for the exhaust hood. Additional extinguishers required should comply with NFPA standards and local fire marshal preferences.

- **Gas Equipment:**
  - Gas-fired ranges, ovens, steam generators, etc., will be furnished with gas pressure regulators that reduce pressure to 4" to 7" water column.

- **Traps for Sinks and Troughs:**
  - Traps for sinks, troughs, drainers, etc., shall be furnished and installed by the Plumbing Contractor. Exposed traps should be painted or plated to maintain an attractive appearance.

- **Floor Drains:**
  - Floor drains are essential for several purposes, such as general cleaning, receiving indirect waste lines from food preparation sinks, warewashers, hot food wells, cold pans, coffee drainers, ice machines, and more. We recommend using the Zurn Z1900 Series Stainless Steel Floor Sink, which features a 12" square design with a 1/2" grate and dome strainer, or an equivalent product.
  - In cooking batteries and occasionally at ice machines, we provide custom fabricated stainless steel floor pans with removable fiberglass grate sections. Installation of these requires coordination between the Flooring, Plumbing, and Kitchen Contractors. The pan's rim should be flush with the adjacent finished floor.

- **Floor Drain Location and Installation:**
  - The Plumbing Contractor must carefully locate floor drains during the rough-in stage to ensure they serve their intended purpose effectively. Drains should be set to the correct height to provide a level floor in the kitchen and servery. To keep equipment level, it is generally preferred that the kitchen and servery floors to not pitch to drains unless requested by the Owner. The floor should be level with just a slight pitch at the walls to keep water from collecting at the walls and corners where it's hard to get to. The user can squeegee to the area drains as needed if there is any puddling on level areas.

- **Indirect Waste Requirements:**
    - The Food Code specifies that any sink or device that might come into contact with food items must be indirectly wasted. This includes vegetable preparation sinks, cook's sinks, utility sinks, and warewashers, as well as units such as ice bins, cold plates, steam tables, and coffee urn drainers.
- **Plumbing Code:**
    - Massachusetts plumbing code requires that all three-compartment sinks be directly wasted to a grease interceptor. This may differ from regulations in other jurisdictions, so it is the responsibility of the Plumbing Engineer to advise our office on how to pipe the three-compartment sink to comply with local codes. Additionally, hand sink requirements vary by jurisdiction. Some plumbing codes mandate direct waste, while others do not. This information should be clarified early in the project, especially for sinks in bars or chef's counters, to ensure compliance.
- **FOG (Fats, Oils, and Grease) Regulations:**
    - FOG regulations for kitchen fixtures, sinks, floor troughs, and floor drains are being implemented with various local interpretations. In some cases, pot sinks are routed through a grease interceptor, which is then connected to an external grease trap. Other projects may route all sinks and dishwashers through interceptors, or include floor troughs at specific cooking equipment like kettles and braising pans. There is also the possibility of including garbage disposers in interceptors, although this can be problematic. We recommend that you keep an eye on these local regulations and inform our office if any special requirements need to be addressed in our drawings.
- **Automatic Grease Removal Systems:**
    - In some cases, automatic grease removal systems (such as the Thermaco Big Dipper) are required. However, connecting all potential devices to such a system can be challenging without a basement. If this system is necessary, please inform our office so we can provide an extended drainboard at the pot sink to accommodate the on-floor device.

CMM-MC-D2 MOP SINK STORAGE CABINET

ITEM #	QUANTITY:	
MODEL #:	2 DOOR	
PROJECT:		

YOUR COMPANY NAME:	
SHIP TO ADDRESS:	
SHIPPING NOTES:	

CRAFTSMANSHIP ABOVE THE STANDARD

MC-D2
SHEET 1 OF 2

NOTES:

DRAWN BY:	NPR	REVISION DATES	
ISSUE DATE:			
SCALE:	AS NOTED		

CUSTOM METALS OF MASSACHUSETTS, INC.
10 CALIPER RD. WHITMAN, MA. 02382
TELEPHONE: (781)-447-8090
FAX: (781)-447-8095

THIS DRAWING IS THE PROPERTY OF CUSTOM METALS OF MASSACHUSETTS, INC. (CMM) AND IS TO REMAIN IN THE POSSESSION OF OUR REPRESENTATIVE UNLESS PERMISSION IS GIVEN BY CMM AND MUST BE RETURNED WHEN REQUESTED.

ALL DIMENSIONS MUST BE VERIFIED PRIOR TO FABRICATION. ONCE THE DRAWING IS APPROVED ALL THE EQUIPMENT WILL BE BUILT AS SHOWN ON THE APPROVED SET OF DRAWINGS. IN ADDITION TO DIMENSIONS, ALL THE CUTOUTS SHOULD BE VERIFIED TO ENSURE THE PROPER FIT AND LOCATIONS. ALL CHANGES SHOULD BE MADE ON THIS DRAWING AND SIGNED OFF BY THE INDIVIDUAL OR INDIVIDUALS REQUESTING ALL THE CHANGES TO BE MADE BY CMM.

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

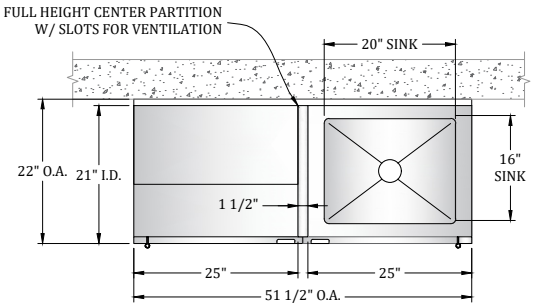
Item #: 1
Quantity: 1

 # CMM-MC-D2

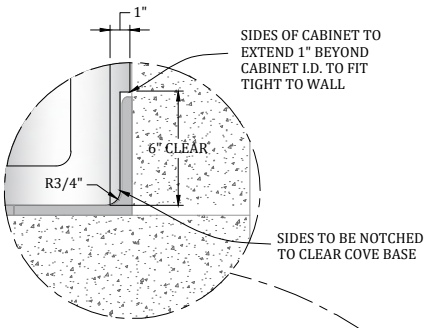
TWO DOOR MOP SINK / STORAGE CABINET

GENERAL NOTES:

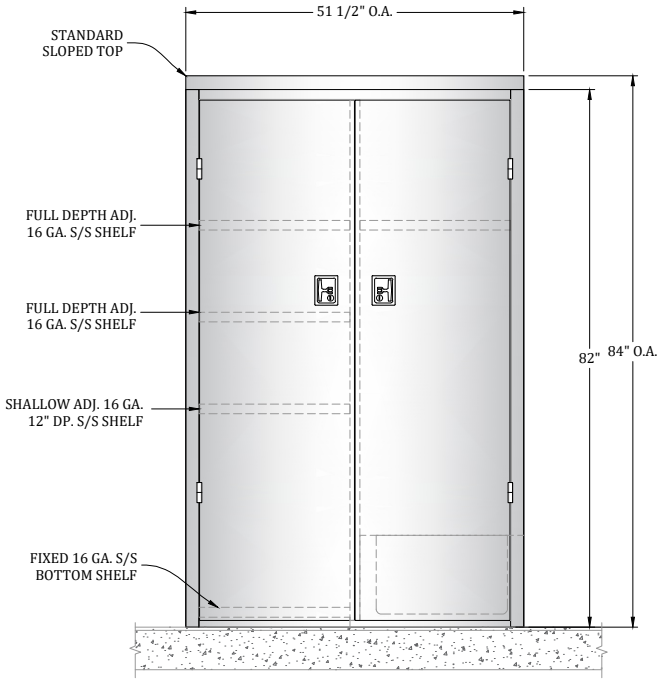
1. CABINET BODY TO BE 16 GA. 304 S/S
2. SINK TO BE 14 GA. 304 S/S W/ COVED CORNERS AS SHOWN
3. SHELVES TO BE 16 GA. 304 S/S AS NOTED
4. DOORS TO BE LOCKING 18 GA. 304 S/S W/ T-HANDLES
5. HINGES TO BE LIFT OFF 300 SERIES S/S
6. ALL WELDING TO BE GTAW
7. FAUCET & DRAIN NOT SUPPLIED
8. FAUCET HOLES / PLUMBING CUT OUTS TO BE DONE IN FIELD



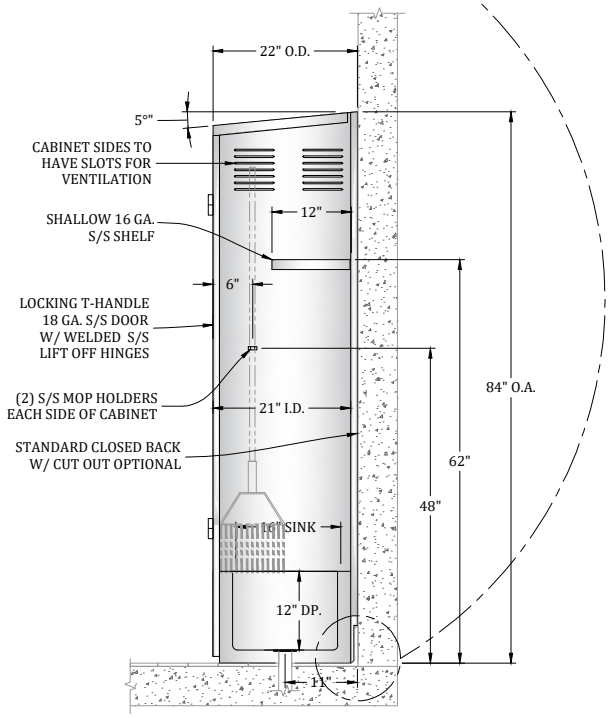
TOP DOWN @ LOWER SHELF
N.T.S.



DETAIL VIEW @ COVE BASE
N.T.S.



FRONT ELEVATION VIEW
N.T.S.



SECTION VIEW @ SINK
N.T.S.

MC-D2 SHEET 2 OF 2	NOTES:	DRAWN BY: NPR ISSUE DATE: SCALE: AS NOTED	REVISION DATES

CUSTOM METALS OF MASSACHUSETTS, INC.
10 CALIPER RD. WHITMAN, MA. 02382
TELEPHONE: (781)-447-8090
FAX: (781)-447-8095

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Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 1

Quantity: 1

Smarter Choices

Item provided by Owner.
Cutsheet provided for design intent & coordination purposes

WAVEBRAKE® 35 QT HIGH-PERFORMANCE MOPPING SYSTEMS

Enhanced features for greater performance.

- Available with side press or down press wringer
- Premium tubular steel and structural web molded plastic
- Works with all Rubbermaid Cleaning Carts
- Accepts 9C74 WaveBrake® Dirty Water Bucket

7580-88 Side Press Combo

COLOR-CODED FOR SPECIALIZED CLEANING

WaveBrake® Side Press and Down Press Combos are color-coded for easy separation of cleaning by room or area to reduce cross-contamination.

7577-88 Down Press Combo

7590-88
Institutional Mop Bucket with sieve wringer.

Rubbermaid Commercial Products offers the industry's best line of mops and handles for use with WaveBrake® buckets and wringers.

For more information, visit
WWW.RCPWORKSMARTER.COM.

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 2
Quantity: 1

Smarter Mopping

6186-88

7570-88

7780

7571-88

7680

6127-88

7580-88

7575-88

7480-18

9C74

7380

9C73*

WAVEBRAKE® 44 QT MOPPING COMBOS

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
6186-88	44 Qt WaveBrake® Side Press Combo	26⅓" l x 18⅛" w x 38⅛" h	44 qt	23.7 lbs	YEL	1
7576-88	44 Qt WaveBrake® Down Press Combo	26¾" l x 18⅛" w x 38¾" h	44 qt	24.4 lbs	YEL	1

WAVEBRAKE® 35 QT MOPPING TROLLEYS

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
7780	35 Qt WaveBrake® Mopping Trolley Side Press	28⅞" l x 18¼" w x 38⅝" h	35 qt	38 lb	YEL	1
7777	35 Qt WaveBrake® Mopping Trolley Down Press	28⅞" l x 18¼" w x 38⅝" h	35 qt	41.1 lb	YEL, RED, BLUE, GRN	1

WAVEBRAKE® 35 QT DUAL WATER MOPPING COMBOS

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
7680	35 Qt WaveBrake® Dual Water Side Press Combo	22⅜" l x 16½" w x 38⅝" h	35 qt	25.5 lb	YEL	1
7677	35 Qt WaveBrake® Dual Water Down Press Combo	22⅜" l x 16½" w x 38⅝" h	35 qt	27.4 lb	YEL	1

WAVEBRAKE® 35 QT MOPPING COMBOS

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
7580-88	35 Qt WaveBrake® Side Press Combo	20⅛" l x 15¾" w x 36½" h	35 qt	19.5 lb	YEL, BRN	1
7577-88	35 Qt WaveBrake® Down Press Combo	20⅛" l x 15¾" w x 36½" h	35 qt	21.2 lb	YEL, BRN	1
7588-88	35 Qt WaveBrake® Side Press Combo	20⅛" l x 15¾" w x 36½" h	35 qt	19.5 lb	RED, GRN, BLUE	1
7578-88	35 Qt WaveBrake® Down Press Combo	20⅛" l x 15¾" w x 36½" h	35 qt	21.2 lb	RED, GRN, BLUE	1
7590-88	35 Qt WaveBrake® Institutional Combo	18⅝" l x 15⅞" w x 24¾" h	35 qt	14.2 lb	YEL	1

WAVEBRAKE® BUCKETS

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
7470	Bucket with Caster Kit	18.6" l x 15.9" w x 16.7" h	26 qt	37.1 lb	YEL	4
7570-88	Bucket with Caster Kit	20.1" l x 16" w x 17.4" h	35 qt	40.1 lb	BLUE[A], BRN, GRN[A], RED[A], YEL	4
7571-88	Bucket no Casters	20.1" l x 16" w x 16" h	35 qt	35.6 lb	YEL, RED, GRN, BLUE	4

[A] Requires 4 weeks lead time and are non-returnable.

WAVEBRAKE® WRINGERS

No.	Description	Dimensions	Mop Capacity	Ship Wt	Color	Pack
6127-88*	Side Press Wringer for WaveBrake®	13" l x 13" w x 27" h	12-32 oz	19.5 lb	BLUE[A], BRN, GRN[A], RED[A], YEL	2
7575-88†	Down Press Wringer for WaveBrake®	13.5" l x 13.2" w x 27" h	16-32 oz	22.1 lb	YEL, RED, GRN, BLUE	2

[A] Requires 4 weeks lead time and are non-returnable.
* Fits 7570, 7571, & 7470 WaveBrake® Buckets
† Fits 7570 & 7571 WaveBrake® Buckets

WAVEBRAKE® ACCESSORIES

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
9C74	Dirty Water Bucket for WaveBrake®	14.1" l x 9.9" w x 14.1" h	18 qt	17 lb	RED, YEL	6
9C73	Quiet Caster Dolly*	22.4" l x 16.5" w x 6.2" h	N/A	10.1 lb	BLA	1

* For use with 35 Qt WaveBrake® Systems only.

WAVEBRAKE® 26 QT MOPPING COMBO

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
7480-18[B]	26 Qt WaveBrake® Side Press Combo	18⅝" l x 15⅝" w x 16¾" h	26 Qt	23.7 lbs	YEL	12 Pcs/ 1 Pallet

[B]Pallet Pack

TANDEM™ 31 QT BUCKET & WRINGER COMBO

No.	Description	Dimensions	Capacity	Ship Wt	Color	Pack
7380	31 Qt Tandem™ Bucket & Wringer Combo	22⅝" l x 13¼" w x 32¼" h	31 qt	11.8 lb	YEL	1

12" Wide See-Through Lockers Single Tier

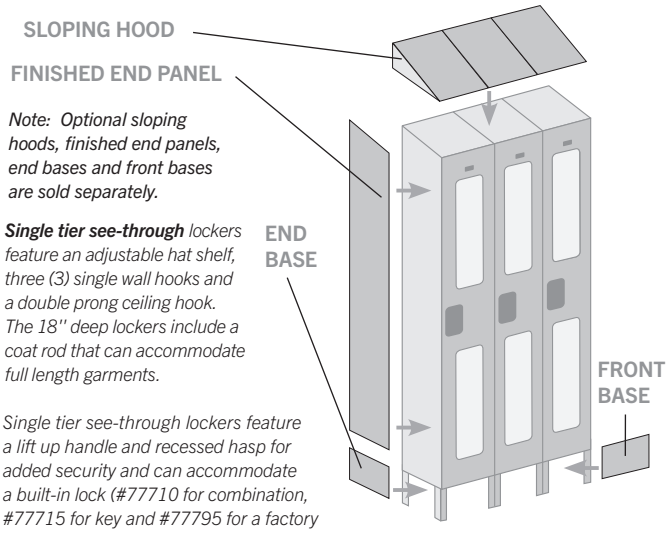
Item provided by Owner.
Cutsheet provided for design intent & coordination purposes

12" WIDE SINGLE TIER SEE-THROUGH LOCKERS
5' HIGH AND 6' HIGH

Constructed of 16 gauge steel, Salsbury S-61000 series 12" wide single tier see-through lockers are available in heights of five (5) feet and six (6) feet (add 6'' for legs) and feature polycarbonate see-through door panels that provide maximum visibility. See-through lockers meet the growing need for lockers in industrial, retail, recreational and office facilities where a view of the locker contents is desired. These durable see-through lockers are available in one wide and three (3) wide units and 12", 15" and 18" depths. 12" wide single tier see-through lockers are available in a gray, tan or blue powder coated finish and as unassembled or assembled units. 12" wide single tier see-through lockers include an adjustable hat shelf, three (3) single wall hooks and a double prong ceiling hook. The 18'' deep single tier see-through lockers also include a coat rod that can accommodate full length garments. Sloping hoods, finished end panels, end bases, front bases, compartment shelves, fillers and lockers without legs are available as options upon request – see all metal locker options and locks on pages 52-53.

Current Pricing and Volume Discounts Available at Lockers.com!

METAL LOCKER OPTIONS



Note: Optional sloping hoods, finished end panels, end bases and front bases are sold separately.

***Single tier see-through** lockers feature an adjustable hat shelf, three (3) single wall hooks and a double prong ceiling hook. The 18'' deep lockers include a coat rod that can accommodate full length garments.*

Single tier see-through lockers feature a lift up handle and recessed hasp for added security and can accommodate a built-in lock (#77710 for combination, #77715 for key and #77795 for a factory installed resettable combination lock) and a padlock (#77720 for combination and #77725 for key).

Note: It is recommended that all lockers be wall and/or floor anchored.

See ALL metal locker options and locks on pages 52-53
See ALL benches on pages 96-101

Factory Assembly Available!

#S-61365's with optional front bases (#77742), combination padlocks (#77720), engraved name / number plates (#77760) and

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT www.lockers.com

Item #: 3
Quantity: &[q]

5' HIGH LOCKERS

12" WIDE SINGLE TIER SEE-THROUGH - ONE WIDE

MODEL	COMPARTMENT SIZE	WEIGHT
***ONE WIDE** - unit size: 12'' W x 60'' H (66'' H with legs)*		
S-61152[1,2]	12" W x 60" H x 12" D	45 lbs.
S-61155[1,2]	12" W x 60" H x 15" D	50 lbs.
S-61158[1,2]	12" W x 60" H x 18" D	55 lbs.

12" WIDE SINGLE TIER SEE-THROUGH - THREE WIDE

MODEL	COMPARTMENT SIZE	WEIGHT
***THREE WIDE** - unit size: 36'' W x 60'' H (66'' H with legs)*		
S-61352[1,2]	12" W x 60" H x 12" D	120 lbs.
S-61355[1,2]	12" W x 60" H x 15" D	130 lbs.
S-61358[1,2]	12" W x 60" H x 18" D	140 lbs.

S-61155

S-61355

6' HIGH LOCKERS

12" WIDE SINGLE TIER SEE-THROUGH - ONE WIDE

MODEL	COMPARTMENT SIZE	WEIGHT
***ONE WIDE** - unit size: 12'' W x 72'' H (78'' H with legs)*		
S-61162[1,2]	12" W x 72" H x 12" D	50 lbs.
S-61165[1,2]	12" W x 72" H x 15" D	55 lbs.
S-61168[1,2]	12" W x 72" H x 18" D	60 lbs.

12" WIDE SINGLE TIER SEE-THROUGH - THREE WIDE

MODEL	COMPARTMENT SIZE	WEIGHT
***THREE WIDE** - unit size: 36'' W x 72'' H (78'' H with legs)*		
S-61362[1,2]	12" W x 72" H x 12" D	125 lbs.
S-61365[1,2]	12" W x 72" H x 15" D	135 lbs.
S-61368[1,2]	12" W x 72" H x 18" D	145 lbs.

S-61165

S-61365

[1] Specify grey, tan, blue

[2] Specify UNASSEMBLED, ASSEMBLED

Metal Locker Options & Locks

for lockers on pages 6-39

SLOPING HOODS

MODEL	DESCRIPTION	WEIGHT
77752[1]	Sloping hood - for up to (3) 12'' wide lockers - 12'' deep	10 lbs.
77755[1]	Sloping hood - for up to (3) 12'' wide lockers - 15'' deep	10 lbs.
77758[1]	Sloping hood - for up to (3) 12'' wide lockers - 18'' deep	10 lbs.
77765[1]	Sloping hood - for up to (3) 15'' wide lockers - 15'' deep	15 lbs.
77768[1]	Sloping hood - for up to (3) 15'' wide lockers - 18'' deep	15 lbs.
77798[1]	Sloping hood - for up to (3) 18'' wide lockers - 18'' deep	15 lbs.
77791[1]	Sloping hood - for up to (3) 18'' wide lockers - 21'' deep	20 lbs.
77759[1]	Sloping hood - for box style bridge lockers - 18'' deep	25 lbs.

FINISHED END PANELS

MODEL	DESCRIPTION	WEIGHT
77352[1]	Finished end panel - for 5 feet high - 12'' deep lockers	10 lbs.
77355[1]	Finished end panel - for 5 feet high - 15'' deep lockers	15 lbs.
77358[1]	Finished end panel - for 5 feet high - 18'' deep lockers	20 lbs.
77362[1]	Finished end panel - for 6 feet high - 12'' deep lockers	15 lbs.
77365[1]	Finished end panel - for 6 feet high - 15'' deep lockers	20 lbs.
77368[1]	Finished end panel - for 6 feet high - 18'' deep lockers	25 lbs.
77361[1]	Finished end panel - for 6 feet high - 21'' deep lockers	25 lbs.

LOCKERS WITHOUT LEGS

MODEL	DESCRIPTION	WEIGHT
77550	Lockers without legs - for one wide and three (3) wide lockers	
77552	Anchoring brackets (set of 2) - for 12'' deep lockers without legs	2 lbs.
77555	Anchoring brackets (set of 2) - for 15'' deep lockers without legs	2 lbs.
77558	Anchoring brackets (set of 2) - for 18'' deep lockers without legs	2 lbs.
77551	Anchoring brackets (set of 2) - for 21'' deep lockers without legs	2 lbs.
77572[1]	Zee base kit - 4" high, 6 foot length - for 12 inch deep lockers	15 lbs.
77575[1]	Zee base kit - 4" high, 6 foot length - for 15 inch deep lockers	15 lbs.
77578[1]	Zee base kit - 4" high, 6 foot length - for 18 inch deep lockers	15 lbs.
77571[1]	Zee base kit - 4" high, 6 foot length - for 21 inch deep lockers	15 lbs.

ADDITIONAL COMPARTMENT SHELVES

MODEL	DESCRIPTION	WEIGHT
77692[1]	Compartment shelf - for 12'' wide lockers - 12'' deep	2 lbs.
77695[1]	Compartment shelf - for 12'' wide lockers - 15'' deep	2 lbs.
77698[1]	Compartment shelf - for 12'' wide lockers - 18'' deep	2 lbs.
77605[1]	Compartment shelf - for 15'' wide lockers - 15'' deep	3 lbs.
77608[1]	Compartment shelf - for 15'' wide lockers - 18'' deep	3 lbs.
77618[1]	Compartment shelf - for 18'' wide lockers - 18'' deep	3 lbs.
77611[1]	Compartment shelf - for 18'' wide lockers - 21'' deep	3 lbs.

For ADA Compliance Guidelines Visit: www.lockers.com/ADA-Metal-Lockers

END BASES

MODEL	DESCRIPTION	WEIGHT
77732[1]	End base - for 12'' deep lockers - 10'' W x 6'' H	1 lb.
77735[1]	End base - for 15'' deep lockers - 13'' W x 6'' H	1 lb.
77738[1]	End base - for 18'' deep lockers - 16'' W x 6'' H	1 lb.
77731[1]	End base - for 21'' deep lockers - 19'' W x 6'' H	1 lb.

FRONT BASES

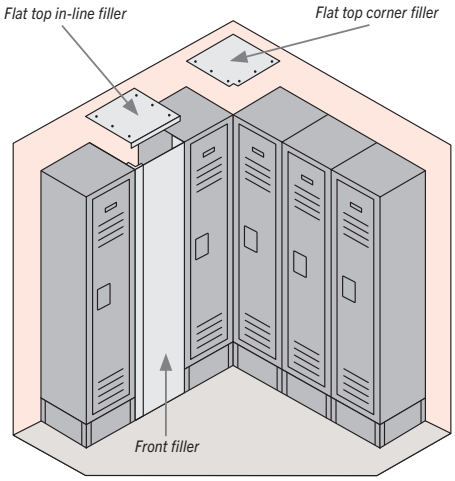
MODEL	DESCRIPTION	WEIGHT
77742[1]	Front base - for 12'' wide lockers - 10'' W x 6'' H	1 lb.
77745[1]	Front base - for 15'' wide lockers - 13'' W x 6'' H	1 lb.
77748[1]	Front base - for 18'' wide lockers - 16'' W x 6'' H	1 lb.

[1] Specify

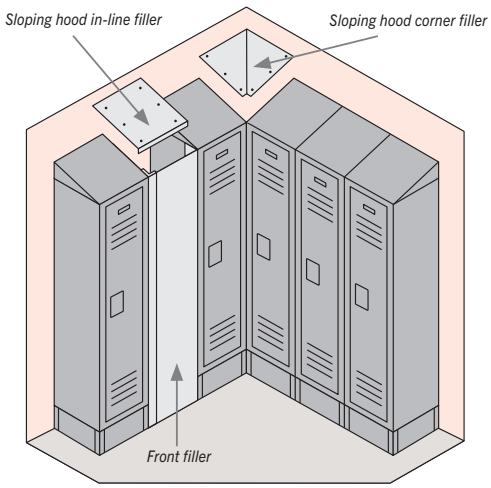
Assembly Available

LOCKER FILLERS

Salsbury locker fillers are an ideal option for locker installations that encounter obstructions such as pipes, columns and other obstacles. Corner and in-line top fillers overlap the existing locker tops and are easily attached with hardware (included) providing a finished look to the locker installation. Vertical front fillers include a wall angle slip joint that conceals uneven edges and provides a professional appearance to the locker installation. Locker fillers can be easily field cut for custom installations.



Locker installation with flat tops



Locker installation with sloping hoods

TOP FILLERS - CORNER

MODEL	DESCRIPTION	WEIGHT
77832[1]	Flat top filler - corner - for 12'' deep lockers	2 lbs.
77835[1]	Flat top filler - corner - for 15'' deep lockers	2 lbs.
77838[1]	Flat top filler - corner - for 18'' deep lockers	2 lbs.
77831[1]	Flat top filler - corner - for 21'' deep lockers	2 lbs.
77872[1]	Sloping hood filler - corner - for 12'' deep lockers	3 lbs.
77875[1]	Sloping hood filler - corner - for 15'' deep lockers	3 lbs.
77878[1]	Sloping hood filler - corner - for 18'' deep lockers	3 lbs.
77871[1]	Sloping hood filler - corner - for 21'' deep lockers	3 lbs.

TOP FILLERS - IN-LINE

MODEL	DESCRIPTION	WEIGHT
77842[1]	Flat top filler - in-line - 15'' wide - for 12'' deep lockers	2 lbs.
77845[1]	Flat top filler - in-line - 15'' wide - for 15'' deep lockers	2 lbs.
77848[1]	Flat top filler - in-line - 15'' wide - for 18'' deep lockers	2 lbs.
77841[1]	Flat top filler - in-line - 15'' wide - for 21'' deep lockers	2 lbs.
77882[1]	Sloping hood filler - in-line - 15'' wide - for 12'' deep lockers	3 lbs.
77885[1]	Sloping hood filler - in-line - 15'' wide - for 15'' deep lockers	3 lbs.
77888[1]	Sloping hood filler - in-line - 15'' wide - for 18'' deep lockers	3 lbs.
77881[1]	Sloping hood filler - in-line - 15'' wide - for 21'' deep lockers	3 lbs.

FRONT FILLERS - VERTICAL

MODEL	DESCRIPTION	WEIGHT
77859[1]	Front filler - vertical - 9'' wide - for (5) feet high lockers	15 lbs.
77855[1]	Front filler - vertical - 15'' wide - for (5) feet high lockers	20 lbs.
77869[1]	Front filler - vertical - 9'' wide - for (6) feet high lockers	20 lbs.
77865[1]	Front filler - vertical - 15'' wide - for (6) feet high lockers	25 lbs.

[1] Specify gray, tan, blue

METAL LOCKER LOCKS AND NAME / NUMBER PLATES

MODEL	DESCRIPTION
77710	Built-in lock - combination style
77711	Master control key - for built-in combination lock #77710
77715	Built-in lock - key style with (2) keys
77715-ADA	ADA compliant lock - key style with (2) keys and (2) ADA key heads
77716	Master control key - for built-in key lock #77715
77799	Key blanks - for #77715 built-in locks - box of (50)
77720	Padlock - combination style
77721	Master control key - for combination padlock #77720
77725	Padlock - key style with (2) keys
77729	Key blanks - for #77725 key padlocks - box of (50)
77790	Electronic lock - factory installed - for four tier & box lockers (specify: silver or black finish)
77795	Resettable combination lock - factory installed (specify: silver or black finish)
77796	Master control key - for resettable combination lock #77795
77760	Name / number plate - 2-1/4'' W x 1-3/8'' H - engraved

#77715

#77710

Sample recessed hasp with built-in combination lock (#77710) displayed

#77725

#77720

Sample recessed hasp with combination padlock (#77720) displayed

#77790

For single or multi-use applications.

#77795

Sample recessed hasp with factory installed resettable combination lock (#77795) in black finish displayed

Note: Built-in locks are pre-installed on assembled lockers.

RELATED EQUIPMENT PROVIDED BY OTHERS

DESCRIPTION: Office Desk

PROVIDED BY:

- ☐ Owner
- ☐ Owner's Vendor
- ☐ Caterer
- ☑ General Contractor
- ☐ Plumbing Contractor
- ☐ Electrical Contractor
- ☐ Ventilation Contractor

INSTALLED BY:

- ☐ Owner
- ☐ Owner's Vendor
- ☐ Caterer
- ☑ General Contractor
- ☐ Plumbing Contractor
- ☐ Electrical Contractor
- ☐ Ventilation Contractor
- ☐ Kitchen Equipment Contractor

Quality you can depend on...

from the inside out.™

Versatile, dependable walk-in coolers and freezers

American Panel

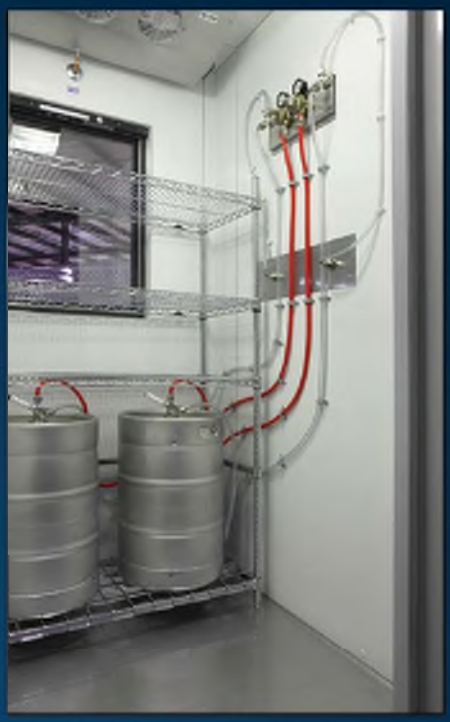
Crabtree McGrath ASSOCIATES, INC.

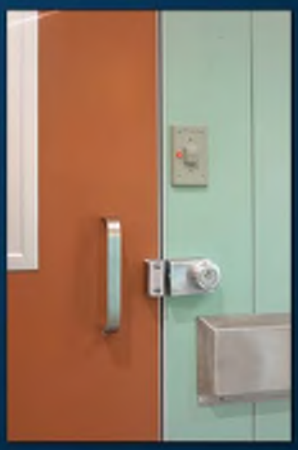
Edgewood Pre-K Academy

Bristol, CT

Item #: 5

Quantity: 1





American Panel

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 5

Quantity: 1

For half of a century American Panel Corporation has been dedicated to satisfying the cold storage needs of the industry's most demanding customers. Our attention to superior quality, product versatility and customer service remains unequaled today. Ever poised for an even deeper commitment to our industry - we are committed to the continuing development of state-of-the-art foamed-in-place walk-in coolers and freezers.

High Efficiency

Our foamed-in-place urethane is the ultimate insulating material currently available for walk-in construction. Operating costs are significantly reduced as a result of the high insulating values of panels manufactured with urethane insulation. Other desirable properties include structural rigidity, dimensional stability, uniform density and compliance with nationally accepted building codes.

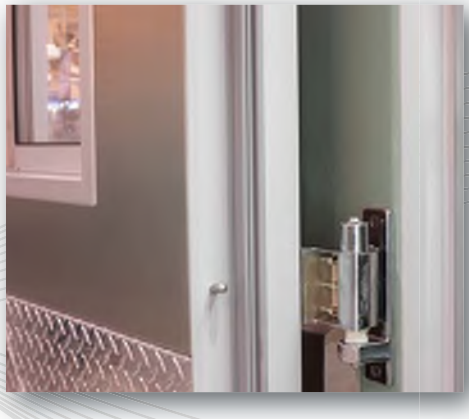
Cam Lock & Floor Screed

Outstanding Value

Considering the thoughtful design, efficient manufacturaing process, skilled craftsmanship, advanced features and customer support, you simply cannot find a better walk-in value than American Panel.

Lasting Durability

Space age materials like our fiberglass reinforced polymer (FRP) door perimeter and frame are used to protect your investment for years to come. This FRP is a corrosion proof, impact resistant, non-conductive material that will not absorb moisture. Moreover, it is superior to steel, vinyl, wood or other commonly used door and frame materials.



Reliable Performance

Choose from our complete selection of high performance refrigeration equipment and accessories for the most efficient and reliable installation possible. Our quality-engineered remote, remote quick connect, pre-assembled remote or top/side quick connect self-contained units are available for any indoor or outdoor application.

Insulation

American Panel insulated panels are 4" thick high pressure impingement mixed (HPIM), foamed-in-place urethane expanded with HFC-245fa at a minimum of 2.3 lb. per cubic foot density, fully heat cured and bonded to the exterior me
nes
fact

Exceptional Appearance

Top quality commercial hardware, premium grade metal finishes and attention to manufacturing detail contribute to the overall appearance of the finished product. Whether used indoor or outdoor, for display purposes or general kitchen applications, American Panel walk-ins are always aesthetically pleasing.

Superior Strength

Optional heavy duty flooring is also available. This heavy-duty structural flooring can support up to 15,000 pounds per square foot (static load) as tested in accordance with ASTM Standards.

Ultimate Flexibility

Every American Panel walk-in is equipped with a full complement of standard accessories designed to meet the needs of a broad range of end users. However, depending on your particular requirements, you may wish to include additional options and features. We can provide every item for even the most sophisticated of applications.

Consistent Quality

Ours is perhaps the most thoroughly scrutinized production process in the industry. Our dedication to zero defect manufacturing and product longevity produces a top quality, pre-tested walk-

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

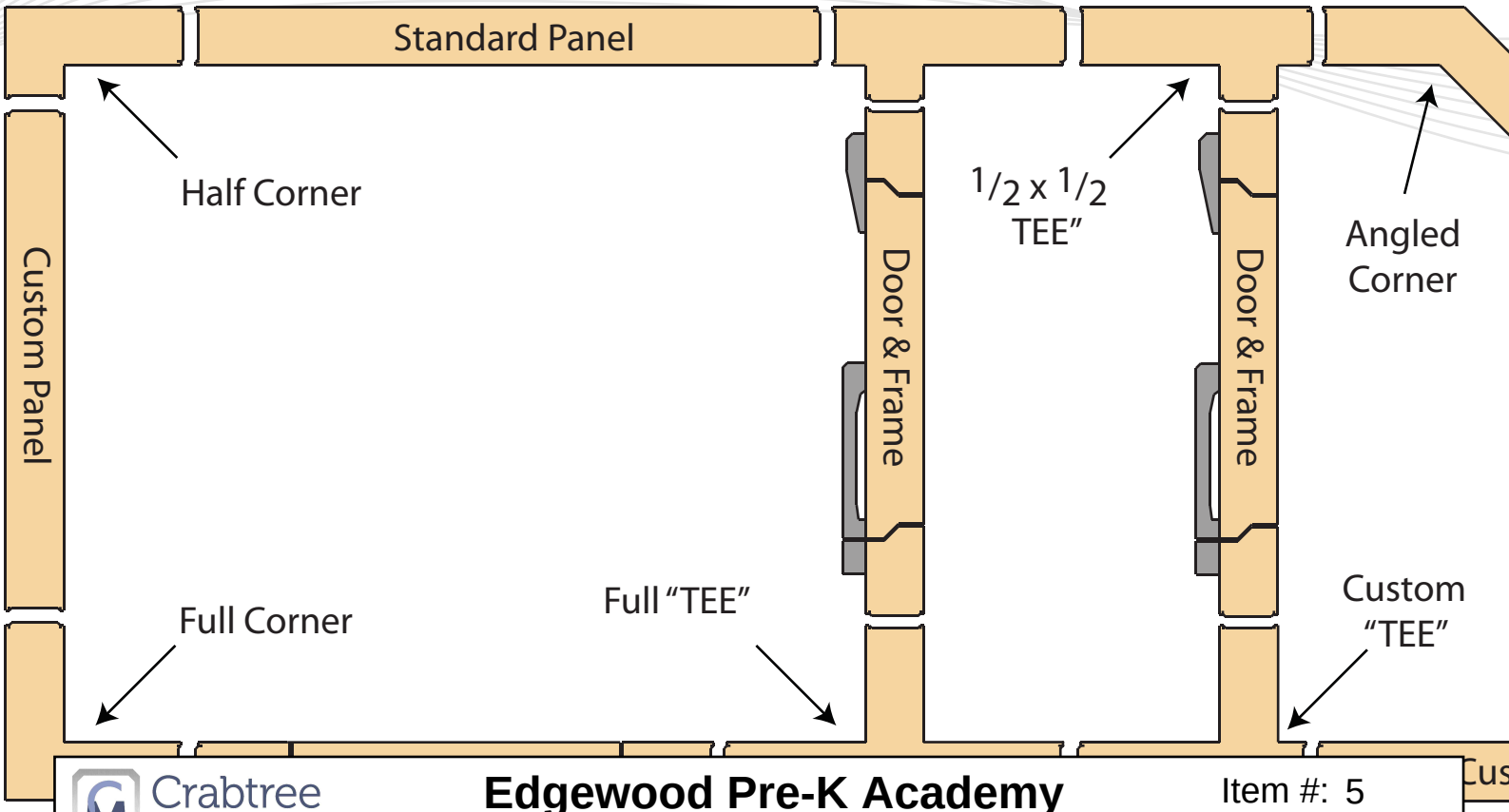
Item #: 5

Quantity: 1

State of the Art Machinery

State of the art machinery allows for the highest degree of precision. In the picture above, a worker uses an automated punch press to create the outer skin for a wall panel. Each piece of sheet metal is programmed by an engineer and then fed to the machinery on the factory floor.

At right, a worker uses a highly accurate computer controlled bend press to form the double 90° bends. These bends will form the perimeter of the panel and help to hold the metal to the foam within the panel. They also serve as an anchor point for the tear-drop gasket that forms the airtight seal on the walk-in.



Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 5

Quantity: 1

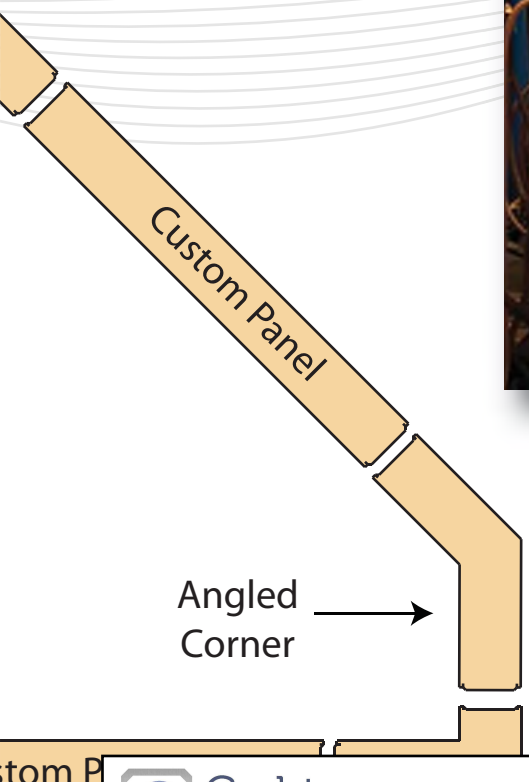
Functional Design

Virtually any cold storage requirement can be met using American Panel walk-ins. Restaurants, hospitality, correctional, healthcare, scientific, industrial, educational and large venues all have highly specialized needs. Rather than over-sell or under-sell our desire is to provide equipment that exactly matches the job at hand. Experienced sales and engineering personnel are at your disposal to assist in the design of your next project no matter how large or small the project or specialized the application.

Monitoring Systems

Along with our high-tech manufacturing processes American Panel is on the cutting edge with the proprietary System 100 monitoring system that comes standard on every room. High and low alarm set points coupled with an audio/visual alert ensure your food product is safe and sound.

Additional options and systems are available to add features like battery backups, multi-compartment monitoring, PC connections and much, much more.



Modular Design Flexibility

Our modular panel system is the most comprehensive in existence, giving you the greatest degree of design flexibility possible. The system has evolved out of an industry-wide need for a more versatile array of standard panel sizes to maximize the amount of cold storage space.

The standard overall height for walk-ins with floors is 7'-6". Additional heights are available and range from 5'-0" to 28'-0" in 1" increments.

BCH0005MBACYC0017 - SUBMITTAL

Project Name:	-	Project Location:	-
Quote ID:	-	Item #:	1000
Submitted For:	-	Submitted On:	-
Submitted By:	-	Submitted From:	-
Identity #:	-	Tag:	-

☐ For Record ☑ For Approval By:_____ Date:_____

General Product Information

Product Family:	HTS	Compressor Brand:	Copeland
Application:	Outdoor	Compressor Type:	Scroll
Temperature Range:	Medium Temp	Compressor Hp:	0.5
Voltage: (Volts/Ph/Hz)	208-230/1/60	Compressor Model:	YB06KAE-PFV
Refrigerant Type:	R454A	Number of Compressor(s):	1
Piping:	Standard	Coil Type:	Microchannel

Technical Information

Performance Data

Ambient Temperature (°F)	Saturated Suction Temperature (°F)	Application Capacity* (BTU/H)	Altitude (ft)	AWEF Value
95	25.0	7,369	20	7.6

Electrical Data

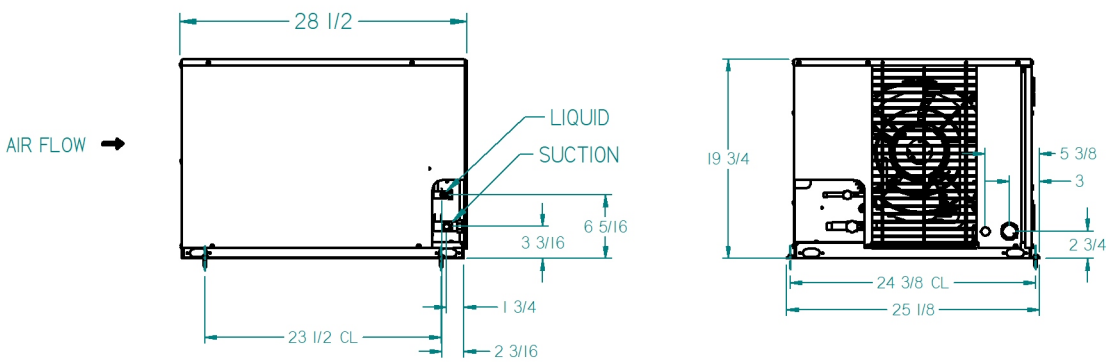
Compressor(s)		Fan Motor(s)			Electric Ratings						
RLA	LRA	Quantity	Hp	FLA	Defrost Type	High or Low Amps?	Number of Contactors	MCA	MOPD	Evap.Fan Amps	Defrost Heater Amps
5.4	35.7	1	1/15	0.5	AIR DEFROST	-	-	15	15	5	15

Unit Specifications

Connections (in.)		Receiver 90% Full (lbs)		Fan Blade(s) Diameter (in)	Sound Data (dB)	Approx. Net Weight (lbs)
Liquid Line	Suction	Standard	Over Sized			
3/8	5/8	9	-	14	61	167

Dimensional Drawing(s)

AGENCY LISTINGS



UOM: inches

BCH0005MBACYC0017 - SUBMITTAL

Project Name:	-	*Project Location:*	-
Quote ID:	-	*Item #:*	*1000*
Submitted For:	-	*Submitted On:*	-
Submitted By:	-	*Submitted From:*	-
Identity #:	-	*Tag:*	-

Standard Features

CABINET AND CONSTRUCTION

- MICROCHANNEL COIL TECHNOLOGY STANDARD ON ALL UNITS
- PAINTED STEEL CABINETS FOR SUPERIOR STRENGTH AND CORROSION PROTECTION
- HEAVY DUTY, STEEL, 1-1/2" TALL BASE

SERVICEABILITY

- SUCTION SERVICE VALVES FOR HERMETIC AND SCROLL COMPRESSORS LOCATED OUTSIDE THE CABINET FOR QUICK INSTALLATIONS.
- RECEIVER WITH FUSIBLE PLUG, LIQUID SHUTOFF VALVE AND CHARGING PORT IS STANDARD
- LARGE ELECTRICAL PANEL FOR EASE OF ACCESS
- PREFABRICATED WIRING HARNESSES FOR TIGHT CRIMP CONNECTIONS AND CONSISTENT LABELING
- UNIT STAYS ON IF THE HOOD IS REMOVED FOR SERVICING
- SIGHT GLASS IS EASILY VIEWABLE

QUALITY

- ALL UNITS ARE COMPLETELY LEAK TESTED IN A HELIUM ENVIRONMENT, BUMP TESTED AND ALLOWED TO CYCLE OFF ON THE HIGH AND LOW PRESSURE CONTROL. EACH UNIT HAS A COPY OF THE RUN DATA SHIPPED INSIDE THE ELECTRICAL PANEL
- ELECTRICAL CIRCUITS ARE COMPLETELY CHECKED FOR CONTINUITY
- PIPING IS LAID OUT TO MINIMIZE STRESS AND VIBRATION AND IS PRE-BENT TO ELIMINATE LEAKS
- ENCAPSULATED, AUTO-RESET, HIGH AND LOW PRESSURE CONTROLS TO ELIMINATE LEAKS (ADJUSTABLE LOW PRESSURE CONTROL STANDARD)

Options

Mounted Options

- Brand Label - BOHN
- Coil Selection - MICROCHANNEL COIL
- Defrost Timer Options - NO TIMER
- Suction Line Options - SUCTION TUBE ONLY
- Cabinet Selection - Painted
- Pressure Options - ADJUSTABLE LOW - FIXED HIGH
- Phase Loss Monitor - NONE
- Hail Guard Factory Installed - NONE
- Motor - FIXED SPEED EC
- Receiver Options - STANDARD
- Liquid Line Options - FILTER DRIER AND SIGHT GLASS
- Discharge Line Options - HEAD PRESSURE VALVE 145#
- Fused Disconnect - AIR FUSED DISCONNECT
- Crankcase Heater - CRANKCASE HEATER
- Snow Legs - NONE

Shipped-Loose Options (Unit)

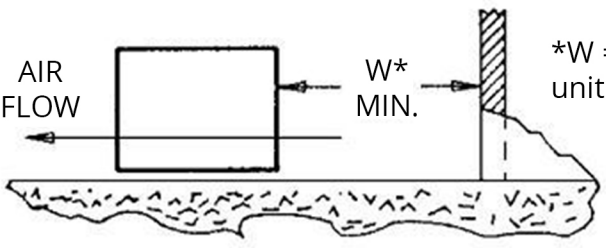
(QTY)Part Number - Description

- (1) AZL1 - AZL1 1 - 1.9HP SCROLL WARRANTY

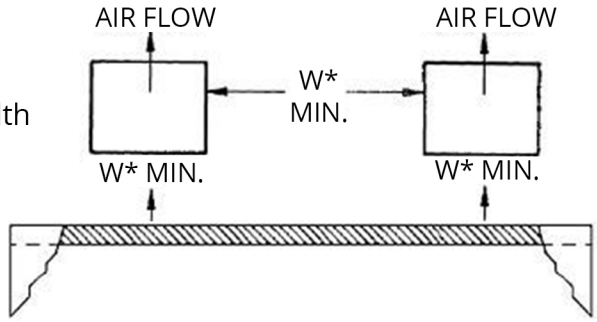
(QTY)Part Number - Description

Minimum Unit Clearances

Walls or Obstructions for Horizontal Air Flow



Multiple Units with Horizontal Air Flow



Notes

** Capacities shown are Application Capacities reflecting nominal operation at 10°F TD. For models within the scope of the DOE AWEF (Annual Walk-in Energy Factor) standard, the Net Capacity is determined by the AHRI 1250 test method. DOE will publish this compliance data at www.regulations.doe.gov*

** Units using A2L refrigerants must be installed in accordance with UL 60335-2-89 and ASHRAE 15 standard*

** Per ASHRAE Standard 15, fusible plugs and pressure relief valves may need to be externally piped when using flammable refrigerants*

**Only refrigerants in compliance with New York state regulations can be used in the state of New York.*

BEL0060AY6AMAG0212 - SUBMITTAL

Project Name:	-	Project Location:	-
Quote ID:	-	Item #:	2000
Submitted For:	-	Submitted On:	-
Submitted By:	-	Submitted From:	-
Identity #:	-	Tag:	-

☐ For Record ☑ For Approval By:_____ Date:_____

General Product Information

Product Family:	BEL	Motor type	2 SPEED EC
Defrost Type:	Air	Number of Fans:	1
Voltage: (Volts/Ph/Hz)	115/1/60	Fan HorsePower	1/20
Refrigerant Type:	R454A	Fins per Inch	6
Minimum Room Area: (ft²)	23 (7.2ft height)	Mitigation Zone:	Volume

Technical Information

Performance Data

Capacity			Air Flow				Altitude (ft)	AWEF Value	
TD (°F)	SST (°F)	Application Capacity* (BTU/H)	CFM	Fan Diameter (in.)	Air Throw (ft)				
					Standard	w/Collar		Cooler > 32	Freezer <= 32
10	25.0	7,893	610	12	-	-	20	9	N/A

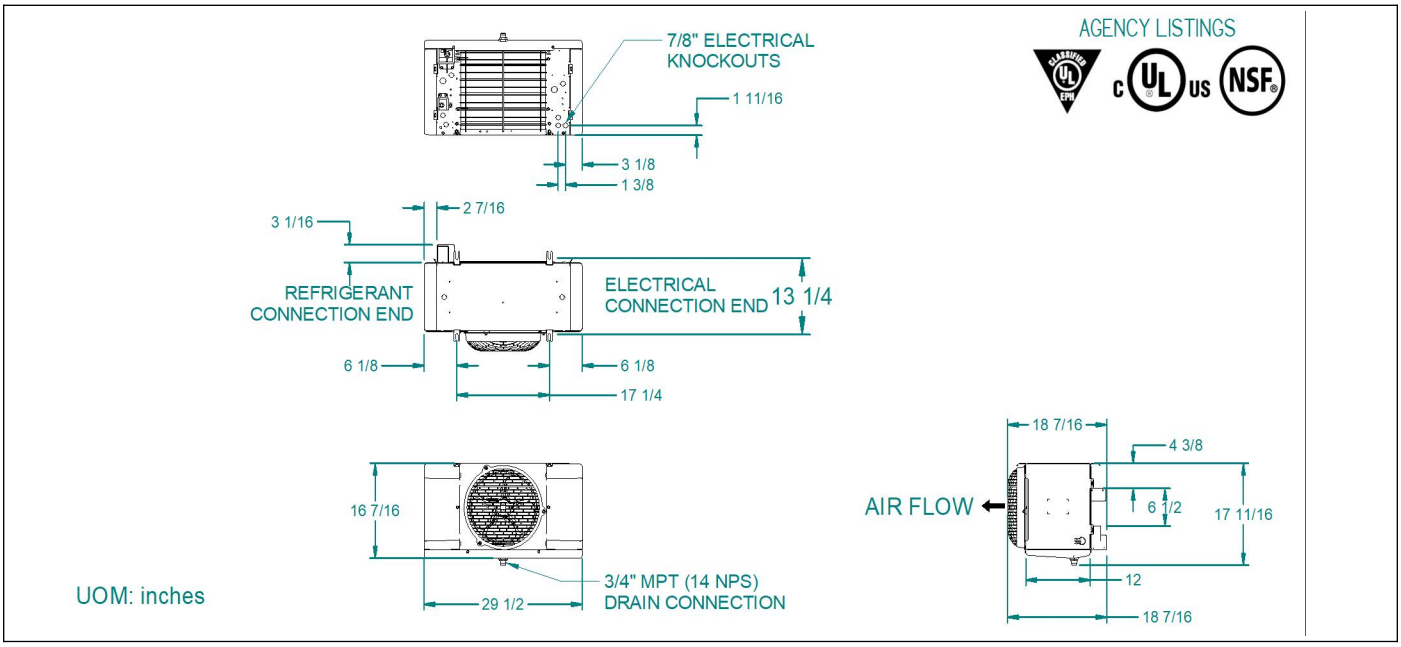
Electrical Data

Fan Motor(s)		Defrost Heater(s)		Drain pan Heater(s) HG	
Watts	Amps	Watts	Amps	Watts	Amps
55	0.85	-	-	-	-

Unit Specifications

Connections (in.)						Approx. Net Weight (lbs)
Coil Inlet	Suction	External Equalizer	Drain	Side Port	Hot Gas Drain Pan	
1/2	5/8	1/4	3/4	-	-	36

Dimensional Drawing(s)



BEL0060AY6AMAG0212 - SUBMITTAL

Project Name:	-	*Project Location:*	-
Quote ID:	-	*Item #:*	*2000*
Submitted For:	-	*Submitted On:*	-
Submitted By:	-	*Submitted From:*	-
Identity #:	-	*Tag:*	-

Standard Features

EASE OF INSTALLATION SERVICE

- ALL ELECTRICAL COMPONENTS FACTORY WIRED TO TERMINAL BOARD AND IDENTIFIED, MAKING IT EASY TO FIELD WIRE THE UNIT
- CABINET DESIGN FEATURES HINGED, REMOVABLE FRONT ACCESS PANELS ON EACH SIDE FOR EASY ACCESS TO ELECTRICAL AND REFRIGERATION COMPONENTS
- LIQUID LINE SOLENOID WIRE HARNESS IS FACTORY-INSTALLED FOR QUICK INSTALLATION
- MOTORS PLUG INTO WIRING HARNESS FOR EASIER SERVICING
- HINGED, REMOVABLE DRAIN PAN FOR EASY AND SAFE ACCESS
- PRE-DRILLED HOLES ON THE BACK OF THE UNIT FOR ROOM THERMOSTAT
- QUICK REMOVAL FAN GUARD/MOTOR ASSEMBLY FOR EASY SERVICE OR REPLACEMENT OF AIR MOVER PARTS

PERFORMANCE

- INTERNAL PANELS ARE ISOLATED FOR QUIET OPERATION
- INTERNALLY ENHANCED TUBING AND FIN DESIGN FOR HIGHER EFFICIENCY
- EC MOTORS STANDARD ON ALL MODELS FOR IMPROVED UNIT EFFICIENCY

RELIABLE DURABLE

- HEAVY GAUGE GRAINED ALUMINUM CABINET CLEANS EASILY AND LOOKS ATTRACTIVE
- MOLDED FAN GUARD AND ACCESS PANELS ARE MADE OF STRONG, DURABLE, AND NSF AND UL SANITATION RATED PLASTIC MATERIAL
- SWEAT CONNECTIONS TO REDUCE POTENTIAL FOR LEAKS

VERSATILE

- LARGE DIAMETER DRAIN HOLE (3/4 " ID) IS LOCATED TOWARDS THE BACK OF THE UNIT
- MINIMAL HEIGHT OF THE LOW PROFILE SERIES MAKES IT IDEAL FOR LOW CEILING COOLERS

Options

Mounted Options

- Brand Label - BOHN
- DTFD Option - None
- Fan Guard - Molded
- Drain Pan Type - Stucco
- Defrost Control - None
- iNTELLIGEN Integration Card Add On - NO
- Coil Mechanical Option - Intelligen
- Customer Specified Valve Type - EEV
- Refrigerant Detection System - Factory Installed
- Motor - 2 Speed EC
- Fan Blade - Standard
- Cabinet Type - Stucco
- Controller Option - Intelligen
- Fin Material - Aluminum
- iNTELLIGEN WebServer/Multi-System Control Card Add on - NO
- Liquid Temperature - 95
- Valve Family - L

Shipped-Loose Options (Unit)

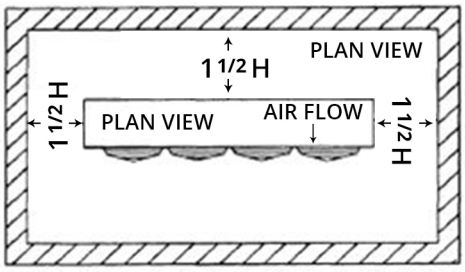
(QTY)Part Number - Description

- (1) 29338301 - VALVE-SOLENOID, 3/8 SSOV3S130 W COIL

(QTY)Part Number - Description

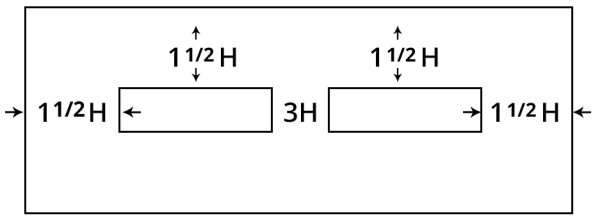
- (1) 29308801 - VALVE-CHECK, A2L, 1/2, CSOV-4S

Minimum Unit Clearances



One Evaporator

NOTE:
H =Total Height evaporator coil surface.



Two Evaporators

Notes

** Capacities shown are Application Capacities reflecting nominal operation at 10°F TD. For models within the scope of the DOE AWEF (Annual Walk-in Energy Factor) standard, the Net Capacity is determined by the AHRI 1250 test method. DOE will publish this compliance data at www.regulations.doe.gov*

** Unit coolers using A2L refrigerants must be installed in accordance with UL 60335-2-89 and ASHRAE 15 standards*

InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

Four tier with 63" high posts on casters

METROMAX Q™ SHELVING

with *Microban Antimicrobial Product Protection

Part of the innovative MetroMax iQ™ Storage System, MetroMax Q™ is a longer life storage solution than conventional wire shelving. The product offers durable polymer mats that remove for easy cleaning and protect stored items from damage. Quick adjust shelves and MetroMax iQ accessories provides a very efficient use of storage space. MetroMax Q™ is integrated with online space planning tools and tutorials. **www.metro.com/iQ**

- **Longer-life performance:** Durable, corrosion proof polymer mats protect the shelves from normal wear and tear. Robust epoxy coated steel frames and posts hold as much weight as Metro's wire shelving. Weight capacity for evenly distributed loads:
  800 lbs. (363kg) per shelf for lengths of 24" to 48" (610 to 1220mm)
  600 lbs. (275kg) per shelf for lengths of 54" (1370mm) or longer
  2,000 lbs. (907kg) maximum per stationary unit.
- **Interchangeable:** MetroMax Q and MetroMax i™ shelves, posts, and most accessories are compatible on the same unit. Use MetroMax Q shelves with MetroMax i™ polymer posts for increased corrosion protection. Use MetroMax i™ solid shelves when spill containment is required or as a bottom shelf to protect supplies from dirt or backsplashes from mops.
- **Easier to clean and maintain:** Polymer mats can be easily removed and cleaned in a sink or dish machine. Microban antimicrobial product protection is built into the high contact areas of the shelf including the mats, frames, and posts to protect the product from bacteria, mold, mildew, and fungus that cause odors and product degradation. Microban protection keeps the product "cleaner between cleanings".
- **Quick to Adjust:** Patented corner release allows shelves to be unlocked without tools. Simply flip each corner release, relocate the wedge connectors on the posts, and reposition the shelf. Quickly adjust shelves to reclaim wasted vertical space.
- **Smooth, Protective Surfaces:** Smooth shelf mats protect packaged items from unwanted rips, tears, or damage.
- **Open Grid and Solid Mat Options:** MetroMax Q is available with open grid mats as standard. Open grid shelves promote air circulation and light penetration.
  MetroMax i™ solid shelves can be used with MetroMax Q grid shelves on the same unit and are available in 18" and 24" (457 and 610mm) depths. For 21" (530mm) deep MetroMax Q, solid mat overlays are available.
- **Efficient, Organized Storage:** Premium MetroMax iQ™ accessories efficiently organize, contain, and compartmentalize ***all*** space between shelves.
- **Quick to Assemble:** MetroMax Q assembles easily in minutes, without tools. Shelves can be adjusted at 1" (25mm) increments along the post. Shelf wedges have a window to locate your desired position.

MetroMax Q Mobile Unit

NSF

MetroMax Q with Accessories and MetoMax i Solid Bottom Shelf

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban Products Company, Huntersville, NC.

Specifications

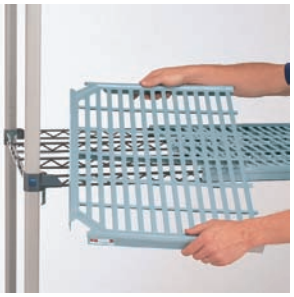
- **Shelf frames and posts:** Steel with electroplated substrate and highly durable, abrasion-resistant epoxy finish. Epoxy finish has built-in Microban antimicrobial product protection. The adjustable foot is reinforced nylon.
- **Shelf Mats:** Injection molded polypropylene with exclusive built-in Microban® antimicrobial product protection.
- **Shelf Wedge Connector:** Reinforced nylon.
- **Temperature range:** -20°F (-29°C) to 125°F (52°C) continuous use, with intermittent exposure to 200°F (93°C) for cleaning.

Standard Interchangeable Shelves

- Part number includes shelf with removable mats and one bag of wedges.
- MetroMax Q grid shelves, MetroMax i™ grid and solid shelves are all compatible on the same unit.

Nominal Width (in.)	Nominal Width (mm)	Nominal Length (in.)	Nominal Length (mm)	MetroMax Q Shelf with Grid Mat Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	MetroMax i™ Shelf with Solid Mat Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
18	457	24	610	MQ1824G	6.2	2.8	MX1824F	12.7	5.8
18	457	30	760	MQ1830G	8.0	3.6	MX1830F	14.5	6.6
18	457	36	914	MQ1836G	9.7	4.4	MX1836F	17.2	7.8
18	457	42	1060	MQ1842G	11.4	5.2	MX1842F	20.1	9.1
18	457	48	1220	MQ1848G	13.2	6.0	MX1848F	23.1	10.5
18	457	54	1372	MQ1854G	15.0	6.8	MX1854F	21.5	9.7
18	457	60	1524	MQ1860G	16.7	7.6	MX1860F	23.2	10.5
18	457	72	1829	MQ1872G	20.0	9.1	MX1872F	27.5	12.5
21	530	24	610	MQ2124G	8.0	3.6	—		
21	530	30	760	MQ2130G	9.7	4.4	—		
21	530	36	914	MQ2136G	11.4	5.2	—		
21	530	42	1060	MQ2142G	12.8	5.8	—		
21	530	48	1220	MQ2148G	14.5	6.6	—		
21	530	54	1372	MQ2154G	16.7	7.6	—		
21	530	60	1524	MQ2160G	18.5	8.4	—		
21	530	72	1829	MQ2172G	21.7	9.9	—		
24	610	24	610	MQ2424G	9.7	4.4	MX2424F	14.2	6.4
24	610	30	760	MQ2430G	11.4	5.2	MX2430F	15.9	7.2
24	610	36	914	MQ2436G	13.1	6.0	MX2436F	19.6	8.9
24	610	42	1060	MQ2442G	14.1	6.4	MX2442F	21.5	9.8
24	610	48	1220	MQ2448G	15.8	7.1	MX2448F	25.3	11.5
24	610	54	1372	MQ2454G	18.5	8.4	MX2454F	25.0	11.3
24	610	60	1524	MQ2460G	20.3	9.2	MX2460F	26.8	12.1
24	610	72	1829	MQ2472G	23.5	10.7	MX2472F	31.0	14.1

Actual Dimensions:
Width: Add 3/8" (10mm) to nominal size.
Length: Subtract 3/16" (5mm) from nominal size.



MetroMax Q Open Grid Shelf

MetroMax i™ Solid Shelf

Heavy-Duty Dunnage Shelves

- Corrosion proof MetroMax i™ dunnage shelf is compatible with MetroMax Q.
- Open grid and solid version available.
- Weight capacity per shelf evenly distributed: 1,200 lbs. (544kg) on shelves up to and including 48" (1220mm) long; 900 lbs. (408kg) for shelves 60" (1524mm) long.
- Dunnage shelves are recommended for use on units with four posts.

Nominal Width (in.)	Nominal Width (mm)	Nominal Length (in.)	Nominal Length (mm)	Shelf with Grid Mat Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	Shelf with Solid Mat Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
18	457	36	914	MHP1836G	18	8.2	MHP1836F	22	10.0
18	457	48	1220	MHP1848G	22	10.0	MHP1848F	26	11.8
18	457	60	1524	MHP1860G	26	11.8	MHP1860F	30	13.6
24	610	36	914	MHP2436G	21	9.5	MHP2436F	25	11.3

Solid Mat Overlays

- Overlays snap onto the open grid mats to create a solid surface.
- Available for 21" (530mm) deep MetroMax Q shelves.

Fits Shelf (in.)	Fits Shelf (mm)	Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
21x24	530x610	Q2124SM	0.35	0.16
21x30	530x760	Q2130SM	0.45	0.20
21x36	530x914	Q2136SM	0.50	0.23
21x42	530x1060	Q2142SM	0.60	0.27
21x48	530x1220	Q2148SM	0.70	0.32
21x54	530x1372	Q2154SM	0.80	0.36
21x60	530x1524	Q2160SM	0.90	0.41
21x72	530x1829	Q2172SM	1.00	0.45

METROMAX Q™
POLYMER AND STEEL SHELVING

Standard Interchangeable Posts

- MetroMax Q: Epoxy coated steel with Microban antimicrobial product protection.
- MetroMax i: Polymer with Microban antimicrobial product protection.
- Stationary posts include an adjustable leveling foot to compensate for uneven floors. Leveling foot can be adjusted 1" (25mm).
- When mounting a shelving unit to a dolly base, stationary posts are used.
- Special height cut posts are available. Consult your Metro representative.

MetroMax Q Steel Post

MetroMax i Polymer Post

STATIONARY POST WITH LEVELING FOOT

Nominal Height (in.)	Nominal Height (mm)	Actual Height* (in.)	Actual Height* (mm)	MetroMax Q Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	MetroMax i Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
13	370	14 3/4	375	MQ13PE	1.0	0.5	MX13P	0.5	0.2
27	685	28 3/4	730	MQ27PE	2.0	0.9	MX27P	0.9	0.4
33	875	34 3/4	883	MQ33PE	2.5	1.1	MX33P	1.0	0.5
54	1370	54 3/4	1391	MQ54PE	4.0	1.8	MX54P	1.6	0.7
63	1585	62 3/4	1594	MQ63PE	4.5	2.0	MX63P	1.8	0.8
74	1690	74 3/4	1899	MQ74PE	5.5	2.5	MX74P	2.2	1.0
86	2195	86 3/4	2203	MQ86PE	6.5	2.9	MX86P	2.5	1.1

POST FOR STEM CASTER

Nominal Height (in.)	Nominal Height (mm)	Actual Height* (in.)	Actual Height* (mm)	MetroMax Q Steel Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)	MetroMax i Polymer Model No.	Approx. Pkd. Wt. (lbs.)	Approx. Pkd. Wt. (kg)
13	370	13 3/4	349	MQ13UPE	1.0	0.5	MX13UP	0.5	0.2
27	685	27 3/4	705	MQ27UPE	2.0	0.9	MX27UP	0.9	0.4
33	875	33 3/4	857	MQ33UPE	2.5	1.1	MX33UP	1.0	0.5
54	1370	53 3/4	1365	MQ54UPE	4.0	1.8	MX54UP	1.6	0.7
63	1585	61 3/4	1568	MQ63UPE	4.5	2.0	MX63UP	1.8	0.8
70	1778	69 3/4	1765	MQ70UPE	5.0	2.3			
74	1690	73 3/4	1873	MQ74UPE	5.5	2.5	MX74UP	2.3	1.0
86	2195	85 3/4	2178	MQ86UPE	6.5	2.9	MX86UP	2.5	1.4

Replacement Leveling Foot:
Model No. RPM3-FOOT

Replacement Post Cap for Steel Post:
Model No. RPMQS-POSTCAP

Replacement Post Cap for Polymer Post:
Model No. RPMXS-POSTCAP

Replacement MetroMax Q Wedges
Model No. MQ9985 Bag of 4

Replacement MetroMax Q Wedges MQ9985

NOTE: Compatibility with existing Metro polymer mat shelving systems
- MQ9985 wedges are compatible with original MetroMax Q shelves and posts.
- The post centers on MetroMax Q have been changed to allow interchangeability with MetroMax i™ shelves. MetroMax Q shelves manufactured within or after April 2009 are not compatible with Q shelves made prior to April 2009.
- MetroMax Q is not compatible with original MetroMax manufactured prior to April 2009.
- Posts listed in above table (ex. MQ74PE, MX74PE) can be used with original MetroMax Q shelves made prior to April 2009.

Post Clamp

Adds stability by joining posts of two separate units together. With it, each unit is supported by four posts and buttressed by the adjacent unit.
Model No. 9994X

Foot Plate

Use to add stability to the shelving unit or to bolt units to the floor.
Model No. Zinc 9993Z
Model No. Stainless Steel 9993S

Stem Casters

A variety of stem casters are offered for MetroMax i™ mobile applications.
Stem caster models include bumpers.
See Catalog Sheet 11.20 for stem casters.

Replacement Bumper M9992DBX

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 9
Quantity: 6

Cutsheet provided for design intent;
Item is existing to be provided by Owner

New Age Industrial Corp., Inc.
PO Box 520 • 16788 US Hwy 36 • Norton, Kansas 67654
Phone: 800-255-0104 • Fax: (877)-877-7687 • **www.NewAgeIndustrial.com**

Job: _____

Item: _____

Quantity: _____

Bun Pan Racks

Virtually Maintenance Free,

- All welded construction insures the maximum strength and stability of each rack.
- Shipped assembled for immediate use.
- Available in both end and side loading styles, to accommodate 18" x 26", 13" x 18", and 14" x 18" pans

Easy to Maneuver

- Equipped with four 5" heavy duty platform type casters.
- Non-marking wheels protect floors and minimize noise.
- Caster plates are securely welded to the frame of each unit and casters are then bolted to the caster plate…not directly to the frame…with four bolts. This procedure strengthens the overall integrity of the rack and prevents breakage.

Guaranteed To Last

- Five-Year Guarantee against material defects and workmanship.
- Lifetime Guarantee against rust and corrosion.

NSF Certified

#1330

#1461

#1331S

#1461S

This information is for general sales and engineering use only. New Age Industrial reserves the right to modify or

Made For:

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 10
Quantity: 1

New Age Industrial Corp., Inc.
PO Box 520 • 16788 US Hwy 36 • Norton, Kansas 67654
Phone: 800-255-0104 • Fax: (877)-877-7687 • **www.NewAgeIndustrial.com**

Job: _____

Item: _____

Quantity: _____

Bun Pan Racks

APPLICATIONS: General storage and movement of trays and pans.

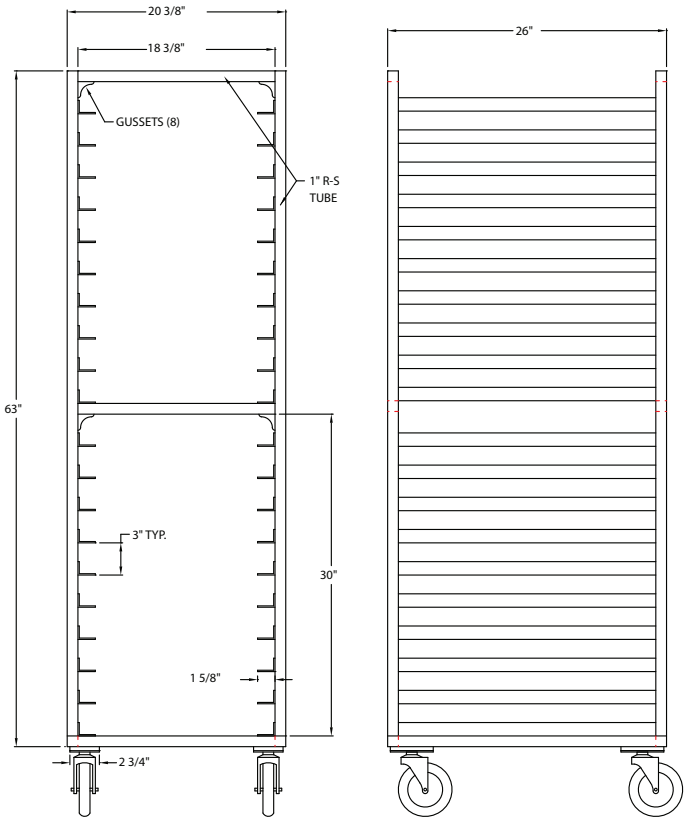
CONSTRUCTION: Heavy duty, high tensile, extruded aluminum. Type 6463-T5 alloy.

TRAY SLIDES: Slides are 1¼" x 1⅝" x .100 extruded aluminum angle welded to frame.

FRAME & CROSS SUPPORTS: Vertical and horizontal frame members are 1" x 1" x .070 extruded aluminum tubing. All welded unit.

CORNER GUSSETS: Gussets of 1½" x 1½" x ⅝" thick angle are welded to the inside angles (bottom side) where horizontal cross bracing meets vertical uprights. Note: Each gusset requires 4½" of weld.

CASTERS: Platform type, 5" diameter wheel, full swivel design with sealed ball bearing. Wheel material is non-marking polyurethane.



#1331

Model No.	Size W-H-D	Pan Cap.	Runner Spacing	Ship Wt.
¾-SIZE END LOADING RACK				
1361	20⅜" x 60" x 26"	17	3"	54#
END LOADING RACKS				
1461*	20 11/16" x 69¾" x 26"	38	1½"	56#
1330	20⅜" x 69¾" x 26"	30	2"	70#
1331	20⅜" x 69¾" x 26"	20	3"	58#
1332	20⅜" x 69¾" x 26"	15	4"	49#
1333	20⅜" x 69¾" x 26"	12	5"	46#
1334	20⅜" x 69¾" x 26"	10	6"	42#
SIDE LOADING RACKS				
1461S*	28⅜" x 69¾" x 19"	38	1 ½"	50#
1330S	28⅜" x 69¾" x 19"	30	2"	60#
1331S	28⅜" x 69¾" x 19"	20	3"	51#
1332S	28⅜" x 69¾" x 19"	15	4"	45#
1333S	28⅜" x 69¾" x 19"	12	5"	42#
1334S	28⅜" x 69¾" x 19"	10	6"	41#

Four 5" platform type swivel casters (#C450).
*** #1461 & #1461S Units Hold Pans By The Lip Only.**

NSF

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Made For:

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 10
Quantity: 1

METRO®

Item # _____

74" High; 5 tier
Sized as shown on plan

Job _____

SUPER ADJUSTABLE™ SUPER ERECTA SHELF®
Adjustable Wire Shelving

10.01A

SUPER ADJUSTABLE™ SUPER ERECTA SHELF®
WIRE SHELVING

Super Adjustable™ Super Erecta Wire Shelving is the most advanced and innovative wire storage system available.

- **Maximum Space Utilization:** The Corner Release System encourages repositioning of shelves during initial assembly to reclaim wasted vertical space. In some cases, reclaimed vertical space will allow an extra shelving tier to be added to the storage unit resulting in a 25% increase in storage capacity!
- **Easily Assembled:** The unique Corner Release System enables quick and easy repositioning of shelves during the initial set up to accommodate different package or container sizes. "Total Assembly" is complete only after the shelves are properly spaced to maximize storage. SiteSelect™ Posts, with the double-groove visual guide feature, have circular grooves at 1" (25mm) increments and are numbered at 2" (51mm) intervals to easily identify proper shelf locations.
- **Easily Adjustable:** The unique shelf design and SiteSelect™ Posts enable "tool-free", quick adjustment at 1" (25mm) increments along the entire height of the post.
- **Improved Rigidity:** An enhanced Corner Release System has made Super Adjustable™ the most rigid, easily adjustable shelving system ever.
- **Strong:** Super Adjustable™ shelves hold as much weight as traditional Super Erecta wire shelving. Stationary units hold a maximum of 2,000 lb. (910kg). Maximum weight capacity per shelf (48" [1219mm] or shorter = 800 lb. [364kg]; longer than 48" [1219mm] = 600 lb. [273kg])
- **Choice of Finishes:** Super Adjustable™ Super Erecta shelving is available in a variety of finishes: chrome-plated for dry storage; Metroseal 3™ with antimicrobial product protection and Type 304 stainless steel for corrosive environments.
- **Accessories:** Compatible with the entire system of Super Erecta shelves and accessories. See Catalog Sheets 10.04, 10.05, 10.06 for more information.

Dry Storage — Chrome

NSF

Corner Release System

Super Adjustable™ Advantage . . .

Easy "no tool" shelf adjustment

1" 25mm spacing minimizes dead space

Efficient use of space allows more storage levels to be added.

Storage efficiency can increase by 25% or more!

*MICROBAN® and the MICROBAN® symbol are registered trademarks of the Microban Products Company, Huntersville, NC.

METRO®

InterMetro Industries Corporation
North Washington Street

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 11
Quantity: 4

Job _____

SUPER ADJUSTABLE™ SUPER ERECTA SHELF®
WIRE SHELVING

Dimensions

Super Adjustable™ Super Erecta Wire Shelving

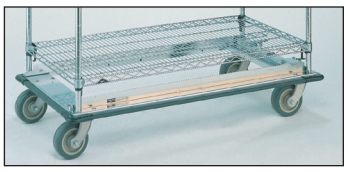
Model No. Chrome	Model No. Metroseal 3	Model No. Stainless	Shelf Width/Length (in.)	(mm)	Approx. Pkd. Wt. (lbs.)	(kg)
A1424NC	A1424NK3	A1424NS	14x24	355x610	6	2.7
A1430NC	A1430NK3	A1430NS	14x30	355x760	7	3.2
A1436NC	A1436NK3	A1436NS	14x36	355x914	8	3.6
A1442NC	A1442NK3	A1442NS	14x42	355x1066	9 1/2	4.3
A1448NC	A1448NK3	A1448NS	14x48	355x1219	10 1/2	4.7
A1460NC	A1460NK3	A1460NS	14x60	355x1524	14	6.3
A1472NC	A1472NK3	A1472NS	14x72	355x1829	17	7.7
A1824NC	A1824NK3	A1824NS	18x24	457x610	7	3.2
A1830NC	A1830NK3	A1830NS	18x30	457x760	8	3.6
A1836NC	A1836NK3	A1836NS	18x36	457x914	9 1/2	4.3
A1842NC	A1842NK3	A1842NS	18x42	457x1066	11	5.0
A1848NC	A1848NK3	A1848NS	18x48	457x1219	12	5.4
A1854NC	A1854NK3	A1854NS	18x54	457x1370	14 1/2	6.6
A1860NC	A1860NK3	A1860NS	18x60	457x1524	17	7.7
A1872NC	A1872NK3	A1872NS	18x72	457x1829	20	9.1
A2124NC	A2124NK3	A2124NS	21x24	530x610	8	3.6
A2130NC	A2130NK3	A2130NS	21x30	530x760	9	4.1
A2136NC	A2136NK3	A2136NS	21x36	530x914	11	5.0
A2142NC	A2142NK3	A2142NS	21x42	530x1066	12	5.4
A2148NC	A2148NK3	A2148NS	21x48	530x1219	14	6.4
A2154NC	A2154NK3	A2154NS	21x54	530x1370	16	7.3
A2160NC	A2160NK3	A2160NS	21x60	530x1524	18	8.2
A2172NC	A2172NK3	A2172NS	21x72	530x1829	24	10.9
A2424NC	A2424NK3	A2424NS	24x24	610x610	9	4.1
A2430NC	A2430NK3	A2430NS	24x30	610x760	11	5.0
A2436NC	A2436NK3	A2436NS	24x36	610x914	13	5.9
A2442NC	A2442NK3	A2442NS	24x42	610x1066	15	6.8
A2448NC	A2448NK3	A2448NS	24x48	610x1219	16	7.3
A2454NC	A2454NK3	A2454NS	24x54	610x1370	18	8.6
A2460NC	A2460NK3	A2460NS	24x60	610x1524	21	9.5
A2472NC	A2472NK3	A2472NS	24x72	610x1829	26	11.8
A3036NC			30x36	760x914	15	6.8
A3048NC			30x48	760x1219	21	9.5
A3060NC			30x60	760x1524	26 1/2	11.8
A3072NC			30x72	760x1829	31	14.0
A3636NC			36x36	914x914	18	8.2
A3648NC			36x48	914x1219	23	10.4
A3660NC			36x60	914x1524	29	13.1
A3672NC			36x72	914x1829	34 1/2	15.4

NOTE: MICROBAN® protects the Metroseal 3 coating from bacteria, mold, mildew and fungi that cause odors, stains and product degradation. For Metroseal 3 shelving information see sheet #10.10A.

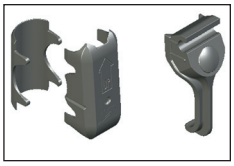
All Environments — Metroseal 3™ with *Microban® Antimicrobial Product Protection

Mobile Options

Stem Casters



Dolly Trucks



Replacement Parts
Each kit includes components for one original Super Adjustable or Super Adjustable shelf; (4) wedges, (4) sleeves, (4) shelf releases.
Model No. SAKITA2

SiteSelect™ Posts

STATIONARY Actual Height* (in.)	(mm)	Model No. Plated	Model No. Metroseal 3	Model No. Stainless	MOBILE Actual Height* (in.)	(mm)	Model No. Plated	Model No. Metroseal 3	Model No. Stainless	Approx. Pkd. Wt. (lbs.)	(kg)
7 3/8	187	7P	7PK3	7PS	6 3/4	171	7UP	7UPK3	7UPS	1/2	0.3
14 3/8	365	13P	13PK3	13PS	13 3/4	349	13UP	13UPK3	13UPS	1	0.5
28 3/8	720	27P	27PK3	27PS	27 3/4	704	27UP	27UPK3	27UPS	1 3/4	0.75
34 3/8	873	33P	33PK3	33PS	33 3/4	857	33UP	33UPK3	33UPS	2	0.9
54 7/16	1382	54P	54PK3	54PS	53 13/16	1366	54UP	54UPK3	54UPS	3	1.4
62 7/16	1585	63P	63PK3	63PS	61 13/16	1570	63UP	63UPK3	63UPS	3 1/2	1.6
—	—	—	—	—	69 3/4	1771	70UP	—	—	3 3/4	1.7
74 1/2	1892	74P	74PK3	74PS	73 7/8	1876	74UP	74UPK3	74UPS	4	1.8
86 1/2	2197	86P	86PK3	86PS	85 7/8	2181	86UP	86UPK3	86UPS	4 1/2	2.0
96 1/2	2450	**96P	96PK3	96PS						5 1/2	2.5

*Actual height for the stationary post includes the post cap and the leveling bolt completely tightened.

Important: When ordering by components remember that for maximum stability, units should be kept as wide and low as possible.

All Metro Catalog Sheets are available on our Web Site: **www.metro.com**

InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705
Phone: 570-825-2741 • Fax: 570-825-2852
For Product Information:

L02-006A
Printed in U.S.A. Rev. 2/17

Information and specifications are subject to change without notice. Please confirm at time of order.

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Crabtree McGrath ASSOCIATES, INC.
Edgewood Pre-K Academy
Bristol, CT
Item #: 11
Quantity: 4

New Age Industrial Corp., Inc.
PO Box 520 • 16788 US Hwy 36 • Norton, Kansas 67654
Phone: 800-255-0104 • Fax: (877)-877-7687 • **www.NewAgeIndustrial.com**

Job: _____

Item: _____

Quantity: _____

Dunnage Racks -- 2000 Series

APPLICATION:
- These Dunnage Racks are a heavy-duty constructed rack.
- All welded aluminum design is great for keeping product organized and off the floor.

MATERIAL:
- Framework is constructed of 1½" x 1¾" x.070" wall tubing.
- The legs are permanently sealed with welded aluminum caps.

GUARANTEE:
- Five-Year Guarantee against material defects and workmanship.
- Lifetime Guarantee against rust and corrosion.

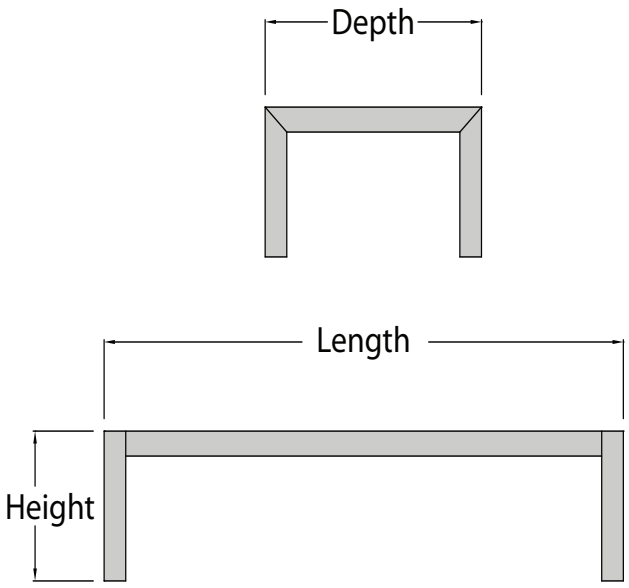
Model No.	Size D-H-L	Weight Capacity	# of Laterals	Ship Lbs.
2001	18" x 8" x 36"	3000 lbs.	4	9
2002	18" x 8" x 48"	2500 lbs.	4	11
2003	18" x 8" x 60"	2000 lbs.	4	13
2029	18" x 12" x 24"	3200 lbs.	4	7
2020	18" x 12" x 36"	3000 lbs.	4	10
2021	18" x 12" x 48"	2500 lbs.	4	14
2022	18" x 12" x 60"	2000 lbs.	4	17
2017	20" x 8" x 36"	3000 lbs.	4	9
2018	20" x 8" x 48"	2500 lbs.	4	12
2019	20" x 8" x 60"	2000 lbs.	4	13
2052	20" x 12" x 30"	3000 lbs.	4	10
2004	20" x 12" x 36"	3000 lbs.	4	11
2054	20" x 12" x 42"	3000 lbs.	4	13
2005	20" x 12" x 48"	2500 lbs.	4	15
2006	20" x 12" x 60"	2000 lbs.	4	18
2031	24" x 8" x 24"	3000 lbs.	5	9
2014	24" x 8" x 36"	2500 lbs.	5	11
2015	24" x 8" x 48"	2500 lbs.	5	14
2016	24" x 8" x 60"	2000 lbs.	5	17
2032*	24" x 8" x 72"	4000 lbs.	5	20
2013	24" x 12" x 24"	2500 lbs.	5	9
2062	24" x 12" x 30"	2500 lbs.	5	11
2008	24" x 12" x 36"	2500 lbs.	5	15
2064	24" x 12" x 42"	2500 lbs.	5	15
2009	24" x 12" x 48"	2500 lbs.	5	21
2033	24" x 12" x 54"	2000 lbs.	5	17
2010	24" x 12" x 60"	2000 lbs.	5	24
2012*	24" x 12" x 72"	4000 lbs.	5	27
2026	30" x 12" x 36"	3000 lbs.	6	14
2027	30" x 12" x 48"	3000 lbs.	6	19
2028	30" x 12" x 60"	2500 lbs.	6	20
2007*	30" x 12" x 72"	2500 lbs.	6	27

* Models have 6 legs

Options:

Removable Aluminum Cover — *Call For Pricing*

Custom Sizes Available — *Call For Pricing*



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Made For:

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 12
Quantity: 2

Project _____

AIA #_____ SIS #_____

Item #_____ Quantity _____ C.S.I. Section 114000

COMMERCIAL REFRIGERATION

DEALERS CHOICE G-SERIES

G-SERIES

2-Section Freezer Reach-In Self-Contained Solid Door(s)

Cutsheet provided for design intent;
Item is existing to be provided by Owner

Many models are ENERGY STAR® listed. Please refer to www.energystar.gov to view the most up-to-date product listing and performance data.

Intertek 4004142

This unit is listed to the applicable UL, CSA and NSF Standards by an approved NRTL. Consult the factory or unit's data plate for approval information.

STANDARD PRODUCT FEATURES

- High Performance, Energy Efficient Refrigeration System
- Reliable Microprocessor Control With LED Temperature Display
- Evaporator Coil Outside Food Zone Provides More Usable Space
- Load-Sure Guard Prevents Problems From Improper Loading
- Durable All-Metal Construction
- Stainless Steel Front & Doors, Anodized Aluminum Sides & Interior
- Full or Half Height Door Models with a Variety of Hinging Configurations
- Long Life EZ-Clean Door Gasket(s)
- Three (3) Epoxy Coated Shelves Per Section (factory installed)
- Easy to Maintain Front Facing Condenser Coil
- 6" High Locking Casters
- Guaranteed for Life Door Handles & Hinges
- 3-Year Parts & Labor Warranty
- 2-Years Additional Compressor Parts Warranty

ACCESSORIES & OPTIONS (*field installed)

- Tray Slides for 18" x 26" Sheet Pans*
- Tray Slides for 12" x 20" Food Pans*
- Tray Slides for 14" x 18" Sheet Pans*
- Tray Slides for 18" x 26, 12" x 20" & 14" x 18" Pans*
- Additional Shelves*
- 6" High Legs*
- Lower Height Casters*

*Please refer to form number TR35872 for precise kit details. See back page for tray slide versatility chart.

AVAILABLE CONFIGURATIONS

Half-Height Door Models	Hinging
G22000	Left/Right
G22001	Right/Left
G22002	Right/Right
G22003	Left/Left

Full-Height Door Models	Hinging
G22010	Left/Right
G22011	Right/Left
G22012	Right/Right
G22013	Left/Left

MODELS

Half Height Door Models: G22000, G22001, G22002, G22003

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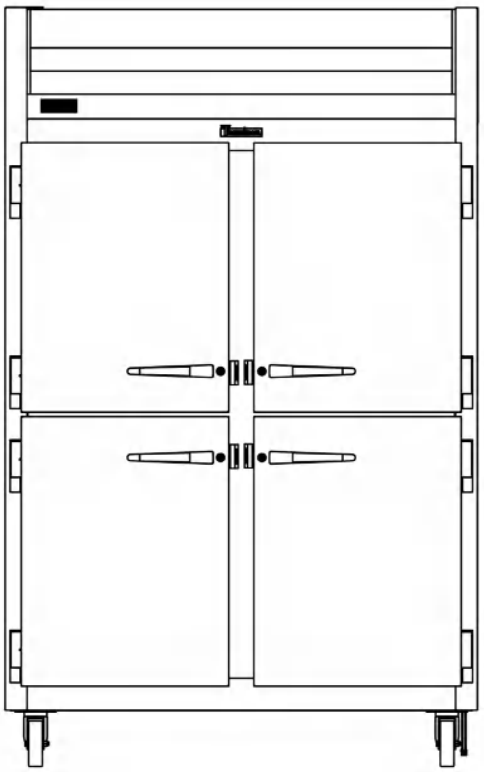
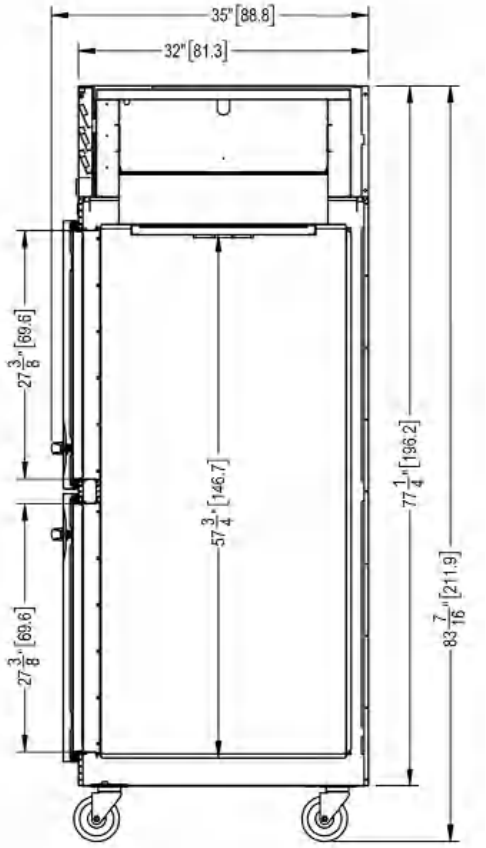
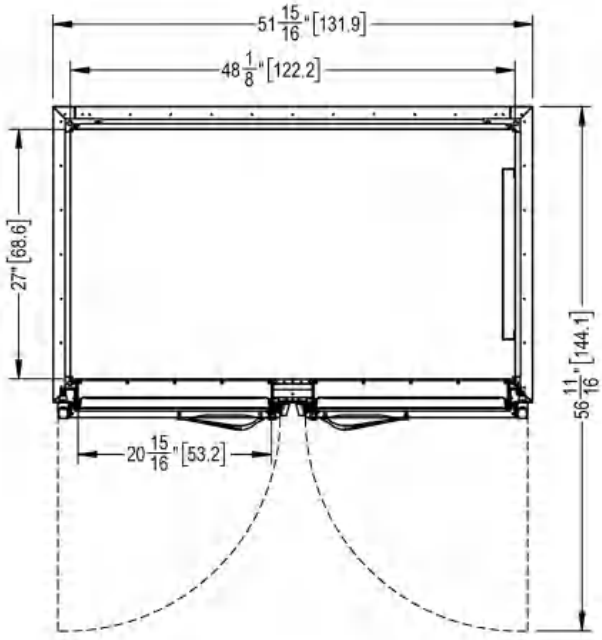
For KCL CADalog Website







Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 14

Quantity: 1

G-SERIES

2-Section Freezer Reach-In
Self-Contained Solid Door(s)

MODELS

Full Height Door Models: G22010, G22011, G22012, G22013

CLICK
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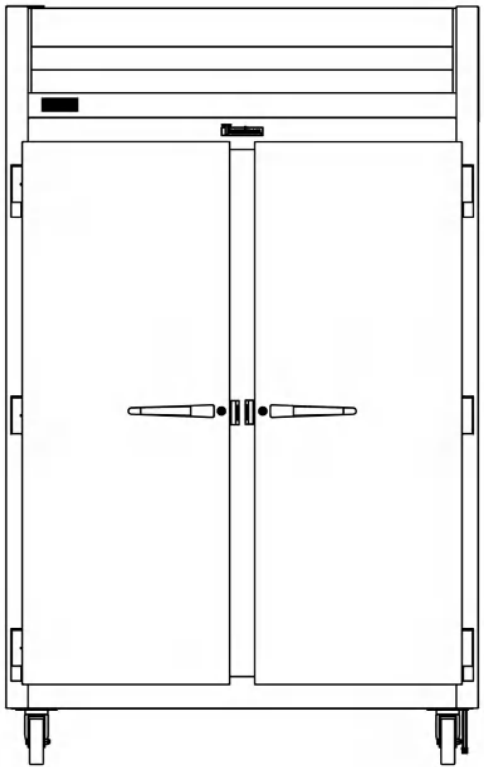
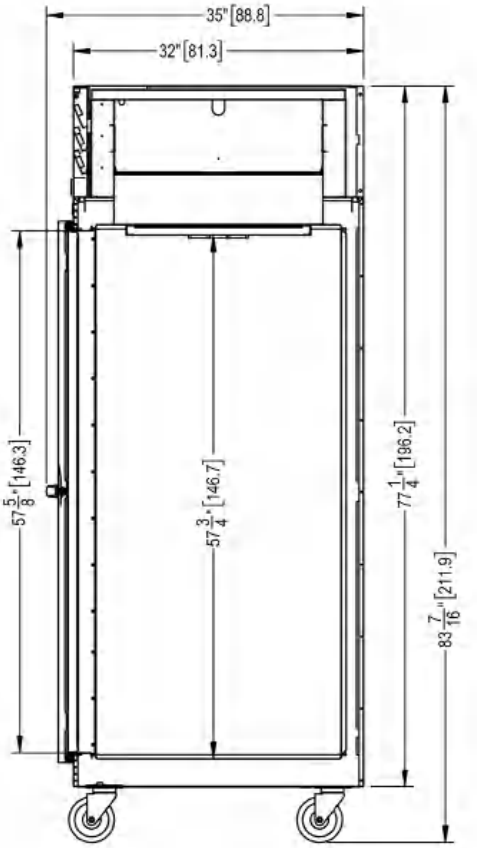
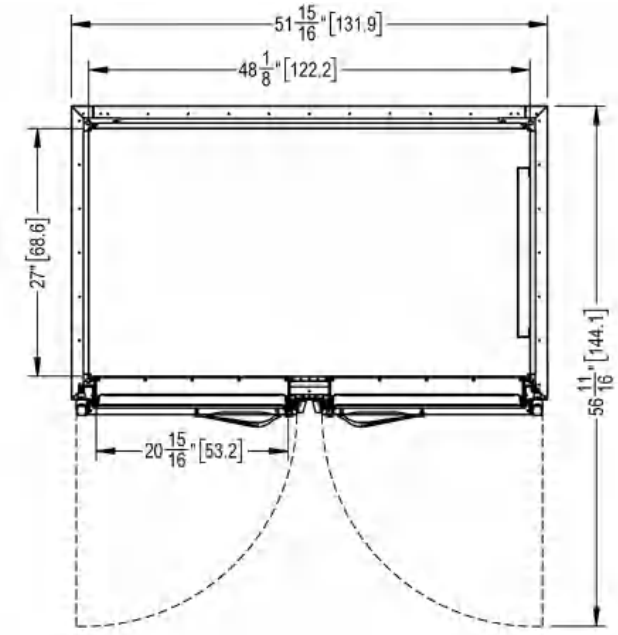
For KCL CADalog Website







Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 14

Quantity: 1

G-SERIES
2-Section Freezer Reach-In
Self-Contained Solid Door(s)

MODELS

Half Height Door Models: G22000, G22001, G22002, G22003
Full Height Door Models: G22010, G22011, G22012, G22013

MODELS	G220_ _
DIMENSIONAL DATA	
Net Capacity cu. ft.[1]	45.89 (1299 l) | 46.02 (1303 l)
L x D x H - Overall in.[2]	52⅛ (132.4 cm) x 35 (88.8 cm) x 83⅞₁₆ (211.9 cm)
Depth - over body in.	32 (81.3 cm)
Depth - door open 90° in.	57⅝ (146.3 cm)
Clear half-door W x H in.	21⅛ (53.6 cm) x 27½ (69.9 cm)
Clear full-door W x H in.	21⅛ (53.6 cm) x 57⅝ (146.3 cm)
No. Standard Shelves	6
Shelf Area sq. ft.[3]	34.6 (3.21 sq m)
ELECTRICAL DATA	
Voltage | Plug	115/60/1 | NEMA 5-15P (attached)
Feed wires with ground	3
Full Load Amperes | MDEC[4]	11.2 | 9.89 kWh/Day
REFRIGERATION DATA	
Refrigerant	R-448A
Refrigerant Charge oz.	23 oz (652 g)
BTU/HR | H.P.[5]	2270 | 3/4 HP
Required Clearance	12" Above
SHIPPING DATA	
L x D x H Crated in.	62 (158 cm) x 42 (107 cm) x 85 (216 cm)
Volume Crated cu. ft.	128 (3625 l)

NOTES:
1. Net Capacity cu. ft. = Half Height Door | Full Height Door models.
2. Height shown when mounted on standard 6" high casters.
3. Figure shown reflects the area of standard shelf compliment.
4. MDEC = Maximum Daily Energy Consumption
5. Based on a 90°F ambient and -20°F evaporator.

EQUIPMENT SPECIFICATIONS

CONSTRUCTION, HARDWARE, INSULATION
Cabinet exterior front, louver assembly and door(s) are constructed of heavy gauge stainless steel. Cabinet sides (including returns), interior and door liners are constructed of anodized aluminum. The exterior cabinet top, back and bottom are constructed of heavy gauge galvanized steel. A set of four (4) 6" high locking casters are included. Doors are equipped with a gasket protecting, raised metal door pan, cylinder locks, and guaranteed for life self-closing cam-lift hinges with a stay open feature at 120 degrees. Hinges include a concealed switch to automatically activate the interior LED lighting. Guaranteed for life, metal work flow door handles are mounted horizontally over recess in door which limits protrusion into aisle ways. Gasket profile and durable long life material simplify cleaning and increase overall gasket life. Anti condensate heaters are located behind each door opening. Both the cabinet and door(s) are insulated with an average of 2" thick high density, non-CFC, 100% foamed in place polyurethane.

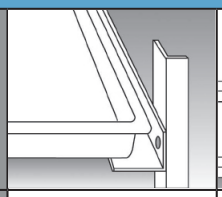
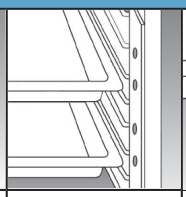
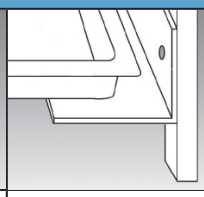
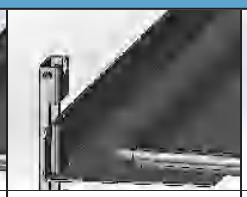
SELF-CONTAINED REFRIGERATION SYSTEM
A top mounted, self-contained, balanced refrigeration system using environmentally friendly, non-flammable R-448A refrigerant is conveniently located behind the one piece louver assembly. It features an easy to clean front facing condenser, thermostatic expansion valve metering device, air-cooled hermetic compressor, large, high humidity evaporator coil located outside the food zone and a top mounted non-electric condensate evaporator. A 9' cord and plug is provided. Standard operating temperature is 0 to -5°F and can be adjusted to operate as low as -10°F in a 90°F or less ambient.

CONTROL
The easy to use water resistant microprocessor control is supplied standard. It includes a 3-Digit LED Display, and a Fahrenheit or Celsius Temperature Scale Display Capability.

INTERIOR ARRANGEMENTS
Standard interior arrangements include three (3) epoxy coated steel wire shelves per section, mounted on shelf pins, installed at the factory. Shelves are full-width, and do not have any large gaps between them requiring the use of "bridge" or "junior shelves." Recommended load limit per shelf should not exceed 225 lbs.

DOMESTIC WARRANTY
Both a three year parts and labor warranty and an additional two year compressor parts warranty (for a total of five on self-contained models) are provided standard.

OPTIONAL ACCESSORY TRAY SLIDE VERSATILITY CHART

TRAY SLIDE DRAWINGS						
TRAY SLIDE OFFERING	#1 (1) 18" x26" or (2) 14"x18"	#4 (Rod Type) (1) 18" x26"	Universal (1) 18" x26" or (2) 14"x18" or (2) 12"x20"	#1 EZ-Change (1) 18" x26" or (2) 14"x18"	Universal EZ-Change (1) 18" x26" or (2) 14"x18" or (2) 12"x20"	HD Universal EZ-Change (1) 18" x26" or (2) 14"x18" or (2) 12"x20"
SPACING CAPACITY DOOR SIZE	2" 28 Pairs Full Door & 13 Half 3" 19 Pairs Full Door & 09 Half 4" 14 Pairs Full Door & 07 Half 5" 11 Pairs Full Door & 05 Half	1 1/2" 38 Pairs Full Door (2 Pair) 1 1/2" 18 Pairs Half Door (1 Pair)	4" 14 Pairs Full Door & 06 Half[1] 4" 14 Pairs Full Door & 07 Half[2] 5" 11 Pairs Full Door & 05 Half 6" 09 Pairs Full Door & 04 Half	2" 26 Pairs Full Door & 12 Half 4" 13 Pairs Full Door & 06 Half	2 1/4" 22 Pairs Full Door & 11 Half 4 1/2" 11 Pairs Full Door & 05 Half	4 1/2" 11 Pairs Full Door & 05 Half 9" 05 Pairs Full Door & 02 Half

- **Upper Half Height Door[1]**

LAKESIDE®

Item # _____
Quantity _____

Stainless Steel Utility Carts

Heavy Duty - 700 Lb Capacity

Spec. #

AIA #

Model 744

Models
710, 711, 721, 722, 743, 744, 758, 759
510, 511, 521, 522, 543, 544, 558, 559

"U" Shaped Angled Frame Provides The Strength Needed For Heavy-duty Jobs

- 700 lb. (300 kg) capacity is ideal for continuous moving of heavy loads over various standard floor surfaces
- Rugged 18 gauge reinforced stainless steel shelves are stain and rust resistant. Electronically welded for added strength.
- Easy to clean and sanitize, simply wipe down or steam clean
- Leg and handle bumpers protect walls and furniture
- NSF listed models available

Specifications

Unit shall be of fully welded stainless steel construction. Legs and frame shall be of U-frame design, eliminating the need for corner reinforcements. Leg/frame shall be .120 x 1" x 1" angle stainless steel. Shelves shall be of 18-gauge stainless steel and shall be welded to vertical leg frames. Shelves shall be double hemmed on all four edges for extra rigidity. Unit shall have two each 5" (127 mm) diameter extra-load swivel casters with 1-1/4" (32 mm) wide non-marking polyurethane wheels, and two each 8" diameter extra-load wheels mounted to a fixed axle. Swivel casters shall be plate type and shall be bolted to an 18-gauge 5" (127 mm) wide stainless steel cross member with a galvanized reinforcement. Unit shall have push handle made of 18 gauge 1" O.D. stainless steel `tubing. Handle mounting brackets shall be welded to vertical leg frame. Unit shall have two each bumpers mounted to handle ends and two each 6" (152 mm) vertical bumpers riveted to front legs.

Lakeside Manufacturing, Inc.
4900 West Electric Avenue • West Milwaukee, WI 53219 U.S.A.
800-558-8565 • 414-902-6400 • Fax 414-902-6446 • info@eLakeside.com • www.eLakesideFoodservice.com

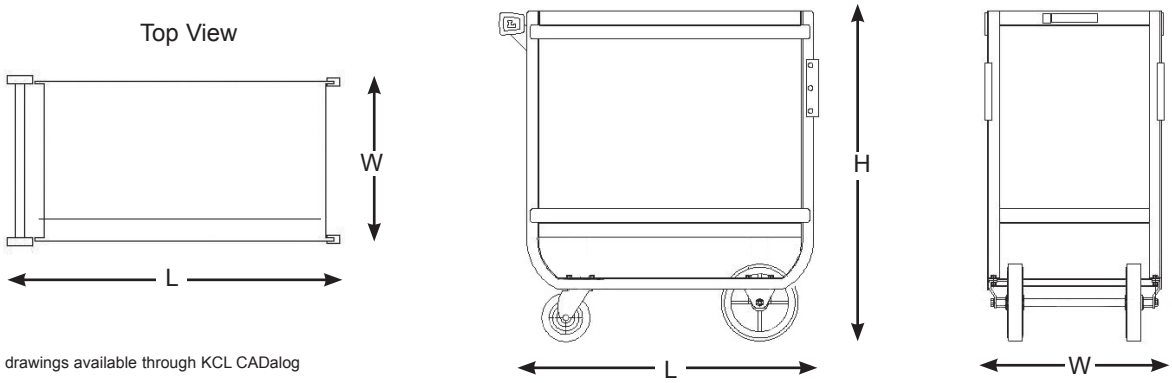
Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 15
Quantity: 1

Stainless Steel Utility Carts

Heavy Duty - 700 Lb Capacity



AutoCAD drawings available through KCL CADalog

Model Information

Model	NSF Model	Shelf Description # of	Shelf Description Size	Shelf Description Clearance	Overall Size L	Overall Size W	Overall Size H	Case Weight lbs.	Case Weight (kg.)
710	510	2	15-1/2" x 24" (394 x 610)	19" (483)	30" (762)	16-1/4" (413)	34-1/4" (870)	49	(22.2)
711	511	3	15-1/2" x 24" (394 x 610)	10" (254)	30" (762)	16-1/4" (413)	34-1/4" (870)	57	(25.9)
721	521	2	18" x 27" (457 x 686)	19" (483)	32-5/8" (829)	19-3/8" (492)	34-1/2" (876)	53	(24)
722	522	3	18" x 27" (457 x 686)	10" (254)	32-5/8" (829)	19-3/8" (492)	34-1/2" (876)	63	(28.6)
743	543	2	21" x 33" (533 x 838)	21" (533)	38-5/8" (981)	22-3/8" (568)	37-1/8" (943)	64	(29)
744	544	3	21" x 33" (533 x 838)	11-3/8" (289)	38-5/8" (981)	22-3/8" (568)	37-1/8" (943)	78	(35.4)
758	558	2	21" x 49" (533 x 1245)	21" (533)	54-5/8" (1387)	22-3/8" (568)	37-1/8" (943)	87	(39.5)
759	559	3	21" x 49" (533 x 1245)	11-3/8" (289)	54-5/8" (1387)	22-3/8" (568)	37-1/8" (943)	108	(49)

Measurements in ( ) denote metric millimeters, unless otherwise specified.

Optional Accessories

- ☐ Extended perimeter bumper
- ☐ All 5" swivel casters
- ☐ Set of 2 ea. 5" brake casters

LAKESIDE®
Ingenuity On Wheels™

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4900 West Electric Avenue • West Milwaukee, WI 53219 U.S.A.
800-558-8565 • 414-902-6400 • Fax 414-902-6446
info@el.lakeside.com • www.eLakesideFoodservice.com

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 15
Quantity: 1

Glastender®
A family company manufacturing in the USA
www.glastender.com

Project: _____	AIA#
Item #: _____ Qty: _____	SIS#
Model #: _____	

Wall-Mount Hand Sinks w/Integral Side Splashes

WH-14-S, WHS-14-S

WHS-14-S

Standard Features

- All stainless steel
- One-piece seamless top and backsplash featuring 1/4″ radius corners
- Drawn sink bowl
- Heavy-duty, hot and cold water faucet
- Integral left and right side splashes, featuring radius work surface corners and a front lip
- Wall-mounting bracket

Configurable Options

- Foot-operated faucet; specify option FOF-D
- Side splashes; specify option LS15 (left) and/or RS15 (right)

Accessories

03000483 Lift-out perforated plastic wet waste strainer

Intertek
4004503
Conforms to NSF/ANSI STD 2
WH-14-S Certified to CSA STD B45.4

FOF-D Foot-operated faucet

Specifications

Drains
- 1-1/2″ I.P.S. threaded drain will fit Dearborn part #8033 slipnut and part #W-573P washer

Faucet
- Deck mount on 4″ centers, accepts 3/8″ sink leads, hot and cold water connections required
- Optional foot-operated faucet: single hole, (2) 1/2″ NPT female inlets and (1) 1/2″ NPT female outlet
- NSF/ANSI 61, 372 low lead compliant

Sink Bowl Dimensions
- 9-1/4″ by 11-1/2″ by 6″ deep

Materials
- 20 gauge stainless steel parts include: all components unless otherwise noted
- 18 gauge stainless steel parts include: wall-mounting bracket

To view cleaning and care instructions, please visit:
https://www.glastender.com/PDF/F-423-011_ss_clean_care.pdf

Model WHS-14-S featuring integral side splashes, radius work surface corners for easy cleaning and a front lip to contain splashes

⚠**WARNING:** The plastic wet waste strainer accessory can expose you to chemicals including Bisphenol A (BPA), which is known to the State of California to cause birth defects or other reproductive harm.
For more information, go to www.P65Warnings.ca.gov.
Warning applies to State of California only. Part #03000483

Glastender, Inc. • 5400 N Michigan Rd • Saginaw, MI • 48604-9780
989.752.4275 • 800.748.0423 • Fax 989.752.4444
www.glastender.com

Approval/Notes:

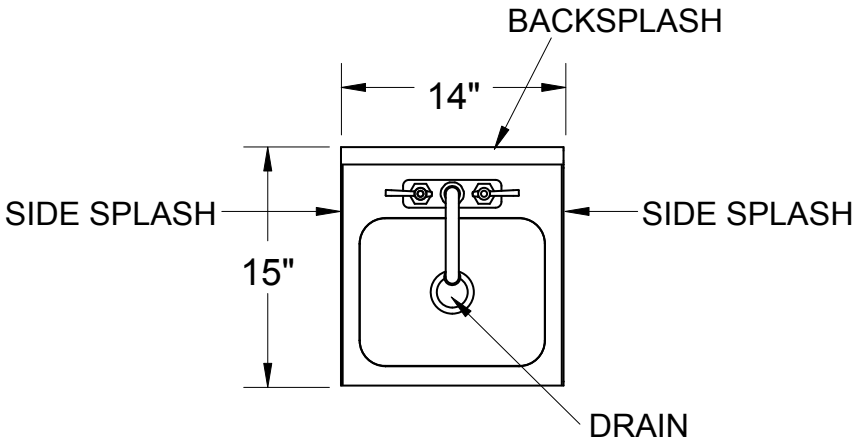
Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

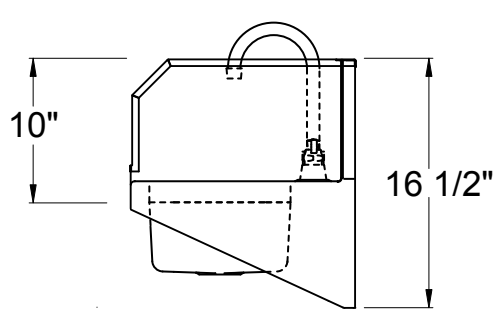
Item #: 16
Quantity: 2

Wall-Mount Hand Sinks with Integral Side Splashes

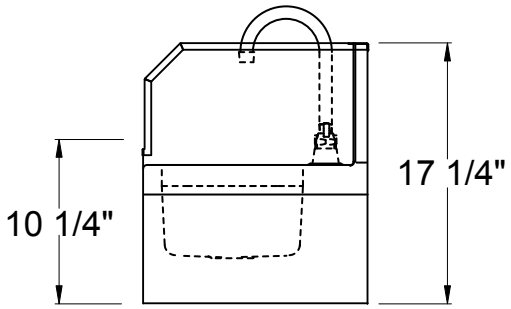
Dimensional Information



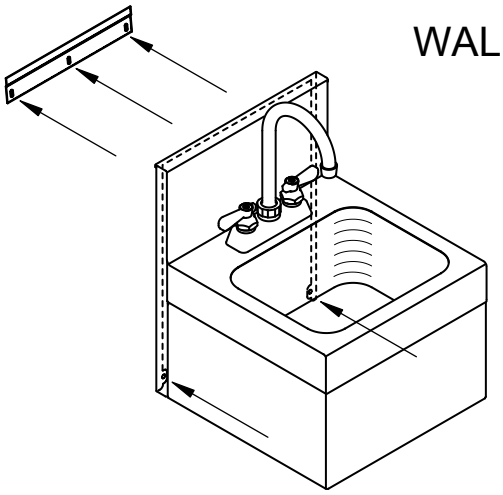
PLAN VIEW



WH-14-S
SIDE VIEW



WHS-14-S
SIDE VIEW



WALL MOUNTING INSTRUCTIONS

1. Secure bracket to wall.
2. Hang sink on bracket.
3. Screw sink to wall through bracket on bottom back of sink.

5400 N Michigan Rd • Saginaw, MI • 48604-9780

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 16

Quantity: 2

SLIM JIM® CONTAINERS

Cutsheet provided for design intent;
Item is existing to be provided by Owner

The Slim Jim® container delivers the durability needed for commercial environments combined with brand new innovation to increase worker productivity. New product features and accessories deliver the most efficient solution for collection, transportation, and disposal of multi-stream waste and recyclables.

Features and Benefits:

- Venting channels make removing liners up to 80% easier, improving productivity and reducing the risk of worker injury
- Four bag cinches secure liners around the rim of the container and allow for quick, knot-free liner changes
- Handles at the base and rim of the container improve grip and control while lifting and emptying full containers
- Rim with rib-strengthened design increases strength and resists crushing
- Build a recycling station with a variety of dolly and lid options to meet any facility need

COLORS AVAILABLE

Blue, Green, Black, Beige, Brown, Gray, Yellow*, Red*

* 23-gallon only

Material Composition:

Injection molded with a high-quality resin blend.

Accessories:

STAINLESS STEEL DOLLIES

- Slim Jim® Single Dolly
- Slim Jim® Double Dolly
- Slim Jim® Triple Dolly
- Slim Jim® Quadruple Dolly

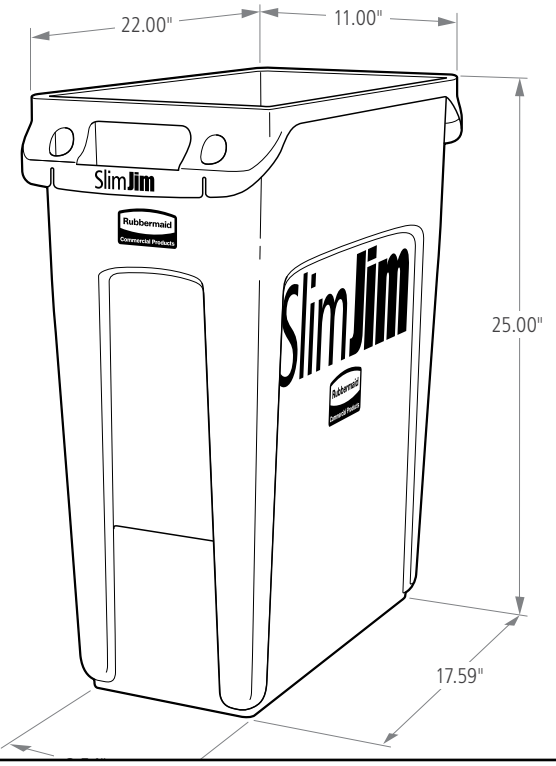
RESIN DOLLY

- Slim Jim® Trainable Dolly

LIDS

- Bottles and Cans Lid
- Paper Lid
- Mixed Recycling Lid
- Hinged Lid
- Swing Lid

23-Gallon Slim Jim® Container



Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 17
Quantity: 2

SLIM JIM® CONTAINERS

SKU #	DESCRIPTION	COLOR	CAPACITY		LENGTH		WIDTH		HEIGHT		PACK SIZE
			GAL	L	IN	CM	IN	CM	IN	CM	
1971258	SLIM JIM® CONTAINER	GRAY	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955959	SLIM JIM® CONTAINER	BLACK	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971259	SLIM JIM® CONTAINER	BEIGE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1956181	SLIM JIM® CONTAINER	BROWN	16	61	22"	55.88	11"	27.94	25"	63.50	4
1971257	SLIM JIM® CONTAINER	BLUE	16	61	22"	55.88	11"	27.94	25"	63.50	4
1955960	SLIM JIM® CONTAINER	GREEN	16	61	22"	55.88	11"	27.94	25"	63.50	4
FG354060GRAY	SLIM JIM® CONTAINER	GRAY	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BLA	SLIM JIM® CONTAINER	BLACK	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354060BEIG	SLIM JIM® CONTAINER	BEIGE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956187	SLIM JIM® CONTAINER	BROWN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956185	SLIM JIM® CONTAINER	BLUE	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956186	SLIM JIM® CONTAINER	GREEN	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956188	SLIM JIM® CONTAINER	YELLOW	23	87	22"	55.88	11"	27.94	30"	76.20	4
1956189	SLIM JIM® CONTAINER	RED	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007BLUE	SLIM JIM® CONTAINER	BLUE (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4
FG354007GRN	SLIM JIM® CONTAINER	GREEN (RECYCLING)	23	87	22"	55.88	11"	27.94	30"	76.20	4

Project _____

AIA #_____ SIS #_____

Item #_____ Quantity _____ C.S.I. Section 114000

COMMERCIAL REFRIGERATION

DEALERS CHOICE G-SERIES

G-SERIES

1-Section Refrigerator Reach-In Self-Contained Solid Door(s)

Many models are ENERGY STAR® listed. Please refer to www.energystar.gov to view the most up-to-date product listing and performance data.

Intertek 4004142

This unit is listed to the applicable UL, CSA and NSF Standards by an approved NRTL. Consult the factory or unit's data plate for approval information.

STANDARD PRODUCT FEATURES

- High Performance, Energy Efficient Refrigeration System
- Reliable Microprocessor Control With LED Temperature Display
- Evaporator Coil Outside Food Zone Provides More Usable Space
- Load-Sure Guard Prevents Problems From Improper Loading
- Durable All Metal Construction
- Stainless Steel Front & Doors, Anodized Aluminum Sides & Interior
- Full or Half Height Door Models with a Variety of Hinging Configurations
- Long Life EZ-Clean Door Gaskets
- Three (3) Epoxy Coated Shelves Per Section (factory installed)
- Easy to Maintain Front Facing Condenser Coil
- 6" High Locking Casters
- Guaranteed for Life Door Handles & Hinges
- 3-Year Parts & Labor Warranty
- 2-Years Additional Compressor Parts Warranty

ACCESSORIES & OPTIONS (*field installed)

- Tray Slides for 18" x 26" Sheet Pans*
- Tray Slides for 12" x 20" Food Pans*
- Tray Slides for 14" x 18" Sheet Pans*
- Tray Slides for 18" x 26, 12" x 20" & 14" x 18" Pans*
- Additional Shelves*
- 6" High Legs*
- Lower Height Casters*

*Please refer to form number TR35872 for precise kit details. See back page for tray slide versatility chart.

AVAILABLE CONFIGURATIONS

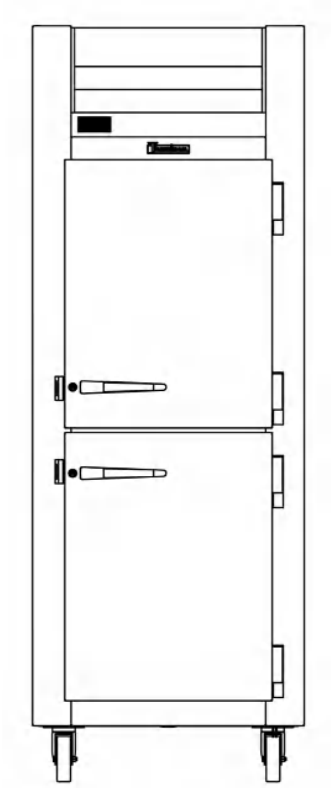
Half-Height Door Models	Hinging
G10000	Right
G10001	Left

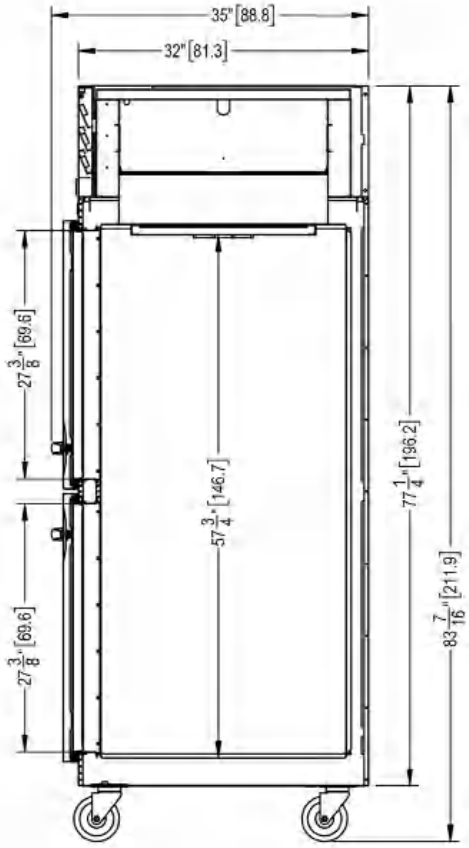
Full-Height Door Models	Hinging
G10010	Right
G10011	Left

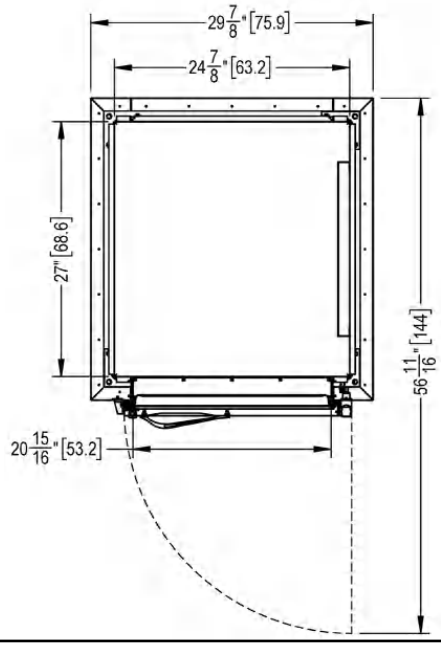
MODELS

Half Height Door Models: G10000, G10001

CLICK
TRANSFER
For KCL CADalog Website







Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 18

Quantity: 1

G-SERIES

1-Section Refrigerator Reach-In
Self-Contained Solid Door(s)

MODELS

Full Height Door Models: G10010, G10011

CLICK
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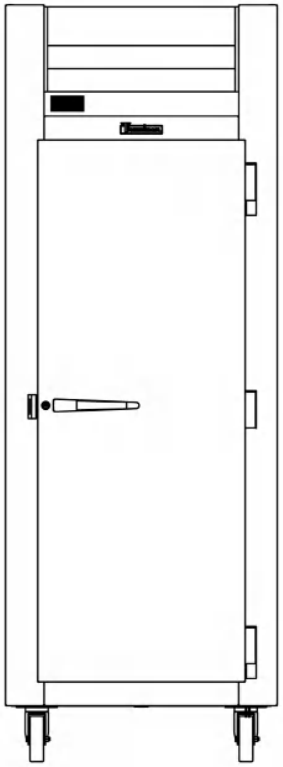
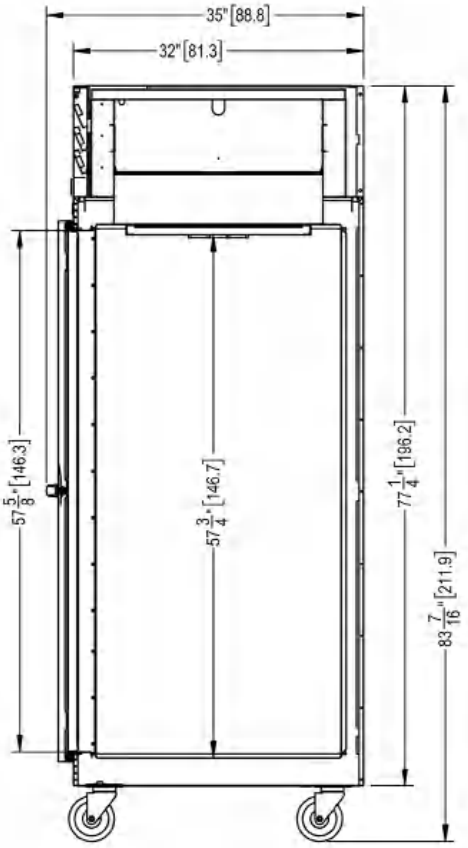
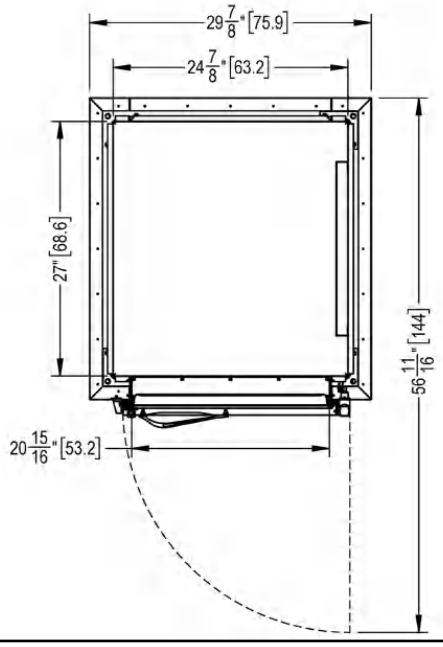






Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 18

Quantity: 1

G-SERIES
1-Section Refrigerator Reach-In
Self-Contained Solid Door(s)

MODELS

Half Height Door Models: G10000, G10001
Full Height Door Models: G10010, G10011

MODELS	G100_ _
DIMENSIONAL DATA	
Net Capacity cu. ft.[1]	23.37 (661.8 l) | 23.43 (663.5 l)
L x D x H - Overall in.[2]	29⅞ (75.9 cm) x 35 (88.8 cm) x 83 7/16 (211.9 cm)
Depth - over body in.	32 (81.3 cm)
Depth - door open 90° in.	57⅝ (146.3 cm)
Clear half-door W x H in.	21⅛ (53.6 cm) x 27½ (69.9 cm)
Clear full-door W x H in.	21⅛ (53.6 cm) x 57⅝ (146.3 cm)
No. Standard Shelves	3
Shelf Area sq. ft.[3]	18.8 (1.75 sq m)
ELECTRICAL DATA	
Voltage | Plug	115/60/1 | NEMA 5-15P (attached)
Feed wires with ground	3
Full Load Amperes | MDEC[4]	4.9 | 1.76 kWh/Day
REFRIGERATION DATA	
Refrigerant	R-450A
Refrigerant Charge Amount	16 oz (453.6 g)
BTU/HR | H.P.[5]	1650 | 1/5 HP
Required Clearance	12" Above
SHIPPING DATA	
L x D x H Crated in.	48 (122 cm) x 42 (107 cm) x 85 (216cm)
Volume Crated cu. ft.	99 (2803 l)
Uncrated | Crated Weight lbs.	305 (138 kg) | 350 (150 kg)

NOTES:
1. Net Capacity cu. ft. = Half Height Door \| Full Height Door models.
2. Height shown when mounted on standard 6" high casters.
3. Figure shown reflects the area of standard shelf compliment.
4. MDEC = Maximum Daily Energy Consumption
5. Based on a 90°F ambient and 20°F evaporator.

EQUIPMENT SPECIFICATIONS

CONSTRUCTION, HARDWARE, INSULATION
Cabinet exterior front, louver assembly and door(s) are constructed of heavy gauge stainless steel. Cabinet sides (including returns), interior and door liners are constructed of anodized aluminum. The exterior cabinet top, back and bottom are constructed of heavy gauge galvanized steel. A set of four (4) 6" high locking casters are included. Doors are equipped with a gasket protecting, raised metal door pan, cylinder locks, and guaranteed for life self-closing cam-lift hinges with a stay open feature at 120 degrees. Hinges include a concealed switch to automatically activate the interior LED lighting. Guaranteed for life, metal work flow door handles are mounted horizontally over recess in door which limits protrusion into aisle ways. Gasket profile and durable long life material simplify cleaning and increase overall gasket life. Anti-condensate heaters are located behind each door opening. Both the cabinet and door(s) are insulated with an average of 2" thick high density, non-CFC, 100% foamed in place polyurethane.

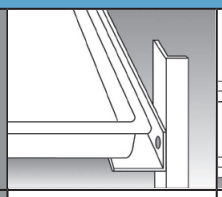
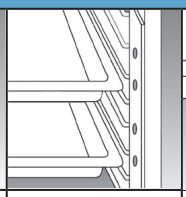
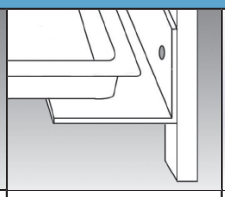
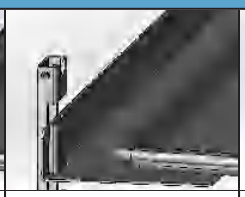
SELF-CONTAINED REFRIGERATION SYSTEM
A top mounted, self-contained, balanced refrigeration system using environmentally friendly, non-flammable R-450A refrigerant is conveniently located behind the one piece louver assembly. It features an easy to clean front facing condenser, thermostatic expansion valve metering device, air-cooled hermetic compressor, large, high humidity evaporator coil located outside the food zone and a top mounted non-electric condensate evaporator. A 9' cord and plug is provided. Standard operating temperature is 34° to 38°F.

CONTROL
The easy to use water resistant microprocessor control is supplied standard. It includes a 3-Digit LED Display, and a Fahrenheit or Celsius Temperature Scale Display Capability.

INTERIOR ARRANGEMENTS
Standard interior arrangements include three (3) epoxy coated steel wire shelves, mounted on shelf pins, installed at the factory. Recommended load limit per shelf should not exceed 225 lbs.

DOMESTIC WARRANTY
Both a three year parts and labor warranty and an additional two year compressor parts warranty (for a total of five on self-contained models) are provided standard.

OPTIONAL ACCESSORY TRAY SLIDE VERSATILITY CHART

TRAY SLIDE DRAWINGS						
TRAY SLIDE OFFERING	#1 (1) 18" x26" or (2) 14"x18"	#4 (Rod Type) (1) 18" x26"	Universal (1) 18" x26" or (2) 14"x18" or (2) 12"x20"	#1 EZ-Change (1) 18" x26" or (2) 14"x18"	Universal EZ-Change (1) 18" x26" or (2) 14"x18" or (2) 12"x20"	HD Universal EZ-Change (1) 18" x26" or (2) 14"x18" or (2) 12"x20"
SPACING CAPACITY DOOR SIZE	2" 28 Pairs Full Door & 13 Half 3" 19 Pairs Full Door & 09 Half 4" 14 Pairs Full Door & 07 Half 5" 11 Pairs Full Door & 05 Half	1 1/2" 38 Pairs Full Door (2 Pair) 1 1/2" 18 Pairs Half Door (1 Pair)	4" 14 Pairs Full Door & 06 Half[1] 4" 14 Pairs Full Door & 07 Half[2] 5" 11 Pairs Full Door & 05 Half 6" 09 Pairs Full Door & 04 Half	2" 26 Pairs Full Door & 12 Half 4" 13 Pairs Full Door & 06 Half	2 1/4" 22 Pairs Full Door & 11 Half 4 1/2" 11 Pairs Full Door & 05 Half	4 1/2" 11 Pairs Full Door & 05 Half 9" 05 Pairs Full Door & 02 Half

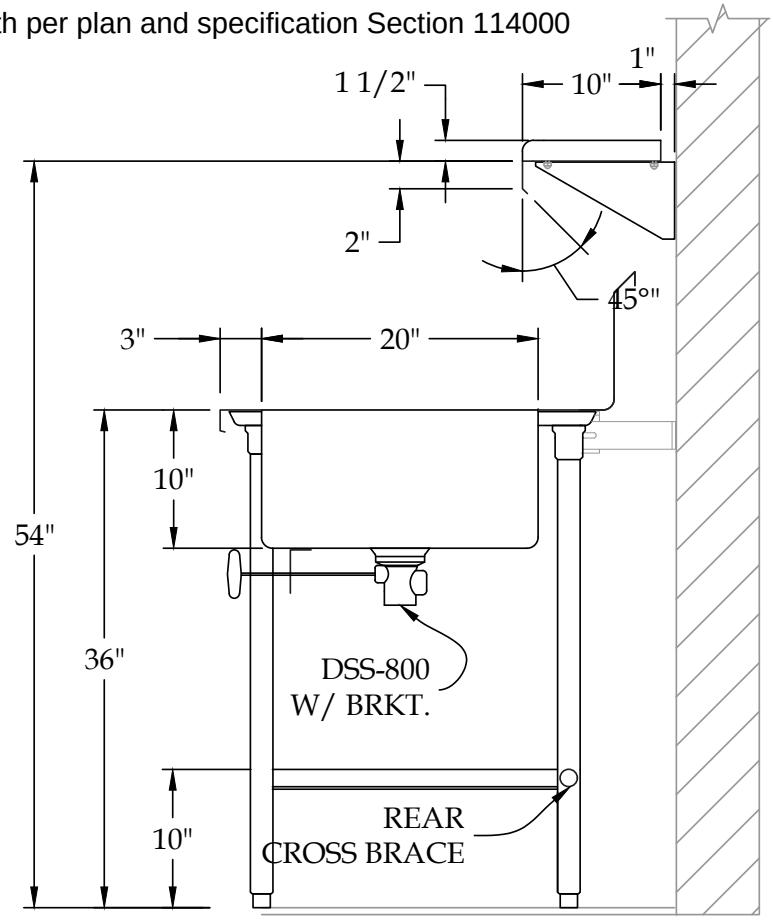
- **Upper Half Height Door[1]**

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Prep Table

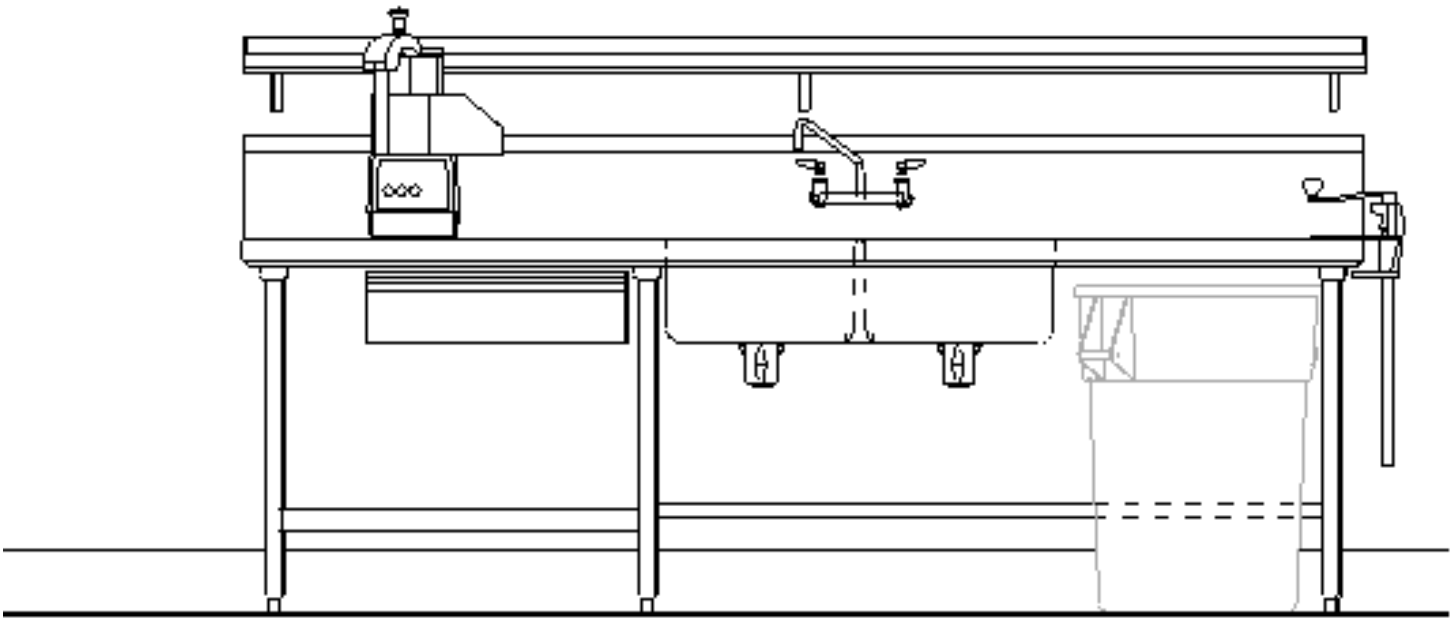
CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction
Size - Length per plan and specification Section 114000



GENERAL NOTES:

1. TOP AND SINKS TO BE 14 GA. S/S (ALL S/S TO BE TYPE 304)
2. LEGS TO BE 1 5/8 DIA. 16 GA. S/S
3. CROSSBRACING TO BE 1 1/4" DIA. 16 GA. S/S
4. UNDERSHELF TO BE 16 GA. S/S
5. FRAME TO BE 1" X 4" X 1" 14 GA. S/S CHANNEL
6. WALL SHELF TO BE 16 GA. S/S
7. BRACKETS FOR WALL SHELF TO BE 14 GA. S/S
8. SOUND DEADENING "TACKY TAPE" APPLIED BETWEEN TOP AND FRAMING
9. BRUSH-ON SOUND DEADENING ON UNDERSIDE OF BASIN



Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 19

Quantity: 1

CUSTOM FABRICATED EQUIPMENT

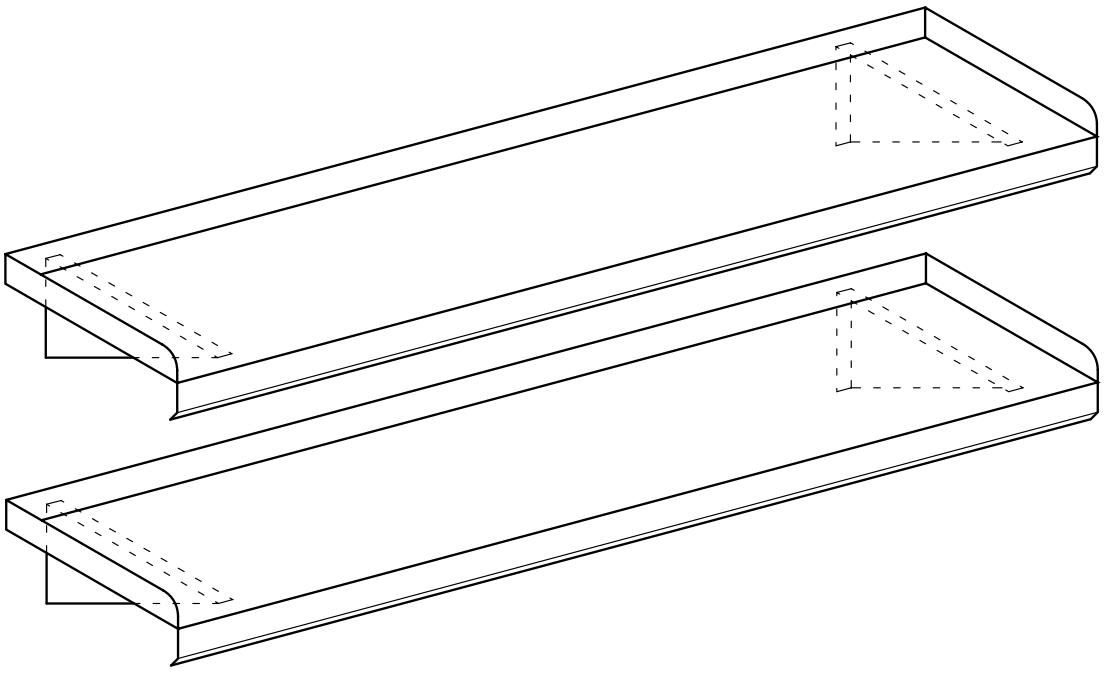
DESCRIPTION: Wall Shelf

CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction

Size - per plan; mounted 54" & 66" above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.



Waste > BRUTE® Utility

2632-56 BRUTE® Container without Lid with "Inedible" Black Imprint, English and Spanish

Durable, heavy-duty containers for a variety of uses.

- All-plastic, professional-grade construction will not rust, chip or peel; resists dents.
- Strong, snap-on lids are available for secure, stable stacking.
- Reinforced rims add strength and durability.
- Built-in handles allow easy, non-slip lifting and anti-jam nesting.
- Double-ribbed base increases stability and dragging capacity.
- Gray, White and Yellow are USDA Meat & Poultry Equipment Group Listed and assist in complying with HACCP guidelines.
- Certified to NSF Standards #2 and #21.
- 2637-88 is California State Fire Marshal (CSFM) approved for fire safety when used with 2632.

AVAILABLE COLORS

Order #	Color	Product UPC/ UCC Code
FG263256 GRAY	GRAY	086876130515 / 10086876130512

Gray
GRAY

EXAMPLE ONLY PROVIDED BY OWNER

SPECIFICATIONS

	U.S.	Metric
Diameter:	22.0 in	55.9 cm
Height:	27.2 in	69.2 cm
Volume Capacity [Nom]:	32 gal	121.1 L
Volume Capacity [Max]:		
Volume Capacity [Min]:		
Carton Height:		
Carton Length:		
Carton Width:		
Length:		
Mass Capacity [Nom]:		
Mass Capacity [Max]:		
Product Weight:		
Quantity Per Pallet:		
Width:		
Certification [BRUTE® Round Containers]:	UV	
Certification [Mobile Collection Equipment]:		
Carton Cube:	18.67 ft30.53 m3	
Ship Weight/Carton:	49.45 lb 22.43 kg	
Pack Quantity:		6
Cartons Per Pallet:		4

ADDITIONAL INFORMATION:

Chemical Resistance Guide: chem.pdf

Products in BRUTE® Round Containers

Item #	Description	Diameter	Height	Volume Capacity
2620-46	BRUTE® Container without Lid with "USDA Condemned" Black Imprint, English and Spanish	19 1/2 in	22.9 in	20 gal
262				

2632-46	BRUTE® Container without Lid with "USDA Condemned" Black Imprint, English and Spanish	22 in	27.2 in	32 gal
2632-56	BRUTE® Container without Lid with "Inedible" Black Imprint, English and Spanish	22 in	27.2 in	32 gal
2632-73	32 Gallon BRUTE® Recycling Container	21.92 in	27.8 in	32 gal
2643-07	44 Gallon BRUTE® Recycling Container	24 in	31.5 in	44 gal
2643-46	BRUTE® Container without Lid with "USDA Condemned" Black Imprint, English and Spanish	24 in	31.5 in	44 gal
2643-56	BRUTE® Container without Lid with "Inedible" Black Imprint, English and Spanish	24 in	31.5 in	44 gal
2643-73	BRUTE® Recycling Container without Lid	24 in	31.5 in	44 gal
2655	BRUTE® Container without Lid	26.38 in	33.2 in	55 gal
1829397	BRUTE® Dome Top for 2632 Containers	22 3/4 in	12.2 in	
2609	Lid for 2610 BRUTE® Container	17.13 in	1.2 in	
2610	BRUTE® Container without Lid	15.63 in	17.1 in	10 gal
2620	BRUTE® Container without Lid	19.38 in	22.9 in	20 gal
2631	32 Gallon BRUTE® Container Lids	22.41 in	1.9 in	
2632	32 Gallon BRUTE® Container	21.92 in	27.8 in	32 gal
2637-88	BRUTE® Dome Top for 2632 Containers	22 11/16 in	12.2 in	
2643-60	BRUTE® 44-Gallon Utility Container	24 in	31.5 in	44 gal
2645-60	BRUTE® Lid	24 1/2 in	2.0 in	
2654	Lid for 2655 BRUTE® Container	29.06 in	2.1 in	
2657-88	BRUTE® Dome Top for 2655 Container	27 1/4 in	14.5 in	
3543	Funnel Top for 2632 Containers	22 3/8 in	5.0 in	

Accessories for BRUTE® Container without Lid with "Inedible" Black Imprint, English and Spanish (2632-56):

No.	Description	Diameter	Height
2631	32 Gallon BRUTE® Container Lids	22.41 in	1.9 in
2637-88	BRUTE® Dome Top for 2632 Containers	22 11/16 in	12.2 in
3543	Funnel Top for 2632 Containers	22 3/8 in	5.0 in
2640	BRUTE® Dolly for 2620, 2632, 2643, 2655 Containers	18 1/4 in	6.6 in
2640-43	BRUTE® Quiet Dolly for 2620, 2632, 2643, 2655 Containers	18 1/4 in	6.6 in
2646	BRUTE® Tandem Dolly for 2620, 2632, 2643, 2655, 3526, 3536 Containers		8.0 in
9W13	Light Duty Container Lid for 9W12, 2632 Containers	22 1/4 in	2.8 in
1829397	BRUTE® Dome Top for 2632 Containers	22 3/4 in	12.2 in

Consumables/Replacement Parts for 2632-56

No.	Fits	Description
5007-88	2632, 2632-46, 2632-56	Linear Low Density Can Liners

Work Smarter.

Rubbermaid Commercial Products, LLC
3124 Valley Avenue, Winchester, VA 22601
www.rcpworksmarter.com

Edlund S-11 NSF Manual Can Openers

For the very highest standard in food safety and sanitation, the S-11 manual can opener has over 17 years of success in foodservice worldwide utilizing proprietary can opening technology. The patented S-11 has successfully opened nearly one billion cans without a single complaint – giving it a stainless reputation. Add in the industry's longest warranty and you've got an opener that's a cut above any other.

- 5-year warranty
- Rustproof stainless steel construction
- Available with screw down base or clamp on model

Crabtree McGrath ASSOCIATES, INC.

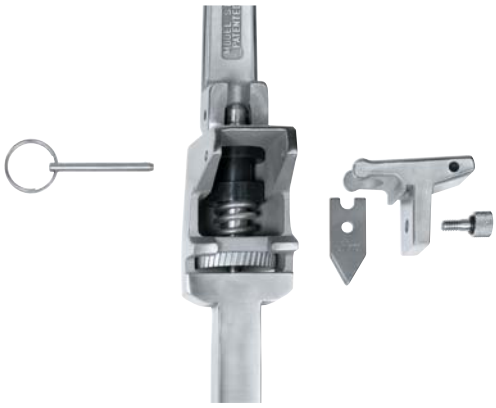
Edgewood Pre-K Academy
Bristol, CT

Item #: 22
Quantity: 1

Open up to a higher standard in food safety.

Dishwasher Safe

Toss in the dishwasher for easy cleaning. The industry's first all-stainless can opener, the S-11 resists rust and stays looking new, no matter how many times it's washed.



Fewer Parts

The S-11's advanced design means fewer parts than most other openers, and its patented Quick Change Mechanism makes knife and gear replacement fast and easy.

Quick Change Mechanism

Makes gear replacement fast and easy.

S-11 with clamp base

Tamper proof S-11 opener with tamper proof base

ST-93 Rustproof can opener cleaning tool

A tamper proof version of the S-11 is now available equipped with locking hardware.

SPECIFICATIONS:

MODEL #	DESCRIPTION	PRODUCT CODE	CASE CUBE FT³/M³	CASE WEIGHT LBS./KGS
S-11	Quick change can opener with standard length bar and new plated base	15000	3.3/0.1	30/13.6
S-11 L	Opener with stainless steel base	15300	3.3/0.1	30/13.6
S-11 E	Opener with stainless steel clamp base	15400	3.3/0.1	31/14.1
S-11 C	Opener with long bar and plated steel base	15020	3.3/0.1	30/13.6
S-11 CL	Opener with long bar and stainless steel base	15320	3.3/0.1	30/13.6
S-11 CE	Opener with long bar and cast stainless steel clamp base	15420	3.3/0.1	32/14.5
S-11 WB	Opener with long bar and cast stainless steel clamp base	15200	3.3/0.1	21/9.5
S-11 TP	Tamper proof opener with tamper proof base	15080	3.3/0.1	30/13.6
ST-93	Rustproof can opener cleaning tool	38500		.5/.2

Note: S-11 Series standard length bar is 16″ (40.6 cm) long. Extra long bar is 22″ (55.9) cm) long.

EDLUND ISO 9001:2000 CERTIFIED

NSF

Edlund *We're in your kitchen.*™

Edlund Company, Inc., 159 Industrial Parkway, Burlington, VT 05401 800-772-2126 www.edlundco.com

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

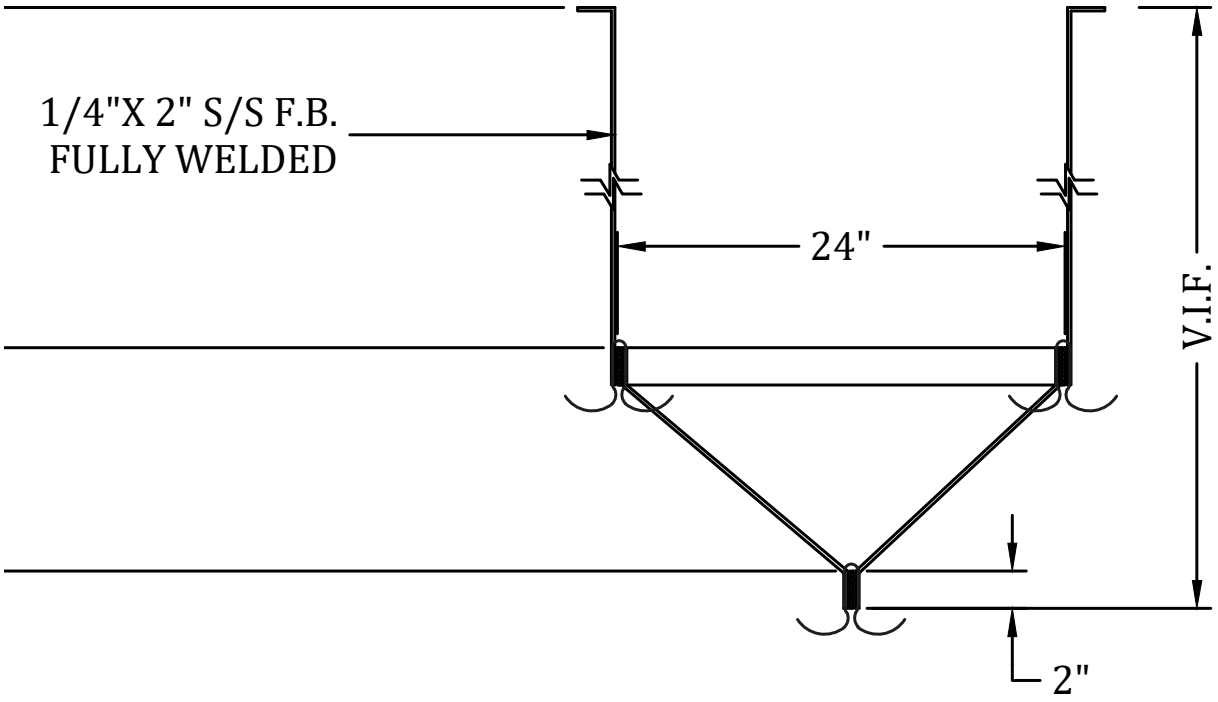
Item #: 22

Quantity: 1

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Ceiling Mounted Pot Rack

CONSTRUCTION FEATURES:



GENERAL NOTES:

1. TOPS AND SINK TO BE 14 GA. S/S
2. LEGS TO BE 1 5/8 DIA. 16 GA. S/S
3. UNDER SHELF / OVER SHELF TO BE 16 GA. S/S
4. CROSS BRACING TO BE 1 1/4" DIA. 16 GA. S/S
5. FRAMES TO BE 1 1/2" X 1 1/2" X 14 GA. S/S ANGLE
6. CEILING HUNG POT RACK TO BR 1/4"X2" S/S F.B. FULLY WELDED
7. SOUND DEADENING "TACKY TAPE" APPLIED BETWEEN TOP AND FRAMING
8. BRUSH-ON SOUND DEADENING ON UNDERSIDE OF BASIN

CLEVELAND

SteamChef™ 6

High Speed Convection Steamer, Automatic Water Fill & Drain, 32,000 BTU Gas Boiler-Free Counter Type Design

Project _____

Item _____

Quantity _____

FCSI Section 11400 _____

Approved _____

Date _____

Steamchef™ Boilerless Convection Steamers

Models

- 22CGT6.1

Short Form Specifications

Shall be a Cleveland SteamChef™ 6, model 22CGT6.1, one compartment 32,000 BTU high efficency atmospheric gas boilerless style heating system. Front access "works in a drawer" style burners for easy servicing. Standard with Compartment Controls and 60-minute electro-mechanical timer. Capacity for six 2.5" (1/1 G/N, 65 mm) full size steam table pans. Includes 1/2" ball valve style automatic drain. Automatic water level controls. Heavy-duty 14 gauge stainless steel cooking compartment door and latch. KleanShield™ clean cavity protection. 4" Adjustable Legs.

ENERGY STAR

Standard Features

- Cooking capacity for up to six 12" x 20" x 2.5" deep steam table pans (1/1 G/N, 65 mm).
- High-speed gas convection steamer with open style 1.0 gallon water reservoir located at the bottom of the cooking compartment for easy access and maintenance.
- Fan forced convection steam with KleanShield™ cooking compartment design. KleanShield™ collects and removes condensate waste from the cooking compartment. This keeps the compartment clean, safe from impurities and easy to maintain. Reduces foaming and avoids contamination of the reservoir water.
- Automatic water level controls, fills when main power switch is turned ON, Low Water and High Water probes inside cooking compartment maintains water levels during cooking, eliminating the need to manually refill and monitor water level during cooking. Large overflow port in rear wall. 193˚ preheat and standby temperature. High Temperature Automatic Safety Shut-off.
- Steam and Fan Shut Off Control when compartment door is opened.
- 32,000 BTU high efficency atmospheric gas boilerless style heating system.
- Front access "works in a drawer" style burners for easy servicing.
- Includes a 60-Minute Electro-Mechanical Timer, LED Indicator Lights for Power On and Reset. Timed and Manual Bypass Switch for constant steaming.
- Exclusive SteamChef™ Automatic Drain Control. Compartment drains when main power is turned OFF via 1/2" ball valve with micro switch circuitry. Simple 1.5" NPT drain connection required with water saving cold water condenser and 3 minute rinse feature.
- Left Hand Door Hinging: Compartment Doors hinged on the left, controls on the right.
- Exclusive, durable 14 gauge stainless steel compartment door and latch withstands abuse and heavy wear. Two piece compartment door with free floating inner door is self adjustable and prevents leaks. Reversible door gasket doubles the life of the gasket.
- Heavy-duty 4" (102mm) Skid Resistant Adjustable Legs with Flanged Feet.
- UL - Gas, UL - Sanitation (NSF Standards).

Options & Accessories

- 34" High Stainless Steel Equipment Stand (UNISTAND34)
- 5 Foot (1524mm) FDA Approved National Hose Thread style water connection kit (garden hose thread), 2 required (NHT60)
- Single Point Water Connection (SPW)
- Electronic Timer

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 26

Quantity: 1

CLEVELAND

Steamchef™ Boilerless Convection Steamers

- Each compartment has capacity for: Six, 12˝ x 20˝ x 212˝ deep Cafeteria Pans.
- Each compartment has capacity for: Twelve, 12˝ x 20˝ x 1˝ deep Cafeteria Pans.
- Each compartment has capacity for: Four, 12˝ x 20˝ x 4˝ deep Cafeteria Pans.

OPERATING CLEARANCES

3" Left, 3" Right and 3" Rear.

SERVICE CLEARANCES

12" on control side. Contact factory for variances to clearances.

CONTROLS

60-minute electro mechanical timer with load compensating feature.

Two function control switch for Timed Cooking and Continuous Steaming.

APPROVALS

UL - Gas, UL - Sanitation (NSF Standards)

Shipping Weights & Dimensions

Weight	Width	Depth	Height
341 lbs	30"	41"	36"

GAS

1/2" Dia. IPS

32,000 BTU's

SUPPLY PRESSURE: NATURAL - 4.00' W.C. minimum, 14.00" W.C. maximum

PROPANE - 11.00" W.C. minimum, 14.00" W.C. maximum

Manufacturer must be notified if unit will be used above 2,000 ft. altitude.

ELECTRICAL

120V, 1 Phase, 4 Amps.

COLD WATER

C-1: Feed water for reservoir, 35 Psi Minimum, 60 Psi Maximum.

C-2: Drain condenser water, 35 Psi Minimum, 60 Psi Maximum.

Two 3/4" NH-F (Garden Thread) connections. Use NSF approved hose.

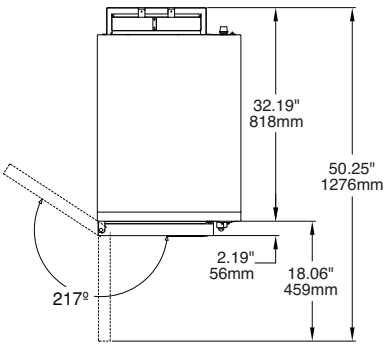
DRAIN CONNECTION

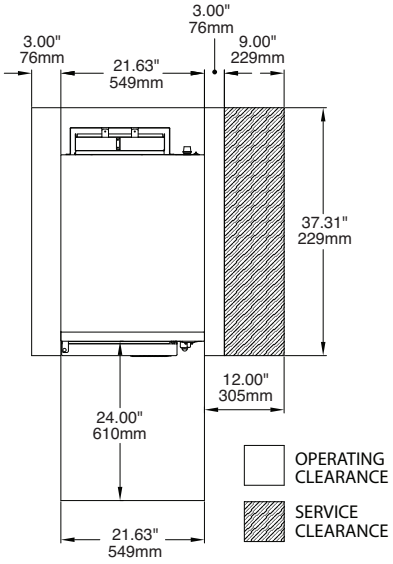
1.5" NPT-M

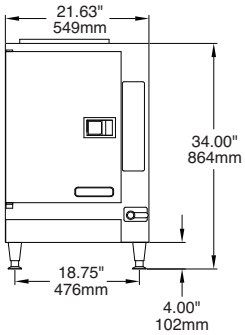
Do not connect other units to this drain.

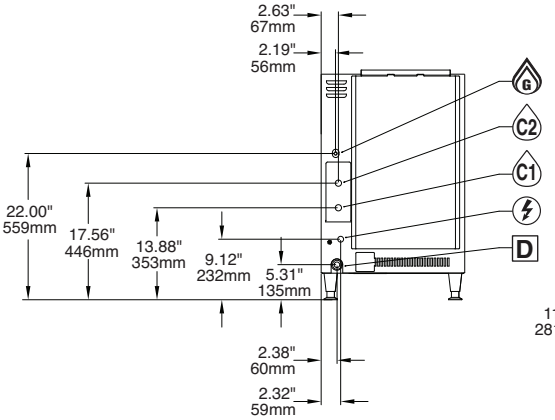
Drain line must be vented.

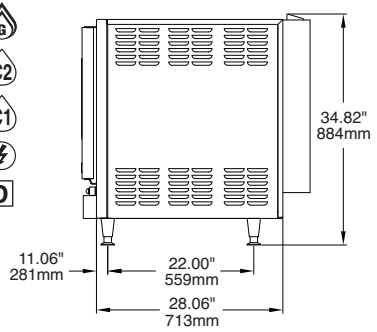
Do not connect the appliance's drain connection to any drain material that cannot sustain 140°.











NOTES:
Cleveland Range reserves right of design improvement or modification, as warranted.
Many regional, state and local codes exist and it is the responsibility of the owner and installer to comply with the codes.
Cleveland Range equipment is built to comply with applicable standards for manufacturers. Included among those approval agencies are U.L/NSF#4 and UL safety.

(NOT TO SCALE)

3M™ Water Filtration Products

SPEC# _____

QUANTITY _____

application: **SCALE CONTROL**

model:

SF165

The 3M™ Water Filtration Products SF165 ScaleGARD™ HT System helps provide consistent Recipe Quality Water™ with reduced sediment and chlorine taste and odor. Operating cost savings from the controlled and metered addition of scale-inhibitors reduces the ability of calcium and magnesium to precipitate as hard scale in both high and low temperature applications, including ice machines, coffee, tea, espresso brewers and steamers*.

- ScaleGARD HT, SF165 combines chlorine taste and odor reduction with sediment reduction and helps protect against the effects of scale formation at flow rates to 3.34 gpm (12.6 lpm) for 35,000 gallons (132,000 liters).

PRODUCT BENEFITS

- Advanced Integrated Membrane Pre-Activated Carbon Technology ("**IMPACT**") filtration media combines a membrane in series with premium activated carbon to provide superior throughput and cartridge life.
- Reduced sediment and chlorine taste and odor for equipment protection and great tasting hot and cold beverages and ice.
- A forced-feed orifice carefully controls and meters the addition of a proprietary scale inhibitor to reduce scale build-up on heating coils.
- Superior scale reduction performance in equipment from ice machines to equipment heating water to temperatures over 200°F (93°C).
- Sanitary Quick Change (SQC) HF65 encapsulated cartridge design allows for fast and easy change-outs with a 1/4 turn while minimizing the possibility of leakage and media contamination.
- 3/4" NPT inlet and outlet ports allow direct or easily adaptable connections to existing plumbing lines.
- FDA CFR-21 and/or NSF compliant materials.
- System includes a pressure gauge, inlet shut-off valve and outlet check valve for simple installation and operation.

PRODUCT SPECIFICATIONS

Model Number	Part Number	Reduction Claims	Micron Rating	Capacity	Service Flow Rate	Application	Replacement Cartridge	Sizing
SF165	56246-01	Sediment, Chlorine Taste and Odor, Scale	3	35,000 gallons (132,000 liters)	3.34 gpm (12.6 lpm)	Normal to Hard Water	HF65 (56134-07) HF8-S (55821-06) Cartpak (56138-11)	Ice: Cubers to 1,200 lbs. (544 kg) Flakers to 2,400 lbs. (1,089 kg) Coffee Brewers and Steamers to demand flow rates of 3.34 gpm (12.6 lpm)

* Periodic acid de-liming of boiler is recommended for steamer applications.

SF165

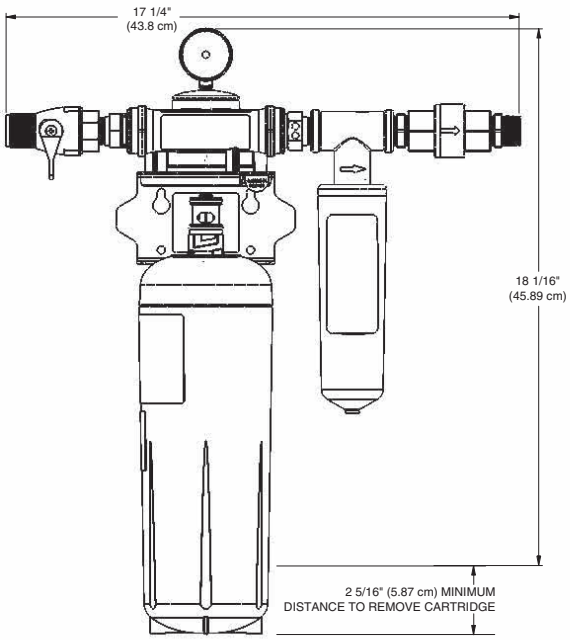
3M™ Water Filtration Products

SPEC# _____

QUANTITY _____

MODEL NUMBER _____

PART NUMBER _____



PHYSICAL SPECIFICATIONS

- System includes a manifold with built-in pressure gauge, inlet water shut-off valve, outlet check valve, mounting bracket, filter cartridge and scale-feeding system.
- Inlet and outlet plumbing connections are 3/4" NPT.
- Filter cartridges are o-ring seal type.
- System maximum operating pressure of 125 psi (862 kPa) and operating temperatures of 100°F (37.8°C).
- Recommended service flow rate is up to 3.34 gpm (12.6 lpm)
- Filter cartridge incorporates carbon block media protected by a pleated pre-filter membrane.
- All wetted parts and media are FDA CFR-21 compliant.
- Cartridges are sanitary in design, requiring no contact with the filter media during cartridge change-out.
- Filter cartridges requires no pre-activation.
- Shipping Weight: 6 lbs. (2.7 kg).
- Operating Weight: 12 lbs. (5.4 kg).

⚠WARNING: To reduce the risk associated with the ingestion of contaminants:

- **Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.**

CUNO Incorporated recommends regularly scheduled maintenance and replacement of the filter cartridge(s) in order for the product to perform as advertised/sold. CUNO shall not be liable for system failures due to improper maintenance.

IMPORTANT: INSTALLATION TIPS

These installation tips are for informational purposes only and are not intended to be used as actual installation instructions. CAUTION: To reduce the risk associated with property damage due to water leakage:

- **Read and follow** Use Instructions before installation and use of this system.
- Installation and use **MUST** comply with all state and local plumbing codes.
- **Protect from freezing,** remove filter cartridge when temperatures are expected to drop below 40°F (4.4°C).
- **Do not install on hot water supply lines.** The maximum operating water temperature of this filter system is 100°F (37.8°C).
- **Do not install** if water pressure exceeds 125 psi (862 kPa). If your water pressure exceeds 80 psi (552 kPa), you must install a pressure limiting valve. Contact a plumbing professional if you are uncertain how to check your water pressure.
- **Do not install** where water hammer conditions may occur. If water hammer conditions exist you must install a water hammer arrester. Contact a plumbing professional if you are uncertain how to check for this condition.
- The disposable filter cartridge **MUST** be replaced every 12 months, at the rated capacity or if a noticeable reduction in flow rate occurs.

LIMITED WARRANTY

CUNO Incorporated warrants this Product (excluding disposable filter cartridge(s)) to be free from defects in material and workmanship for five (5) years from the date of purchase. The disposable filter cartridge is warranted from defects in material and workmanship for a period of one (1) year from the date of purchase. This warranty does not cover failures resulting from abuse, misuse, alteration or damage not caused by CUNO or failure to follow installation and use instructions. If the Product is defective CUNO will replace the Product or refund your Product purchase price. CUNO will not be liable for any indirect, special, incidental, or con-sequential damages arising from the use of this Product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you. To obtain warranty service, mail your request to Warranty Claims, CUNO Incorporated, 400 Research Parkway, Meriden, CT 06450. Proof of purchase (original sales receipt) must accompany the warranty claim, along with a complete description of the Product, model number and alleged defect. This warranty gives you specific legal rights and you may have other rights which vary from state to state, or country to country.

3M

CUNO Incorporated
400 Research Parkway
Meriden, CT 06450 U.S.A.
Toll Free: 1.800.222.7880
Worldwide: 203.237.5541

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Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 27
Quantity: 1

Cutsheet provided for design intent;
Item is existing to be provided by Owner

U.S. Range

U-Series 36" Gas Restaurant Range

Project _____

Item _____

Quantity _____

CSI Section 11400

Approved _____

Date _____

Models

- U36-6R
- U36-6S
- U36-4G12R
- U36-4G12S
- U36-2G24R
- U36-2G24S
- U36-G36R
- U36-G36S

Model U36-6R

Standard Features

- Large 27" (686mm) work top surface
- Stainless steel front and sides
- Stainless steel 5" (127mm) plate rail
- Stainless steel backguard, w/ removable stainless steel shelf
- 12" (305mm) section stamped drip trays w/ dimpled bottom
- 6" (152mm) adj. stainless steel legs
- Large, heavy-duty knobs
- Gas regulator
- Easy to access oven pilot light
- Reinforced chassis corners

Standard on Applicable Models:

- Open storage in lieu of oven, (suffix S)
- Ergonomic split cast-iron top ring grates
- Powerful 32,000 BTU/9.37 kW 2 piece cast-iron geometric open top burner
- 5/8" (15mm) thick steel griddle plate w/ manual hi/lo valve control, 23" (584mm) working depth surface, standard on right, optional on left
- 4-1/4" (108mm) wide grease trough
- 18,000 BTU/5.27 kW cast-iron "H" style griddle burner per 12" (305mm) width of griddle
- Front serviceable griddle plate
- 38,000 BTU/11.13 kW cast-iron "H" style oven burner
- Snap-action modulating oven thermostat low to 500° F
- Nickel-plated oven rack and 3-position removable oven rack guide
- Large oven w/ porcelain ribbed bottom & door, aluminized steel top, sides and back; standard oven fits standard sheet pans in both directions
- Square door design with strong, "keep-cool" oven door handle

Options & Accessories

- Snap-action modulating griddle control 175° to 425° F
- Hot top 12" (305mm) plate in lieu of two open burners, manual valve controlled w/ 18,000 BTU/5.27 kW cast-iron "H" burner standard on left side
- Low-profile 9-3/8" (238mm) backguard stainless steel front and sides
- Additional oven racks
- Four 6" (152mm) levelling swivel casters w/ front locking
- Flanged deck mount legs
- Celsius temperature dials
- Piezo spark ignition for pilots on griddles

Specifications

Gas restaurant series range with large capacity standard oven.

35 7/16" (900mm) wide, 27" (686mm) deep worktop surfaces.

Stainless steel front, sides and 5" wide front rail.

6" (152mm) legs with adjustable feet.

Six powerful 2-piece 32,000 BTU/9.37 kW (Natural Gas), cast-iron open burners set in split cast-iron ergonomic grates.

Griddle or optional hot top with cast-iron "H" style burners, 18,000 BTU/5.27 kW (natural gas), in lieu of open burners.

Front serviceable griddle plate.

Porcelain oven bottom and door line and heavy-duty, "keep-cool" door handle.

Heavy cast-iron "H" oven burner rated 38,000 BTU/11.13 kW (natural gas)

Oven controlled by even bake, fast recovery snap-action modulating oven thermostat.

Available with storage base in lieu of oven.

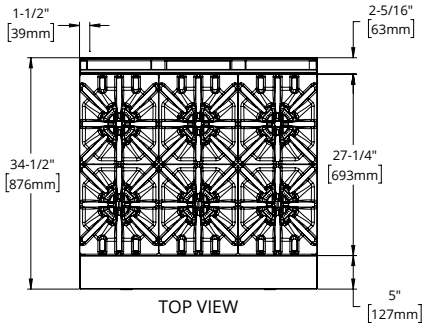
NOTE: Use only Garland certified casters and approved restraining devices.

U-Series 36" Gas Restaurant Range

Garland Commercial Ranges Ltd.
General Inquires 1-905-624-0260
www.garland-group.com

U.S. Range

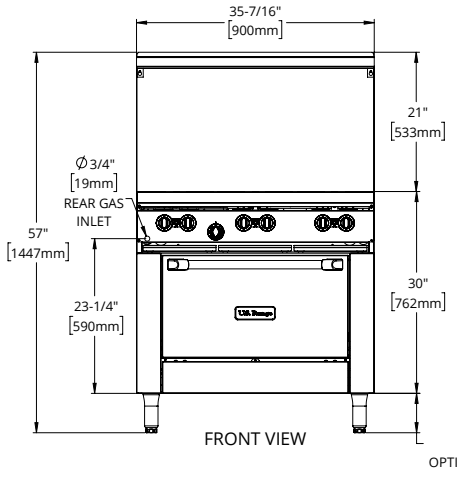
U-Series 36" Gas Restaurant Range

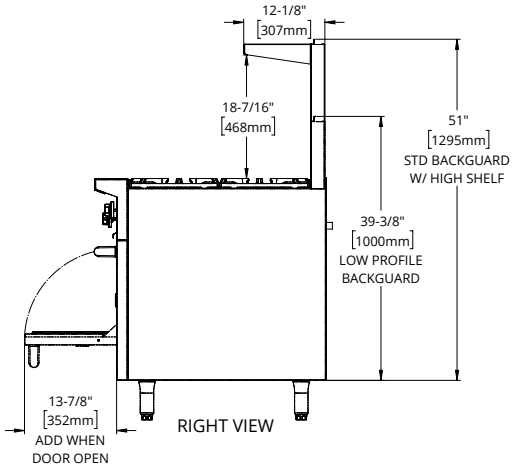


Gas input ratings shown for installations up to 2000 ft., (610m) above sea level. Please specify altitudes over 2000 ft.

This product is not approved for residential use.

Note: Installation clearance reductions are applicable only where local codes permit.





Model Number	Description	Total BTU/Hr Natural	Shipping Information		
			Lbs.	Kg	Cu Ft
U36-6R	Six Open Burners w/26" Oven	230,000	430	195	40
U36-6S	Six Open Burners w/Storage Base	192,000	310	141	40
U36-4G12R	12" Griddle, Four Open Burners w/26" Oven	184,000	460	209	40
U36-4G12S	12" Griddle, Four Open Burners w/Storage Base	146,000	340	154	40
U36-2G24R	24" Griddle, Two Open Burners w/26" Oven	138,000	495	225	40
U36-2G24S	24" Griddle, Two Open Burners w/Storage Base	100,000	375	170	40
U36-G36R	36" Griddle w/26" Oven	92,000	530	240	40
U36-G36S	36" Griddle w/Storage Base	54,000	410	186	40

Width In (mm)	Depth In (mm)	Height w/shelf In (mm)	Oven Interior-in (mm)			Combustible Wall Clearance-In (mm)		Entry Clearances In (mm)		Manifold Operating Pressure	
			Height	Depth	Width	Sides	Rear	Crated	Uncrated	Natural	Propane
35-7/16 (900)	34-1/2 (876)	57 (1448)	13 (330)	26 (660)	26-1/4 (667)	14 (356)	6 (152)	37 (940)	36-1/2 (927)	4.5" WC 11 mbar	10" WC 25 mbar

Burner Ratings (BTU/Hr/kW)			
Gas Type	Open Top	Griddle/Hot Top	Standard Oven
Natural	32,000/9.37	18,000/5.27	38,000/11.13
Propane	26,000/7.61	18,000/5.27	32,000/9.38

Garland/US Range reserves the right to make changes to the design or specifications without prior notice.

Garland Commercial Ranges Ltd.
1177 Kamato Road
General Inquires 1-905-624-0260
USA Sales, Parts and Service 1-800-424-2411
www.garland-group.com

ZEPHAIRE-200-G-ES

Full-Size, Bakery Depth
Gas Convection Oven

Project _____

Item No. _____

Quantity _____

ZEPHAIRE-200-G-ES

Extra depth baking compartment - accepts five 18" x 26" standard full-size baking pans in left-to-right or front-to-back positions.
All data is shown per oven section, unless otherwise indicated.

Refer to operator manual specification chart for listed model names.

EXTERIOR CONSTRUCTION

- Stainless steel front, top, and sides
- Dual pane thermal glass windows encased in stainless steel door frames
- Powder-coated door handle with simultaneous door operation
- Triple-mounted pressure lock door design with turnbuckle assembly
- Ball bearing slide out front control panel for easy servicing
- 1" solid block plus 1" mineral fiber insulation for a total of 2" of insulation

INTERIOR CONSTRUCTION

- Full angle-iron frame
- Double-sided porcelainized baking compartment liner (16 gauge)
- Stainless steel combustion chamber
- Single inlet blower wheel
- Five chrome-plated racks, eleven rack positions with a minimum of 1-5/8" (41mm) spacing
- Interior halogen lights

OPERATION

- Direct fired gas system
- Electronic spark ignition control system
- Removable inshot burners
- Internal pressure regulator
- Manual gas service cut-off switch located on the front of the control panel
- Solid state thermostat with temperature control range of 200°F (93°C) to 500°F (260°C)
- Two speed fan motor
- 3/4 horsepower blower motor with automatic thermal overload protection
- Control area cooling fan

STANDARD FEATURES

- SSI-M - solid state infinite control with separate dials for thermostat and timer
- 25" (635mm) adjustable stainless steel legs (for single units)
- 6" (152mm) adjustable stainless steel legs (for double sections)
- Two year parts and labor warranty*
- Three year limited oven door warranty*

** For all international markets, contact your local distributor.*

NOTE: The company reserves the right to make substitutions of components without prior notice

OPTIONS AND ACCESSORIES

(AT ADDITIONAL CHARGE)

- **Legs, casters & stands**
  - ☐ 6" (152mm) seismic legs
  - ☑ 6" (152mm) casters
  - ☐ 4" (102mm) low profile casters (double only)
  - ☐ 25" (635mm) stainless steel stand w/rack guides
  - ☐ 29" (737mm) stainless steel, fully welded open stand with pan supports
- **Gas hose w/quick disconnect restraining device**
  - ☑ 48" (1219mm) hose
  - ☐ 36" (914mm) hose
- ☑ SSD - Solid state digital control with LED display, Cook & Hold and Pulse Plus®
- ☐ Extra oven racks
- ☐ Stainless steel solid back panel
- ☑ Gas manifold (for double sections)
- ☐ Prison package (includes security control panel and stainless steel back)
- ☐ Flue connector
- ☐ Direct vent

OPTIONS AND ACCESSORIES

(AT NO ADDITIONAL CHARGE)

- ☐ Solid stainless steel doors

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

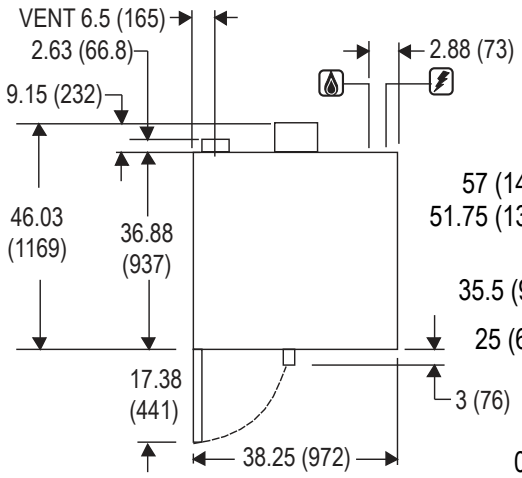
Item #: 29
Quantity: 1

BLODGETT

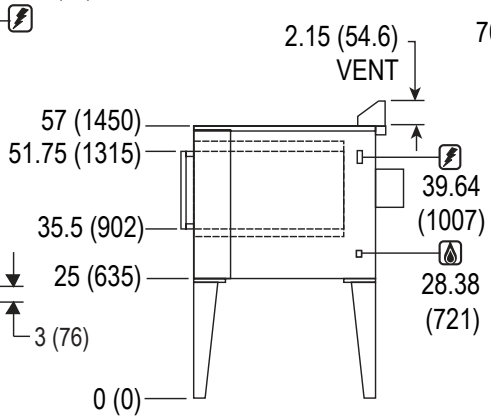
ZEPHAIRE-200-G-ES

APPROVAL/STAMP

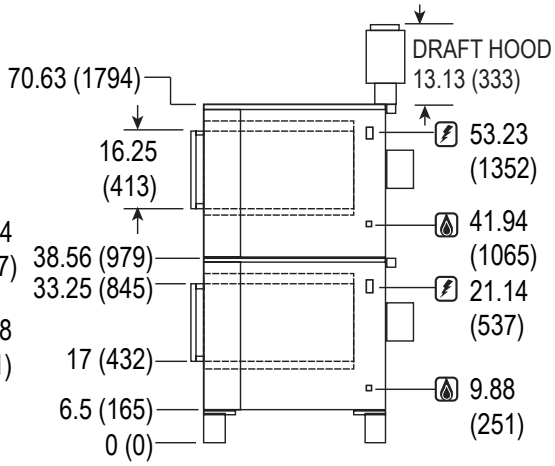
DIMENSIONS ARE IN INCHES (MM)



TOP VIEW



SINGLE



DOUBLE

SHORT FORM SPECIFICATIONS Provide Blodgett full-size, bakery depth convection oven model Zephaire-200-G-ES, (single/double) compartment. Each compartment shall have porcelainized/stainless steel liner and shall accept five 18" x 26" standard full-size bake pans in left-to-right or front-to-back positions. Stainless steel front, top and sides. Doors shall be (solid stainless steel/dual pane thermal glass windows) with single powder-coated handle and simultaneous operation. Unit shall be gas heated with electronic spark ignition and shall cook by means of a direct fired system with a gas shutoff switch on the front of the control panel. Air in baking chamber distributed by single inlet blower wheel powered by a two-speed, 3/4 HP motor with thermal overload protection. Each chamber shall be fitted with two halogen lamps and five chrome-plated removable racks. Control panel shall be recessed with Cook/Cool Down mode selector, solid state infinite control with separate dials for thermostat and timer. Provide two years parts and labor and three year door warranty. Provide options and accessories as indicated.

DIMENSIONS

Floor space	38-1/4" (972mm) W x 36-7/8" (937mm) D
Interior	29" (737mm) W x 20" (508mm) H x 28-1/4" (718mm) D
If oven is on casters	
Single	Add 4-1/2" (114mm) to height
Double	Height dimensions remain the same
Double Low Profile	Subtract 2.5" (64mm) from all height dimensions

PRODUCT CLEARANCE

From combustible and non-combustible construction

0" (0 mm)

MINIMUM ENTRY CLEARANCE

Uncrated	32-1/16" (814mm)
Crated	37-1/2" (953mm)

SHIPPING INFORMATION

Approx. Weight

Single	590 lbs. (268 kg)
Double	1095 lbs. (497 kg)

Crate Size

37-1/2" (952mm) x 43-1/2" (1105mm) x 51-3/4" (1315mm)
(2 crates required for double)

GAS SUPPLY (per section)

3/4" NPT

Inlet Pressure

Natural Gas	7.0" W.C. min. – 10.5" W.C. max.
Propane	11.0" W.C. min. – 13.0" W.C. max.

Manifold Pressure

Natural Gas	3.5" W.C.
Propane	10" W.C.

MAXIMUM INPUT

50,000 BTU/hr (14.6 Kw) per oven section

POWER SUPPLY

115 VAC, 1 phase, 8 Amp, 60 Hz., 2-wire with ground, 3/4 H.P., 2 speed motor, 1120 and 1680 RPM

6' (1.8m) electric cord set furnished on 115 VAC ovens only

230V CE model, 1 phase, 3 Amp, 50 Hz., 2-wire with ground, 1/2 H.P., 2 speed motor, 1440/930

EXAMPLE ONLY
See shop drawing

The ND-2 Series is a Type I, Wall Canopy Hood for use over 450°F, 600°F and 700°F cooking surface temperatures. The aerodynamic design includes a mechanical baffle and performance enhancing lip for exceptional capture and containment.

Fully Integrated Package

CaptiveAire sells this hood as a stand-alone appliance to be integrated into a kitchen ventilation application, or provided as part of a FULLY INTEGRATED PACKAGE designed by CaptiveAire and pre-engineered for optimum performance. The package consists of the hood, an integral utility cabinet, factory pre-wired electrical controls, and a listed fire suppression system. Other options include a listed exhaust fan, a listed make-up air unit and listed, factory-built ductwork.

Advantages

- **Exhaust Flow Rates:** Superior exhaust flow rates. A 4' Hood can operate at 150 CFM/ft or 600 total CFM. Available in single or back-to-back configurations.
- **ETL Listed:** ETL Listed for use over 450°F, 600°F and 700°F cooking surface temperatures, which provides flexibility in designing kitchen ventilation systems. ETL Listed to US and Canadian safety standards, ETL Sanitation Listed and built in accordance with NFPA 96.
- **Capture and Containment:** Insulated, double-wall rigid front has aerodynamic design that reduces radiant heat into kitchen, prevents condensation and provides exceptional capture and containment of cooking vapors. This is accomplished with the signature ND-2 "mechanical baffle" on the front of the hood's capture area and the "C-shaped" design of the hood's capture area. Mechanical baffle provides a built-in wiring chase for optimal positioning of electrical controls and outlets on the front face of the hood without penetrating capture area or requiring external chase way.
- **Convenient Design:** Factory pre-wired lighting to illuminate the cooking surface is accessible from the bottom of the hood. Fitted with UL Listed, pre-wired, incandescent light fixtures and tempered glass globes to hold up to a standard 100 watt bulb. Pre-punched hanging angles on each end of hood and additional set provided for hoods longer than 12'.
- **Construction:** Polished stainless steel on the interior and exterior of the front enhance aesthetics. Fully welded and polished front corners. Fabricated from
- **Grease Extraction:** All hoods come standard with stainless steel baffle filters and a deep grease trough which allows for easy cleaning. Captrate Combo® and Captrate Solo® filters are optional. Grease drain system with removable 1/2 pint cup for easy cleaning. Standard filter stops eliminate gaps between filters.
- **Reduced Lead Times and Shipping Costs:** Produced on a high volume assembly line at one of six manufacturing facilities to reduce lead times and shipping costs.
- **Clearance to Combustibles:** Standard built in 3" rear standoff to meet NFPA 96 requirements, when installed in a wall application.
- **Controls:** Hoods can be equipped with modular utility cabinets and end standoffs. Optional listed light and fan control switches flush mounted and pre-wired through electrical chase way.
- **Optional Make-Up Air:** Make-up air can be supplied through optional front and/or side plenums (ND-2 Series with PSP or AC-PSP Accessory).
- **Optional Self Cleaning Technology:** The Self Cleaning Hood option adds a spray bar that extends the full length of the hood immediately behind the filters. The system cleans grease from the plenum and portion of the duct with the daily hot water spray cycle.
- **Optional CORE Protection:** The CORE Fire Protection System is an automatic, pre-engineered fire suppression system which is ETL listed to UL Standard

Type 430 stainless steel with option of Type 304 available.

- **Channels:** Hood comes standard with structural channels on top and wrapper channels on the bottom.
- **Reduced Weight:** Rigid single wall end panels reduce weight.

300. The CORE Protection System is designed to provide primary coverage for ventilating equipment including hoods, ducts, plenum and filters.

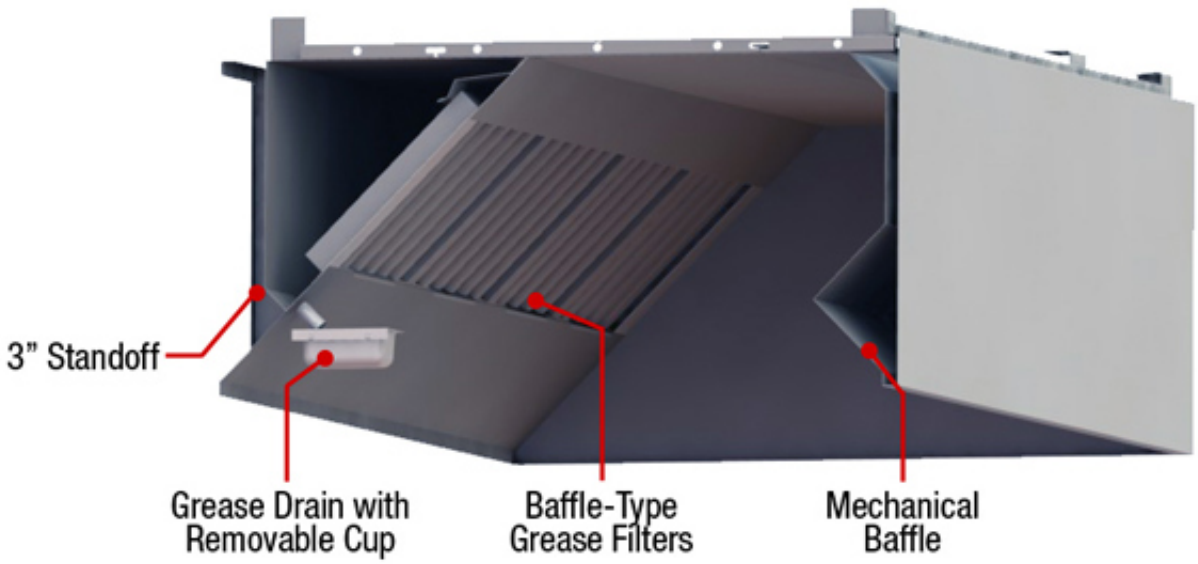
- **Optional Heat Recovery Coil:** This option is available for hoods with CORE Protection. A listed coil accessory can be added to the hood plenum to recover heat from the exhaust stream. Warm air in the exhaust stream passes over the coil and heats the cold water in the coil, acting as a preheater on the hot water supply line for the restaurant or facility.

Performance

AVG. COOKING SURFACE TEMP. (°F)	CONFIGURATION	MIN. EXHAUST CFM / FT.
450°F	Single Wall Hood 2 Wall Hoods Back-to-Back	150 300
600°F	Single Wall Hood 2 Wall Hoods Back-to-Back	200 400
700°F	Single Wall Hood 2 Wall Hoods Back-to-Back	250 500

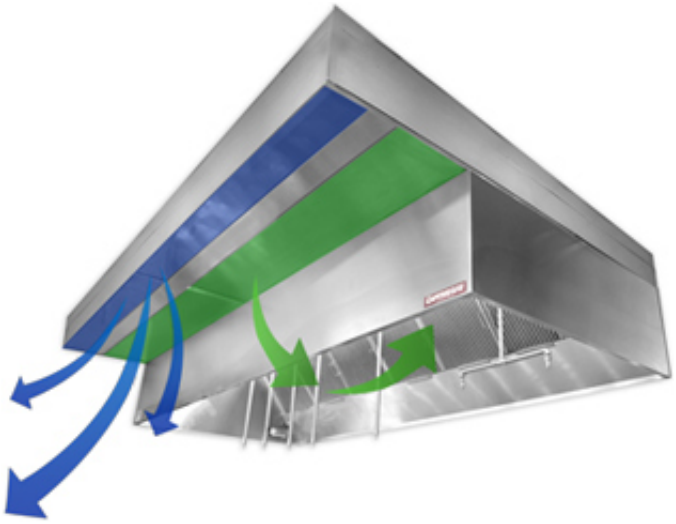
Recommended Duct Sizing: Exhaust - Based on 1500 FPM

Features



Optional Make-Up Air Accessory

- Provides the required make-up air for your kitchen system
- Delivers AC where it is needed most
- AC air does not interfere with the hoods capture and containment
- Convenient termination for AC ductwork in kitchen
- Stainless steel construction to match the ventilation hoods
- Insulated to prevent condensation
- Make-up plenum is located nearest the hood; the air conditioned plenum is away from the hood
- Make-up air stream and the air conditioned air stream are not permitted to mix until leaving the dual plenum
- Perforated, stainless steel diffuser plates provide even air distribution
- Optional LED Lights



Make-up air is evenly distributed along the length of the hood through the first plenum and **conditioned air** is delivered through the outer plenum.

Optional Vertical End Panels (VEP & WVEP)

Energy Savings

- VEPs provide improved capture and containment by directing effluents into the hood and blocking cross drafts
- Allows exhaust CFM reductions up to 18%
- Equivalent reduction in makeup air
- This saves on fan energy, make-up air heating/cooling energy
- Possible equipment downsizing, reduces upfront cost

Design

- Stainless steel matches hood finish
- Gas chase allows appliance lines to run between wall and end panel
- Double-wall insulated construction
- Adjustable feet
- May allow for a reduction in required side overhangs

Safety

- Encloses the hood area, preventing flames or embers from escaping
- Ensures equipment is not accidentally moved outside of the hood area
- Stainless steel construction for sanitation and longevity
- Legs raise bottom of panel off floor to allow room for cleaning

- Hemmed edges prevent sharp surfaces
- Wide Vertical End Panels (WVEPs) provide an increased level of heat containment and fire protection, especially useful for high radiant load appliances such as solid fuel

Options

Utility Cabinet: Listed for integral side mount and fabricated of same material as hood. Cabinet can house listed fire suppression system and listed, pre-wired electrical controls.

Front Perforated Supply Plenum: Provides low velocity make-up air for the kitchen and is discharged in front of the hood. Perforated diffuser plates allow for even air distribution and supply riser includes a volume damper for easy balancing. Side Perforated Supply Plenums can be added to optimize the air flow if necessary.

Enclosure Panels: Constructed of stainless steel. Sized to extend from hood top to ceiling, enclosing pipe and hanging parts.

End Panels: Should be used to maximize hood performance and eliminate the effects of cross drafts in kitchen. units constructed of stainless steel and sized according to hood width and cooking equipment. Exposed edges hemmed for safety and rigidity.

Roof Top Package: Combination ETL Listed exhaust/supply air unit with factory prewired and mounted motors, trunkline and curb vented on exhaust side.

Separate Exhaust and/or Make-Up Air Fans: ETL Listed single exhaust fans and supply-air fans and curbs available.

Fire Suppression System: UL 300 fire suppression system.

Lighting: Recessed Incandescent, Recessed Fluorescent, Compact Fluorescent, Recessed LED, Halogen

CUSTOM FABRICATED EQUIPMENT

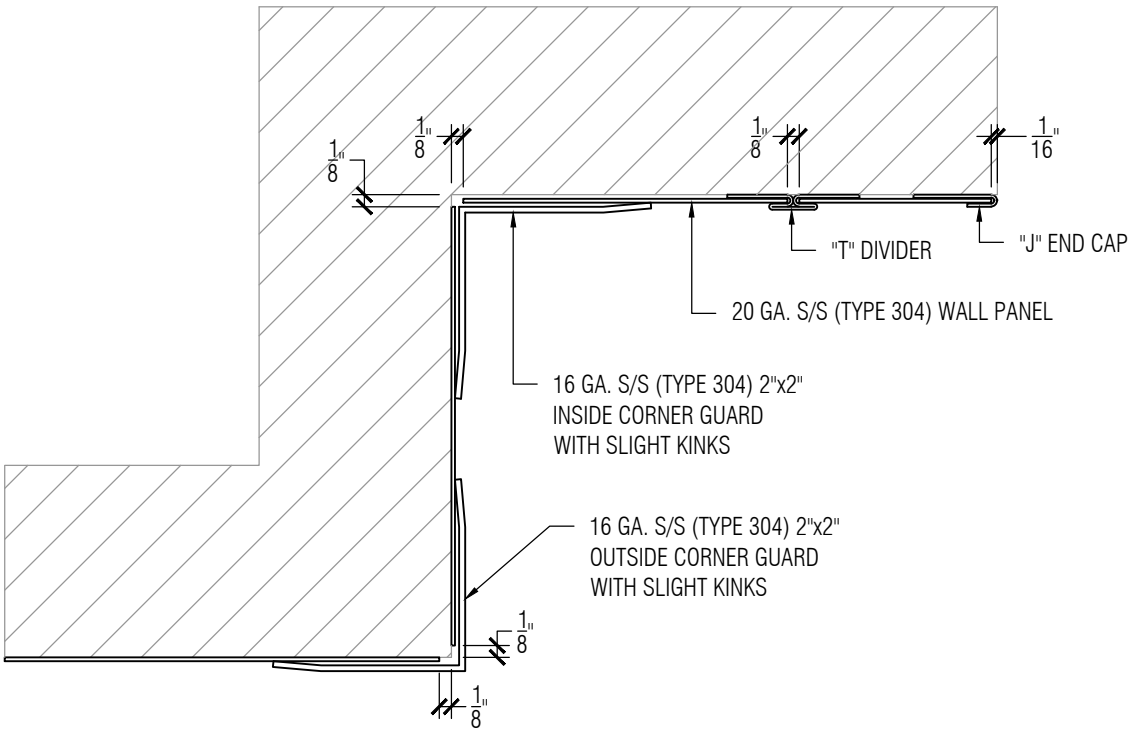
DESCRIPTION: Stainless Steel Wall Flashing

CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction

Size - Length per plan and specification Section 114000

Construction - Wall shall be clad with 20 gauge type 304 stainless steel cut in largest sheets to minimize joints and secured to wall with adhesive and no exposed fasteners. Provide Component Hardware J64-1450 “T” dividers at joints and J63-1451 cap strips at ends



TYPICAL WALL PANEL DETAILS
(VERTICAL CONNECTIONS)

SCALE: 6"=1'-0"

R-102 Restaurant Fire Suppression Systems

Features

- Low pH Agent
- Proven Design
- Reliable Gas Cartridge Operation
- Aesthetically Appealing
- UL Listed – Meets Requirements of UL 300
- ULC Listed – Meets Requirements of ULC/ORD-C1254.6
- CE Marked

Application

The ANSUL® R-102 Restaurant Fire Suppression System is an automatic, pre-engineered, fire suppression system designed to protect areas associated with ventilating equipment including hoods, ducts, plenums, and filters. The system also protects auxiliary grease extraction equipment and cooking equipment such as fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite, or gas-radiant char-broilers; and woks.

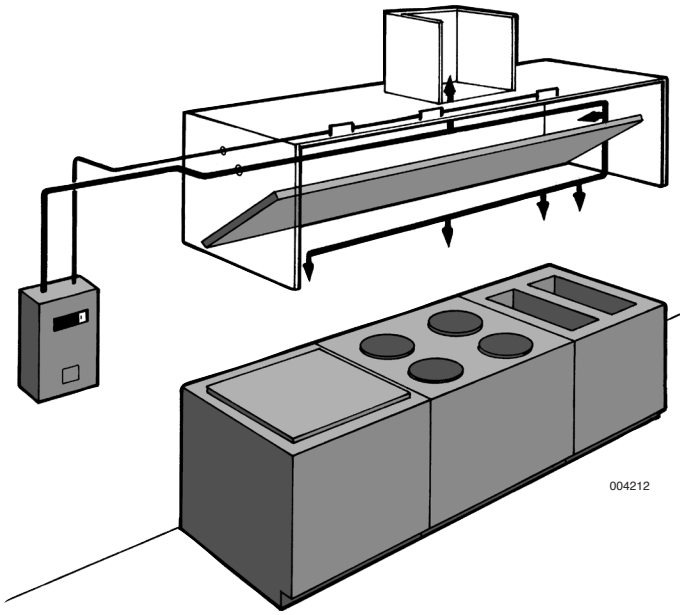
The system is ideally suitable for use in restaurants, hospitals, nursing homes, hotels, schools, airports, and other similar facilities.

Use of the R-102 system is limited to indoor applications or locations that provide weatherproof protection within tested temperature limitations. The regulated release and tank assemblies must be mounted in an area where the air temperature will not fall below 32 °F (0 °C) or exceed 130 °F (54 °C). The system must be designed and installed within the guidelines of the UL/ULC Listed Design, Installation, Recharge, and Maintenance Manual.

System Description

The restaurant fire suppression system is a pre-engineered, wet chemical, cartridge-operated, regulated pressure type with a fixed nozzle agent distribution network. It is listed with Underwriters Laboratories (UL/ULC).

004215


004212

The system is capable of automatic detection and actuation as well as remote manual actuation. Additional equipment is available for building fire alarm panel connections, electrical shutdown and/or interface, and mechanical or electrical gas line shut-off applications.

The detection portion of the fire suppression system allows for automatic detection by means of specific temperature-rated alloy type fusible links, which separate when the temperature exceeds the rating of the link, allowing the regulated release to actuate.

A system owner's guide is available containing basic information pertaining to system operation and maintenance. A detailed technical manual, including system description, design, installation, recharge and resetting instructions, and maintenance procedures, is available to qualified individuals.

The system is installed and serviced by authorized distributors that are trained by the manufacturer.

The basic system consists of an AUTOMAN regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles with blow-off caps, detectors, cartridges, agent, and pulley elbows are supplied in separate packages in the quantities needed for fire suppression system arrangements.

Additional equipment includes a remote manual pull station(s), mechanical and electrical gas valves, and electrical switches for automatic equipment and gas line shut-off. Accessories can be added such as alarms, warning lights, etc., to installations where required.

Additional tanks and corresponding equipment can be used in multiple arrangements to allow for larger hazard coverage. Each tank is limited to a listed maximum amount of flow numbers.

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 32
Quantity: 1

009368

Component Description

Wet Chemical Agent – The extinguishing agent is a mixture of organic salts designed for rapid flame knockdown and foam securement of grease related fires. It is available in plastic containers with instructions for wet chemical handling and usage.

Agent Tank – The agent tank is installed in a stainless steel enclosure or wall bracket. The tank is constructed of stainless steel.

Tanks are available in two sizes: 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tanks have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 660 psi (45.5 bar).

The tank includes an adaptor/tube assembly. The adaptor assembly includes a chrome-plated steel adaptor with a 1/4 in. NPT female gas inlet, a 3/8 in. NPT female agent outlet, and a stainless steel agent pick-up tube. The adaptor also contains a bursting disc seal which helps to prevent the siphoning of agent up the pipe during extreme temperature variations.

Regulated Release Mechanism – The regulated release mechanism is a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one, two, or three agent tanks depending on the capacity of the gas cartridge used. It contains a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It has automatic actuation capabilities by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism contains a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure contains knock-outs for 1/2 in. conduit. The cover contains an opening for a visual status indicator.

It is compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch and manual reset relay, it is compatible with electric gas line or appliance shut-off devices.

Regulated Actuator Assembly – When more than two agent tanks (or three 3.0 gallon (11.4 L) tanks in certain applications) are required, the regulated actuator is available to provide expellant gas for additional tanks. It is connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. It contains a regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It has automatic actuation capabilities using pressure from the regulated release mechanism cartridge.

The regulated actuator assembly contains an actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure contains knockouts to per

Discharge Nozzles – Each discharge nozzle is tested and listed with the R-102 system for a specific application. Nozzle tips are stamped with the flow number designation (1/2, 1, 2, or 3). Each nozzle must have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

Agent Distribution Hose – Kitchen appliances manufactured with or resting on casters (wheels/rollers) may include an agent distribution hose as a component of the suppression system. This allows the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. The hose assembly includes a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose.

Flexible Conduit – Flexible conduit allows for quicker installations and the convenience of being able to route the cable over, under and around obstacles. Flexible conduit can be used as a substitute for standard EMT conduit or can be used with EMT conduit. Flexible conduit can be used only with the Molded Remote Manual Pull Station and with the Mechanical Gas Valve Assembly.

Pull Station Assembly – The remote manual pull station is made out of a molded red composite material. The red color makes the pull station more readily identifiable as the manual means for fire suppression system operation. The pull station is compatible with the ANSUL Flexible Conduit and with 1/2 in. EMT conduit.

Approvals

- UL/ULC Listed
- CE Marked
- New York City Department of Buildings — COA #5663
- LPCB
- TFRI
- Marine Equipment Directive (MED)
- DNV
- ABS
- Lloyd's Register
- Meets requirements of NFPA 96 (Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment)
- Meets requirements of NFPA 17A (Standard on Wet Chemical Extinguishing Systems)

Ordering Information

Order all system components through your local authorized ANSUL Distributor.

Specifications

An ANSUL R-102 Fire Suppression System shall be furnished. The system shall be capable of protecting all hazard areas associated with cooking equipment.

1.0 GENERAL

1.1 References

1.1.1 Underwriters Laboratories (UL)
- 1.1.1.1 UL Standard 1254
- 1.1.1.2 UL Standard 300

1.1.2 Underwriters Laboratories of Canada (ULC)
- 1.1.2.1 ULC/ORD-C 1254.6

1.1.3 National Fire Protection Association (NFPA)
- 1.1.3.1 NFPA 96
- 1.1.3.2 NFPA 17A

1.2 Submittals

1.2.1 Submit two sets of manufacturer's data sheets

1.2.2 Submit two sets of piping design drawings

1.3 System Description

1.3.1 The system shall be an automatic fire suppression system using a wet chemical agent for cooking grease related fires.

1.3.2 The system shall be capable of suppressing fires in the areas associated with ventilating equipment including hoods, ducts, plenums, and filters as well as auxiliary grease extraction equipment. The system shall also be capable of suppressing fires in areas associated with cooking equipment, such as fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers; and woks.

1.3.3 The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories (UL/ULC).

1.3.4 The system shall be installed and serviced by personnel trained by the manufacturer.

1.3.5 The system shall be capable of protecting cooking appliances by utilizing either dedicated appliance protection and/or overlapping appliance protection.

1.4 Quality Control

1.4.1 Manufacturer: The R-102 Restaurant Fire Suppression System shall be manufactured by a company with at least forty years experience in the design and manufacture of pre-engineered fire suppression systems. The manufacturer shall be ISO 9001 registered.

1.4.2 Certificates: The wet agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.7 – 8.7, designed for flame knockdown and foam securement of grease-related fires.

1.5 Warranty, Disclaimer, and Limitations

1.5.1 The pre-engineered restaurant fire suppression system components shall be warranted for five years from date of delivery against defects in workmanship and material.

1.6 Delivery

1.6.1 Packaging: All system components shall be securely packaged to provide protection during shipment.

1.7 Environmental Conditions

1.7.1 The R-102 system shall be capable of operating within a temperature range of 32 °F to 130 °F (0 °C to 54 °C).

2.0 PRODUCT

2.1 Manufacturer

2.1.1 Johnson Controls, One Stanton Street, Marinette, Wisconsin 54143-2542, Telephone (715) 735-7411.

2.2 Components

2.2.1 The basic system shall consist of an AUTOMAN regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station, mechanical and electrical gas valves, and electrical switches for automatic equipment and gas line shut-off, and building fire alarm control panel interface.

2.2.2 Wet Chemical Agent: The extinguishing agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.7 – 8.7, designed for flame knockdown and foam securement of grease related fires.

2.2.3 Agent Tank: The agent tank shall be installed in a stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. Tanks shall be available in two sizes; 1.5 gallon (5.7 L) and 3.0 gal (11.4 L).The tank shall have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 660 psi (45.5 bar). The tank shall include an adaptor/tube assembly containing a burst disc union.

Specifications (Continued)

2.2.4 Regulated Release Mechanism: The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks depending on the capacity of the gas cartridge used or three 3.0 gallon (11.4 L) agent storage tanks in certain applications. It shall contain a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar).

It shall have the following actuation capabilities: automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator.

It shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch(es), it shall be compatible with electric gas line or appliance shut-off devices, or connections to a building fire alarm control panel.

2.2.5 Regulated Actuator Assembly: When more than two agent tanks or three agent tanks in certain applications are required, the regulated actuator shall be available to provide expellant gas for additional tanks. It shall be connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. The regulator shall be deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar).The regulated actuator assembly shall contain an actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts to permit installation of the expellant gas line.

2.2.6 Discharge Nozzles: Each discharge nozzle shall be tested and listed with the R-102 system for a specific application. Nozzles tips shall be stamped with the flow number designation (1/2, 1, 2, or 3). Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

2.2.7 Distribution Piping: Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel conforming to ASTM A120, A53, or A106.

2.2.8 Detectors: The detectors shall be the fusible link style designed to separate at a specific temperature, or shall be electric thermal detectors designed to operate at a factory preset temperature.

2.2.9 Cartridges: The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.

2.2.10 Agent Distribution Hose: An optional agent distribution hose shall be available for kitchen appliances manufactured with or resting on casters (wheels/rollers). This shall allow the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. Hose assembly shall include a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose.

2.2.11 Flexible Conduit: The manufacturer supplying the Restaurant Fire Suppression System shall offer flexible conduit as an option to rigid EMT conduit for the installation of pull stations and/or mechanical gas valves. The flexible conduit shall be UL Listed and include all approved components for proper installation.

2.2.12 Pull Station Assembly: The Fire Suppression System shall include a remote pull station for manual system actuation. The pull station shall be designed to include a built-in guard to protect the pull handle. The pull station shall also be designed with a pull handle to allow for three finger operation and shall be red in color for quick visibility.

3.0 IMPLEMENTATION

3.1 Installation

3.1.1 The R-102 fire suppression system shall be designed, installed, inspected, maintained, and recharged in accordance with the manufacturer's listed instruction manual.

3.2 Training

3.2.1 Training shall be conducted by representatives of the manufacturer.

Note: The converted values in this document are for dimensional reference only and do not reflect an actual measurement.

ANSUL, R-102, and the product names listed in this material are marks and/or registered marks. Unauthorized use is strictly prohibited.

COMMERCIAL VENTILATION TECHNOLOGIES

MODERN UPDATE TO HOOD & FAN CONTROLS

NEW TECHNOLOGY

CUSTOMIZABLE INTERFACE

CaptiveAire continues to bring innovation to the market - introducing new state of the art controls for hood operation and lighting.

USER FRIENDLY CONTROLS

- Digital Interface with LCD Screen
- Customizable Options via Microprocessor Control

REDUCES INSTALLATION COST & COMPLEXITY

- Plug & Play Wiring between Digital Interface & Equipment
- Reduces High Voltage Wiring between Devices

REMOTE MONITORING

- Equipment Status & Alarms Displayed
- Improves Service & Reliability

INTEGRATED FEATURES

- Automatic Fan Activation
- Room Temperature Sensor
- Reset for Gas Valves
- Monitoring of Fan Overload Trips

CAT-5 Cable Wiring

Learn more about our ventilation products at
www.captiveaire.com

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 33
Quantity: 1

Thermostatic Control Option Specification

TYPICAL SPECIFICATIONS

Model: **Thermostatic Control Option**

Description: The Electrical Package, typically FP, is designed to thermostatically activate the exhaust fans for an exhaust hood whenever elevated temperatures are sensed in the exhaust system. This option will meet the requirements of IMC 507.2.1.1 by providing a thermostat(s) mounted in the duct or hood riser to sense increased exhaust temperatures. Controls shall be listed by ETL (UL 508A). The control enclosure shall be NEMA 1 rated and listed for installation inside of the exhaust hood utility cabinet. The control enclosure may be constructed of stainless steel or painted steel.

Temperature probes(s) located in the duct riser shall be constructed of Stainless Steel.

Once the duct temperature reaches the activation point, the exhaust fans will be activated. The controls also provide hysteresis to prevent cycling of the fans after the cooking appliances have been turned off and the heat in the exhaust system is reduced. The hysteresis is factory set 2 degrees and will keep the exhaust running until the temperature falls 2 degrees below the activation set point. A hysteresis timer also exists to keep the fans running for at least 30 min after being activated by the temperature rise.

The activation and hysteresis settings may be field adjusted on the board LCD interface located inside the control enclosure to meet application needs. The panel is factory configured to shut down supply fans, turn on the exhaust fans and turn off the hood lights in a fire condition.

Product Data

A/AN Series
A/CP Series
A/3K Series
A/1.8K Series
A/20K Series

Temperature Sensor

Product Description

The A/10K-AN (Type III), A/10K-CP (Type II), A/3K, A/1.8K and A/20K Series temperature sensors are thermistor type sensors. These sensors provide a predictable output over a specified temperature range to meet each manufacturer's required input values. (See www.workaci.com for complete curve chart specifications)

These units are offered in Room, Room with Setpoint, Room with Override, Room with Setpoint and Override, and Room w/ Setpoint, Override, and RJ11 Jack, Stainless Steel Duct and Duct without Box, Immersion, Stainless Plate, Raw, Bendable Copper and Stainless Steel Rigid Averaging, Strap-On, Bullet Probe, Button Sensor, and Outdoor Air Configurations.

All ACI Room sensors may be ordered with an optional setpoint (see chart on the following page), override, or with a 4 pin RJ11 or 6 pin RJ12 communication jack with terminal blocks, for remote programming. These units are also available with a 1/8" RS232 Stereo Jack.

These products are covered by ACI's Five (5) Year Limited Warranty, which is located in the front of ACI'S SENSORS & TRANSMITTERS CATALOG or can be found on ACI's web site, which is: www.workaci.com.

Product Specifications

Sensor Output	10K Ohms @ 77°F (25°C) Type III 10K Ohms @ 77°F (25°C) Type II 3K Ohms @ 77°F (25°C) 1.8K Ohms @ 77°F (25°C) 20K Ohms @ 77°F (25°C)
Accuracy (0 to 70°C)	+/-0.2°C (+/-0.36°F)
Stability	+/- 0.13°C (0.23°F)
Operating Temperature Range	-40 to 302°F (-40 to 150°C)
Operating Humidity	0 to 90% RH non-condensing
Interchangeability	+/- 0.2°C (+/-0.36°F)
Power Dissipation Constant	3 mW / °C
For sensors with Display option, see **LCD Series** Temp display cut sheet	

Thermistor

Attributes

- **Offer high accuracy and interchangeability over a wide temperature range.**
- **Higher resistance output relative to Platinum RTD's**
- **Non-polarity sensitive**
- **CE approval for thermistors except for:**
  - **Averaging sensors**
  - **LCDs and units that have leads longer than 3 meters**

Applications

- **OEM / Industrial**
- **Light Industrial**
- **DDC Systems**

Made in the USA

Automation Components, Inc.
2305 Pleasant View Rd.
Middleton, WI 53562
PH: (608) 831-2585
FAX: (608) 831-7407

Ordering Information

AN=type III
CP=type II

A/AN, A/CP, A/3K, A/1.8K or A/20K (choose configuration below)

-Configuration		-Length	-Enclosure Type	-Optional Plenum Wire
D	(Duct)	**4", 8", 12", 18"**	**PB, GD, BB, 4X, EH**	
DO	(Duct without Box)	**4", 8", 12", 18"**	**- - - - - - -**	**6'CL2P, 10'CL2P, 20'CL2P**
I	(Immersion w/ well)	**2.5", 4", 6"**	**PB*, GD, BB, 4X, EH**	
INW	(Immersion no well)	**2.5", 4", 6"**	**PB*, GD, BB, 4X, EH**	
A	(Copper Averaging)	**8', 12', 24'**	**PB, GD, BB, 4X, EH**	
FA	(Flex. Cable Averaging)	**8', 12', 24'**	**PB, GD, BB, 4X, EH**	
RA	(Rigid Averaging)	**18", 24", 36"**	**PB, GD, BB, 4X, EH**	
S	(Strap)	**- - - - - - -**	**PB*, GD, 4X**	
O	(Outdoor Air)	**- - - - - - -**	**EH, BB, 4X**	

SP	(Stainless Plate)
W	(Raw Potted Sensor)
W-6'	(Raw w/ 6' Leads)
BP	(Bullet Probe)
BP-20'Z	(BP w/20' of Zip Wire)
BBS	(Brass Button Sensor)
SBS	(Stainless Button Sensor)
PBS	(Plastic Button Sensor)

Enclosure Key
PB = Plastic Box
GD = Galvanized Box
BB = NEMA 3R
4X = NEMA 4X
EH = Euro Housing (Weather tight)

*Please note that the -**PB** (Plastic Box) is rated to 140° F and may not be suitable for high temperature applications.

Example: A/AN-D-4"-PB

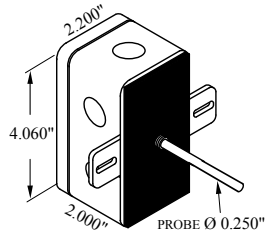
Room configurations:

Configuration -[ ]	Communication Jack -[ ]	Pot Value* -[ ]	Setpoint Indicator* -[ ]	Pot Action* -[ ]	Display -[ ]
R - Room	**RJ4** (4 Pin RJ11)	400 5K	Cool | Warm	DA (Direct)	( ) No Display (Standard)
RS* - Room w/ Setpoint	**RJ6** (6 Pin RJ12)	1K 8.5K	55 to 85	RA (Reverse)	(DF) LCD Display (Degrees F)
RO - Room w/ Override	**RS232** (Stereo Jack)	2K 10K	10 to 30 °C		(DC) LCD Display (Degrees C)
RSO* -Room w/ Setpoint & Override		3K 20K 100K			

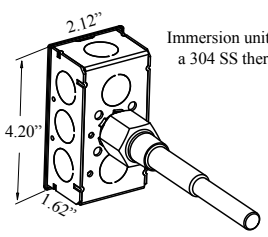
Room Sensors with* require setpoint specs (value, indication, and action) and are not listed on your packing slip or invoice.

Example: A/CP-RSO- 10K- Cool/Warm-DA

Standard enclosure defaults:

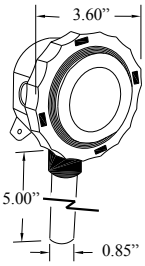


Duct
(Plastic Box)

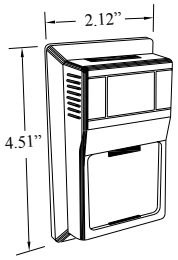


Immersion units include a 304 SS thermowell

Immersion
(Galvanized Box)



Outdoor Air
(Euro Enclosure)



Room

2305 Pleasant View Road Middleton, WI 53562

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

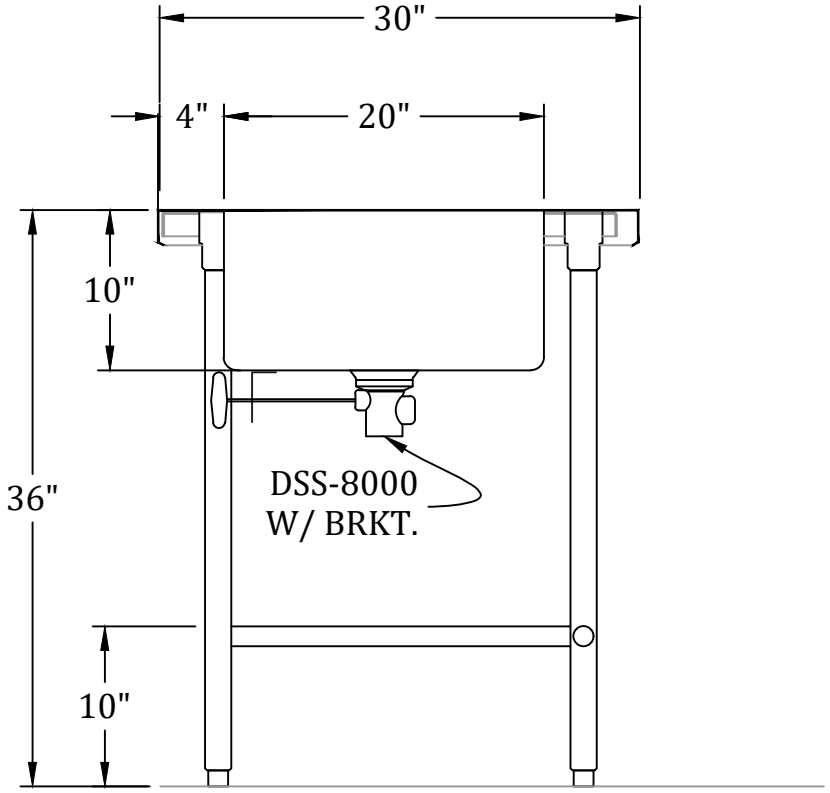
Item #: 35
Quantity: 1

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Cook's Table

CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction
Size - Length per plan and specification Section 114000



SECTION VIEW

SCALE 1"=1'-0"

GENERAL NOTES:

1. TOPS AND SINK TO BE 14 GA. S/S
2. LEGS TO BE 1 5/8 DIA. 16 GA. S/S
3. UNDER SHELF TO BE 16 GA. S/S
4. CROSS BRACING TO BE 1 1/4" DIA. 16 GA. S/S
5. FRAMES TO BE 1 1/2" X 1 1/2" X 14 GA. S/S ANGLE
6. SOUND DEADENING "TACKY TAPE" APPLIED BETWEEN TOP AND FRAMING
7. BRUSH-ON SOUND DEADENING ON UNDERSIDE OF BASIN

METRO®

We put space to work.®

Item # _____

Cutsheet provided for design intent;
Item is existing to be provided by Owner

Job _____

Metro C5® 3 Series Insulation Armour® Heated Holding and Proofing Cabinets

- **Insulation Armour™:** Patented insulation technology retains heat, saves energy, and provides a cool-to-touch exterior. Durable polymer construction is dent, impact, and stain resistant. Molded-in hand holds create vertical handles for mobile applications.
- **Colors:** Insulation Armour is available in Red, Blue, or Gray standard and in other colors on a promotional basis or upon request.
- **Control:** Three modules are available: Holding, Moisture, and Combination Proof and Hold. All feature an easy-to-read digital thermometer, recessed control dials, a master on/off switch, and power indicator lights. All are removable without tools for easy cleaning, and allow for future upgrades without replacing entire cabinet body.
- **Performance:** All modules provide fast heat-up and recovery through a thermostatically controlled, forced convection system.
- **Sizes:** C5 3 Series cabinets are available in Full Height (71", 1803mm), 3/4 Height (59", 1499mm), 1/2 Height (44", 1118mm), and Under Counter (32", 813mm) sizes.
- **Doors:** Solid insulated aluminum or clear polycarbonate doors are available. Full Height cabinets can be configured with full length or dutch-style doors. Clear doors provide visibility of the contents of the cabinet without the heat loss associated with opening the door.
- **Capacity:** Three slide styles provide maximum holding capacity. Choose from Universal Wire, Lip Load, or Fixed Wire.
- **Reliability:** Reliability and durability are designed into every C5. High-quality components provide a long life of worry free use.
- **Power Options:** Choose between standard high wattage or low wattage models based on the specific needs of the application.

Red Full Height Dutch Clear Doors

Red Under Counter Solid Door

Blue 1/2 Height Full Solid Door

Gray 3/4 Height Full Clear Door

Blue Full Height Full Clear Door

3 Series Removable Control Modules

- **Holding Module:** Hot holding at higher temperatures without moisture control.*
- **Moisture Module:** Hot holding and proofing. Moisture control at any temperature.
- **Combination Module:** Hot holding and proofing. Moisture control at lower temperatures (proofing).

* Note: Cabinets with holding module do not include the water pan.

All Metro Catalog Sheets are available on our website: **www.metro.com**

Metro Heated cabinets are for hot food holding applications only.

METRO®
InterMetro Industries Corporation
North Washington Street, Wilkes-Barre, PA 18705

L03-270
Printed in U.S.A. Rev. 11/18

Information and specifications are subject to

Crabtree McGrath ASSOCIATES, INC.

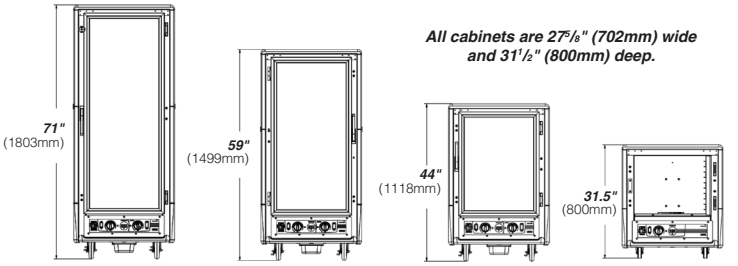
Edgewood Pre-K Academy
Bristol, CT

Item #: 38
Quantity: 1

Job _____

C5® 3 Series Insulation Armour® Heated Holding and Proofing Cabinets

We put space to work.



- **Cabinet Material:** .063" (1.8mm) aluminum, natural interior with .125" (3.2mm) aluminum chassis.
- **Insulation Armour™:** High Density Polyethylene (HDPE).
- **Casters:** Four casters with 5" (127mm) donut neoprene wheel, double ball bearing swivel, ball bearing axel, nickel plated, two with brake. 3" rubber casters on Under Counter models.
- **Solid Doors:** Fully insulated with 1" (25.4mm) fiberglass, double panel .063" (1.8mm) aluminum, brushed exterior, natural interior.
- **Clear Doors:** Extruded aluminum powder coated frame with .090" (2.3mm) polycarbonate window.
- **Hinges:** Field reversible, double hinged, 180° swing, with long-life nylon bearings.
- **Gaskets:** High temperature, door mounted, Santoprene gaskets.
- **Latches:** Polymer high-strength magnetic pull latch with lever-action release.
- **Hand Holds:** Molded into the Insulation Armour™ on all four corners.
- **Universal Slides:** ¼" (6.4mm) dia. nickel-chrome electroplated wire, adjustable on 1½" (38mm) increments.
- **Lip Load Slides:** 1½"x1½"x.063" (38x38x1.8mm) extruded aluminum channel slides, 1½" (38mm) fixed spacing.
- **Fixed Wire Slides:** ¼" (6.4mm) dia. nickel-chrome electroplated wire, welded on 3" (76mm) spacing. Not offered in Under Counter models.
- **Drip Trough:** Smooth polymer drip trough with catch pan.
- **Holding Modules:** Removable without tools, digital thermometer, recessed control dials, master on/off switch, "Power On" light, water pan, ball bearing blower forced air system, 7½' cord, UL, CUL, and NSF Listed.

Electrical and Performance:

- **Holding Module:** 80°F (27°C) to 200°F (93°C) operating temperature range. Available:120V 2000W & 1440W, 220-240V 1681-2000W.
- **Moisture Module:** 80°F (27°C) to 200°F (93°C) operating temperature range. 35% RH at 160°F (71°C), 95% RH at 95°F (35°C). Available: 120V 2000W, 220-240V 1681-2000W.
- **Combination Module:** 80°F (27°C) to 200°F (93°C) operating temperature range. 95% RH at 95°F (35°C). Available:120V 2000W & 1440W, 220-240V 1681-2000W.
- **Clearance Requirements:** 18" (46cm) away from any cooking equipment. AVOID contact with surfaces that exceed 200°F (90°C). Minimum clearance from enclosures is 1½" (38mm) on sides and back, ½" (12.7mm) on top.

Cabinet Height
9 = Full Height
7 = 3/4 Height
5 = 1/2 Height
3 = Under Counter

Module Type
C = Combination
M = Moisture
H = Heated Holding

Slide Type
U = Universal Wire
4 = Fixed Wire
L = Lip Load Aluminum

C5 3 9 - C DC - U

NEMA 5-20P
For Standard Wattage Cabinets (120V, 16A, 60Hz, 2000W)

Door Style
FS = Full Length Solid
FC = Full Length Clear
DS = Dutch Solid *
DC = Dutch Clear *

*Please note: Dutch doors only available on full-height models. Cabinets ordered without a color designation default to Red.

Low Watt Model Number Description

C5 3 9 - C L DC - U

NEMA 5-15P
Add "L" for Lower Wattage Combination or Holding Module Cabinets (120V, 12A, 60Hz, 1440W)

Note: Under Counter holding and combination module cabinets are only available in low watt. Under Counter moisture module cabinets are available in 120V, 2000W.

Export Model Number Description

C5 3 9 - C X DC - U

NEMA 6-15P
Add "X" for Export Cabinets (220-240V, 7.6-8.3A, 50/60Hz, 1681-2000W)

Blue or Gray Model Description

C5 3 9 - C DC - U - BU

** Cabinets ordered without a color designation default to Red.

Please Note: Under Counter Cabinets are only offered in Red & Gray.

Color **
No Suffix = Red
BU = Blue
GY = Gray

Models with Accessories or Options

C5 3 9 - CDC - U A
C5 3 9 - CDC - U - BU A

An "A" suffix indicates that accessories need to be factory assembled to the cabinet. Order accessories separately.

Please Note: Under Counter Combination & Holding modules are not available in 120V, 2000W.

Options/Accessories*

- Small Item Shelf (C5-SHELF-S)
- Stainless Steel Legs (C5-SSLEGS)
- Universal Slide Pair, Chrome (C5-USLIDEPR-C)
- 6" Casters (C5-6CASTER)
- Rear Rigid Casters (C5-5RDGCSTR)
- Travel Latch (C5-TRVL)
- Flush Door Latch (C5-LATCHFLUSH-1)*
- Straight Plug, 20 Amp, 120V (C5-STRPLG-20)
- Straight Plug, 15 Amp, 120V (C5-STRPLG-15)
- Factory Left-Hand Hinging (DD3768)
- Stainless Steel Universal Slides (please call)

**Please note: (2) handles required for dutch door models*

Pan Capacity	Universal Wire Slide					Lip Load Slide	Fixed Wire Slide	
Cabinet Size	Slide Pairs Provided	Sheet Pans 18"x26"	Steam Pans 12"x20"x2.5" GN 1/1 65mm	Steam Pans 12"x20"x4" GN 1/1 100mm	Steam Pans 12"x20"x6" GN 1/1 150mm	Sheet Pans 18"x26"	Sheet Pans 18"x26"	Steam Pans 12"x20"x2.5" GN 1/1 65mm
Full Height	18	18	34	24	14	35	18	34
Full Height Dutch	18	17	32	22	12	34	17	32
3/4 Height	14	14	26	16	10	27	14	26
1/2 Height	9	8	16	10	6	17	8	16
Under Counter	5	5	10	6	4	10	N/A	N/A

an Ali Group Company

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 38
Quantity: 1

Model - WS-SSEXT SYSTEM
Part # - 310071

Job Name:_____

Item#:_____ **Qty:**_____

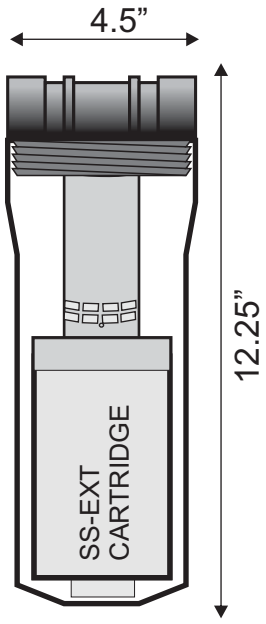
System Summary

WashSpec Warewash Systems utilize HydroBlend™, an NSF approved drinking water additive that effectively controls mineral scale deposits in dish machines and booster heaters. Unlike standard treatments, HydroBlend is specifically formulated to work in high-temperature / high-hardness environments providing unparalleled mineral scale prevention and corrosion control.

Benefits and Features

* Mineral scale build up responsible for increased maintenance is reduced.
* Scale control product is visible ensuring replacement when needed.
* Energy efficiency and machine life are increased while reducing costly service calls.
* Scale-free booster allows for proper rinse temperatures.
* SS-EXT ScaleStick NSF Certified Under Standard 42 Component.
* Provides corrosion control in aggressive water applications.

System Specifications	
Rated Service Flow	2-3 gpm / 7-11 lpm)
Rated Capacity	40,000 gallon (estimated)
Connection Size	3/4” Female Thread
Operating Pressure	30-125 psi / (2-8.6 bar)
Operating Inlet Temperature	35°-160°F / (2°-71°C)
Dimensions	5”x12”x5” (WxHxD)
Shipping Weight	5 lbs
Replacement Cartridges	(1) SS-EXT Cartridge #310076



Installation Summary

* Place the unit prior to the booster heater on high temp machines.
* Do not over tighten fittings onto the connections.
* Ensure the unit is mounted vertically as pictured.
* Allow 3” clearance under the unit for filter replacement.
* Place where the unit is accessible for filter replacement.

For commercial use only.

Warranty

Systems have a limited 1 year warranty against defects in material or workmanship.

NSF COMPONENT

This SS-EXT cartridge is Tested and Certified By NSF International against NSF/ANSI Standard 42 for material requirements only.

WaterSpec Filter Systems
158 Railroad Street
Canton, GA 30114

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 39
Quantity: 1

BEVERAGE-AIR

Project: _____	AIA#
Item: _____	
Location: _____	SIS#
Approved: _____	

SMF SCHOOL MILK COOLERS

SMF58HC Single Access, Forced-Air
Hydrocarbon Series

MODELS:
SMF58HC-1-S
SMF58HC-1-W

SMF58HC-1-S

SMF58HC-1-W

OPTIONS & ACCESSORIES

- ☐ Wrap around & corner bumpers
- ☐ Graphics

3 Year Parts/Labor Warranty
Additional 2 Year Compressor Warranty

CABINET CONSTRUCTION

- SS units: Stainless steel exterior and interior
- White units: White coated steel exterior and interior is galvanized steel with stainless steel floor for maximum milk crate support.
- Stainless steel units: Stainless steel exterior and interior.
- Lids, doors, adjustable hinges and door latches made from stainless steel are standard on all units
- Full electronic Control
- Heavy-duty epoxy coated steel wire floor racks standard
- Floor drain is centrally located for easy cleaning, connecting to drain hose with hose adapter
- Flexible compression door gaskets ensure tight seal
- Self-latching doors/lids with safety bumpers
- Exterior thermometer
- Cylinder lock
- 7” Heavy-duty plate casters (2 with locks)
- Maintains continuous milk temperature between 36º - 38ºF

REFRIGERATION SYSTEM

- Refrigeration system uses R290 refrigerant to comply with all environmental concerns
- Automatic, non-electric defrost
- Epoxy coated evaporator coil

SMF58HC Single Access, Forced Air : School Milk Series

3779 Champion Blvd., Winston-Salem, NC 27105
1-888-845-9800 Fax: 1-336-245-6453

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 40
Quantity: 1

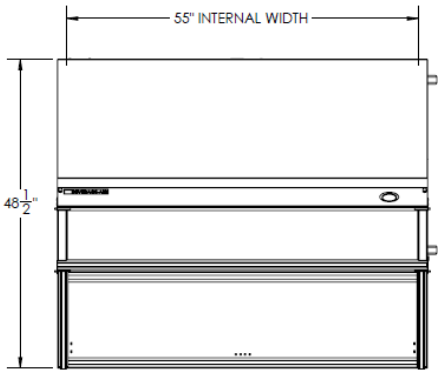
BEVERAGE-AIR

SMF Series—School Milk Cooler

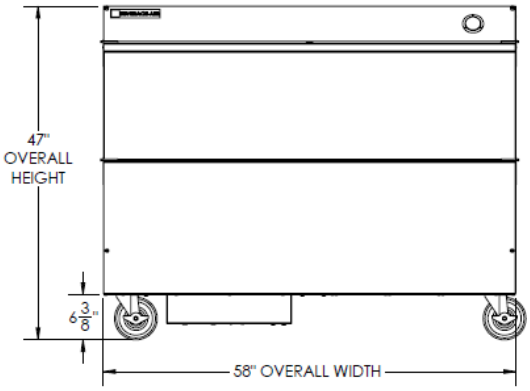
Models: SMF58HC-1-S, SMF58HC-1-W

MODEL	SMF58HC-1-S	SMF58HC-1-W
EXTERNAL DIMENSIONAL DATA		
Width Overall	58”	58”
Depth Overall	33 5/8”	33 5/8”
Height Overall with Casters	47”	47”
Number of Lids/Doors	Single Access	Single Access
INTERNAL DIMENSIONAL DATA		
NET Capacity (cubic ft.)	24	24
Internal Width Overall (in)	55”	55”
Internal Depth Overall (in)	30”	30”
Internal Height Overall (in)	24 7/8”	24 7/8”
CASE CAPACITIES		
13” x 13” x 11”	16	16
19” x 13” x 11”	10	10
ELECTRICAL DATA		
Full Load Amperes 115/60/1	3.3	3.3
REFRIGERATION DATA		
Horsepower	1/3	1/3
Capacity BTU	2052	2052
WEIGHT DATA		
Gross Weight (Crated lbs)	458 lbs	458 lbs
Height - Crated	54”	54”
Width - Crated	63”	63”
Depth - Crated	38”	38”

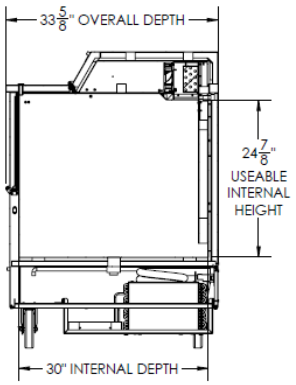
Model Views



Plan View



Elevation View



Side View

ELECTRICAL CONNECTION

115/60/1
NEMA-5-15P

Units pre-wired at factory and include 8’ long cord and plug set.

Cutsheet provided for design intent;
Item is existing to be provided by Owner

Shelleysteel™
by Delfield

SH & SH-NU

Mobile Heated Serving Counters

Project _____

Item _____

Quantity _____

CSI Section 11400

Approved _____

Date _____

SH & SH-NU: Mobile Heated Serving Counters

Models

- SH-2 2 food wells with heated understorage
- SH-3 3 food wells with heated understorage
- SH-4 4 food wells with heated understorage
- SH-5 5 food wells with heated understorage
- SH-6 6 food wells with heated understorage
- SH-2-NU 2 food wells without understorage
- SH-3-NU 3 food wells without understorage
- SH-4-NU 4 food wells without understorage
- SH-5-NU 5 food wells without understorage
- SH-6-NU 6 food wells without understorage

SH-3-NU
Shown with optional tray slide and glass front counter protector

Standard Features

- Stainless steel top and exterior body
- 14-gauge galvanized bottom
- SH units have heated under storage compartment, provided with removable pan slides. SH-NU units have enclosed bases with no under storage
- Cord and plug are supplied standard
- Top has two to six electrically heated, recessed die stamped stainless steel hot food warmers. Each warmer accommodates one 12" x 20" x 6" pan
- All exterior panels reinforced with overlapping corners, welded in place
- All body cutouts reinforced with 14-gauge channel supports
- All units are standard on 5" diameter polyurethane swivel casters for easy cleaning
- Easy access panel for quick replacement of heating element
- One year parts and 90 day labor standard warranty

Options & Accessories

- Counter heights available from 28" to 36" in 2" increments
- Tray slides and work shelves
- Line-up interlock device
- Food shields
- Decal packages
- Stainless steel overshelf
- Incandescent light fixtures*
- Radiant or bullet style heat lamps*
- 120V/60Hz/1Ph, 10 amp convenience outlet with breaker*
- Drains from food wells, plumbed to common valve
- Dry insert with door(s)
- Stainless steel trim strips
- Stainless steel end drop shelf
- Adjustable height casters
- 6" (15cm) high adjustable stainless steel legs in lieu of casters
- Laminate exterior panels
- Energy saving power well (ESP)*

* *Inclusion of these options will alter the electrical specifications of unit*

Specifications

Exterior body is constructed of 18-gauge stainless steel side panels and 14-gauge galvanized bottom. All exterior side panels are reinforced with overlapping corners and are welded in place. All body cutouts are reinforced with 14-gauge galvanized channel supports.

Exterior top is constructed of 14-gauge stainless steel, welded, ground and polished into one integral unit. Top is fabricated with square exterior corners. Top has two to six electrically heated, recessed, die-stamped stainless steel hot food warmers. Each warmer accommodates one 12.75" x 20.75" x 6" (32cm x 53cm x 15cm) pan.

Heated food warmers are constructed of die-stamped stainless steel. Heated food warmers are insulated on bottom. Each heated food warmer is individually equipped with a heated element rated at 1000 watts for 120 volt or 208/230 volt, 60 hertz, single phase service and wired to an adjustable control switch and indicator light in the control panel. Heated food warmers are interwired to a maximum 10' (3m) long cord with a grounded plug for 120 volt or 208/230 volt, 60 hertz, single phase electrical service.

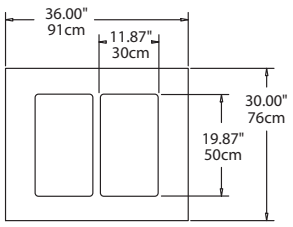
Casters: Unit is mounted on 5" (13cm) diameter swivel casters with non-marking polyurethane tires and plate brakes. Overall height of caster assembly is 6.00" (15cm).

The following applies to SH Series only.
All SH models have a one door heated compartment. Compartment is constructed of 18-gauge stainless steel, is insulated with a minimum of 2" (5cm) insulation and is provided with removable 16-gauge pan slides. KH-2 comes with a single capacity heated compartment; compartment that holds four 12.75" x 20.75" x 2.5" (32cm x 53cm, x 6cm) pans. SH-3, SH-4, SH-5 and SH-6 units come with double capacity (single door) heated compartment with a center partition; compartment holds eight 12.75" x 20.75" x 2.5" (32cm x 53cm, x 6cm) pans. With the center partition removed the double capacity compartment can hold four 18" x 26" (46cm x 66cm) sheet pans. The internally mounted heating element is rated at 890 watts, has a louvered protective cover and is wired to a temperature control thermostat and indicator light in the stainless steel control panel. Doors are built with double-wall construction, with gaskets and stainless steel front panel.

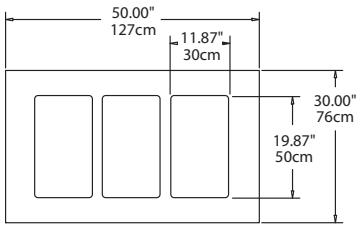
Optional Energy Saving Power wells (ESP) are individually equipped with a heated pad on bottom and sides of well rated at 500 watts for 208-230V or 240V. ESP wells provided with individual solid state digital temperature control wired to one main control panel with 4' of conduit and wire. Drains standard with manifold to common gate valve. This option reduces energy usage.

980 S. Isabella Rd.

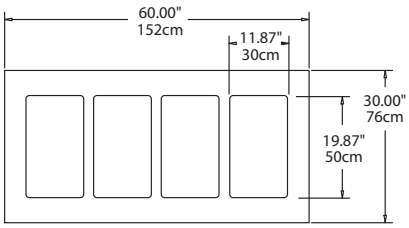
Shelleysteel™
by Delfield



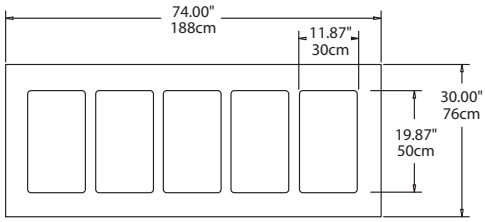
Plan View
SH-2, SH-2-NU



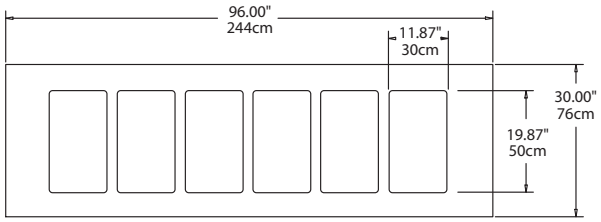
Plan View
SH-3, SH-3-NU



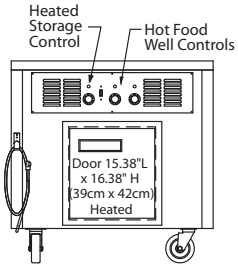
Plan View
SH-4, SH-4-NU



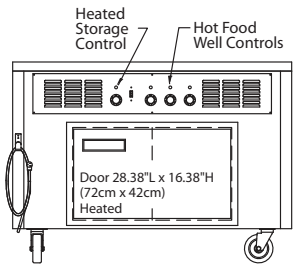
Plan View
SH-5, SH-5-NU



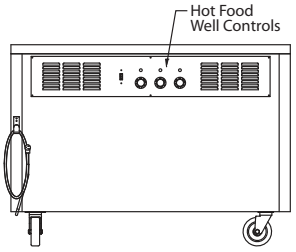
Plan View
SH-6, SH-6-NU



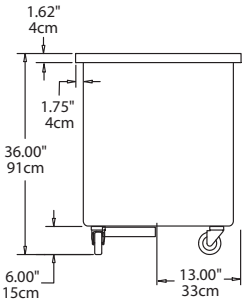
Elevation View
SH-2



Elevation View
SH-3, SH-4, SH-5, SH-6



Elevation View
All SH-NU Models



End View
All Models

*Optional drains must be specified if required.

Mobile Heated Serving Counters

SH & SH-NU

Specifications

Model	12" X 20" Food Wells	Heated Understorage		Voltage (60 Hz/ 1ø)	Nema Plug	Amps	*Optional ESP Amps (500 watt per well, 208-230V & plug change)*	Ship Weight lbs/kg
		12" X 20" Pan Cap.	18" X 26" Pan Cap.					
SH-2	2	4	—	120/208-230	14-20P	15.0	8.5/9.1	380/172
SH-3	3	8	4	120/208-230	14-30P	20.0	10.9/11.8	460/209
SH-4	4	8	4	120/208-230	14-50P	26.0	13.3/14.5	550/250
SH-5	5	8	4	120/208-230	14-50P	31.0	15.7/17.2	660/299
SH-6	6	8	4	120/208-230	14-50P	37.0	18.1/19.9	720/327
SH-2-NU	2	—	—	120/208-230	14-20P	11.0	4.8/5.4	225/102
SH-3-NU	3	—	—	120/208-230	14-20P	16.0	7.2/8.1	275/125
SH-4-NU	4	—	—	120/208-230	14-30P	22.0	9.6/10.8	330/150
SH-5-NU	5	—	—	120/208-230	14-50P	28.0	12.0/13.5	420/191
SH-6-NU	6	—	—	120/208-230	14-50P	33.0	14.4/16.2	510/231

Delfield reserves the right to make changes to the design or specifications without prior notice.

980 S. Isabella Rd.
Phone: 800-733-8948 or 989-773-7981
Printed in the U.S.A.

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 41
Quantity: 1

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Mobile Work Table

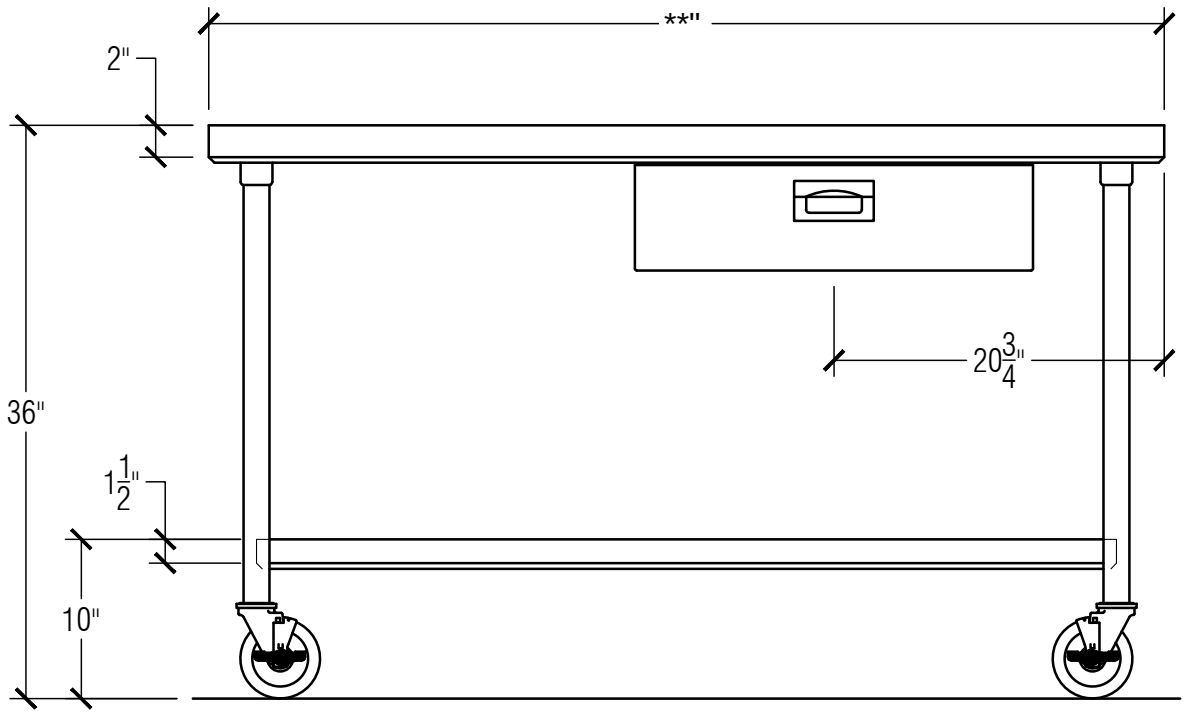
CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction

Size - Per Plan

Construction - Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and full undershelf.

Accessories - Drawer assembly.



Redesigned and Ready for Work

New!

CAMBRO MADE IN USA

StoreSafe StaySafe®

CAMBRO® TRUSTED FOR GENERATIONS™

- Durable insulated storage and transport for sheet pans and food boxes.
- Double cavity design.
- Improved ergonomics for easy transport

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 43
Quantity: 20

Cambro®
Insulated Transport
1826DTC and 1826DBC

The Cambro® 1826DBC and 1826DTC have been long time stalwarts of our insulated transport product category. With continuous product improvement being a part of our culture, we have re-imagined these classic carts with a modern design, upgraded hardware and close attention to ergonomics.

1826DBC for Cambro® Food Boxes

FOOD BOXES CODE*	CAPACITY
18263CW	10 per cart
18266CW	6
18269CW	4

*Cambro® Food Boxes available in both clear Camwear® and white Poly.

1826DTC for sheet pans

Capacity:
24/ea 1826 sheet pans/trays.

Robust, stainless steel hinges prevent door sag and improper seal.

Increased door thickness to eliminate warpage and improve insulation.

Vertical molded-in handles for easy maneuvering at any height.

Casters: 6" x 1¼" 2/EA swivel (1 with brake, 1 without brake) 2/EA rigid.

CODE	DIMENSIONS W x D x H	UNIT WEIGHT	CASE LBS. (CUBE)
1826DBC	21½" x 33¼" x 64"	112.5 lbs.	129 (27.74)
1826DTC	21½" x 33¼" x 64"	115.5	132 (27.74)
1826DBCSP**	21½" x 33¼" x 64 5/16"	140.5	157 (27.74)
1826DTCSP**	21½" x 33¼" x 64 5/16"	143.5	160 (27.74)

Case Pack: 1 **Color:** Black (110), Slate Blue (401), Dark Brown (131), Charcoal Gray (615). Shipping weight excludes pallet/box.
**SP models come equipped with a security package.

For more information about Cambro products visit www.cambro.com or contact your Distributor, Cambro Sales Representative or the Cambro Customer Service Department.

CAMBRO
TRUSTED FOR GENERATIONS®

Telephone 714 848 1555 **Toll Free** 800 854 7631 **Customer Service** 800 833 3003
© Cambro Manufacturing Company 5801 Skylab Road, Huntington Beach, California 92647-2056

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

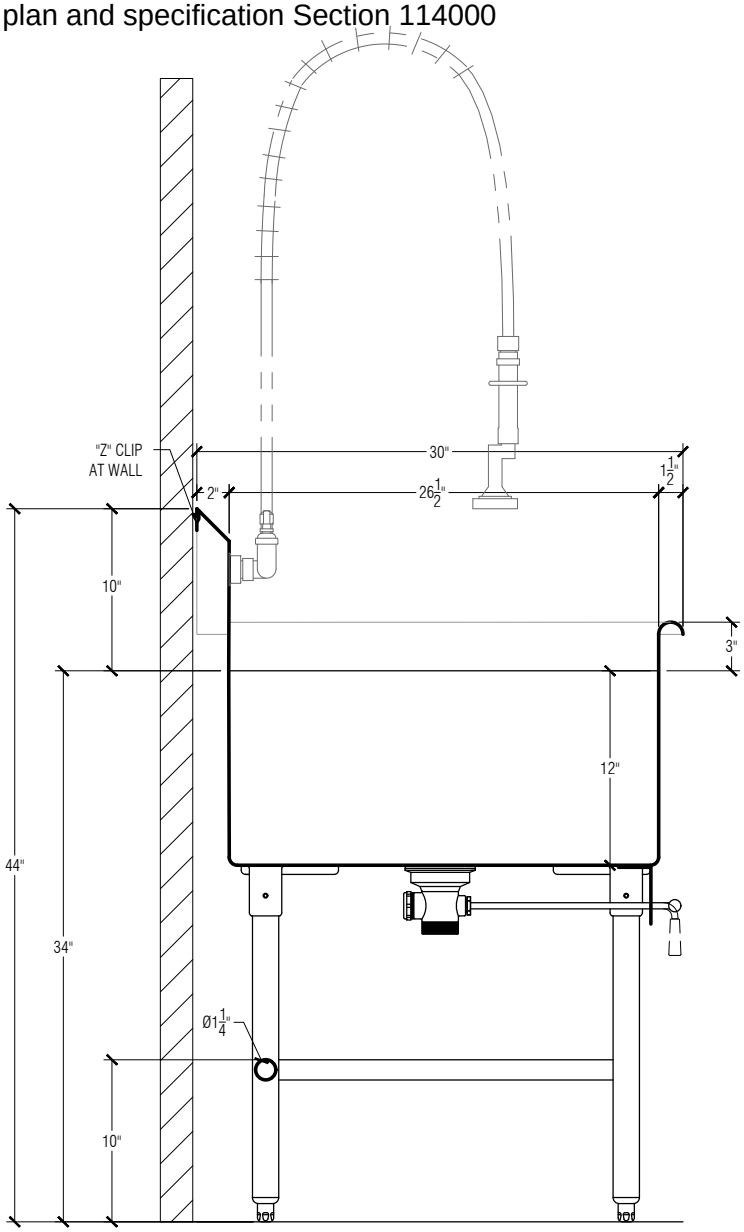
Item #: 43
Quantity: 20

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Three Compartment Sink

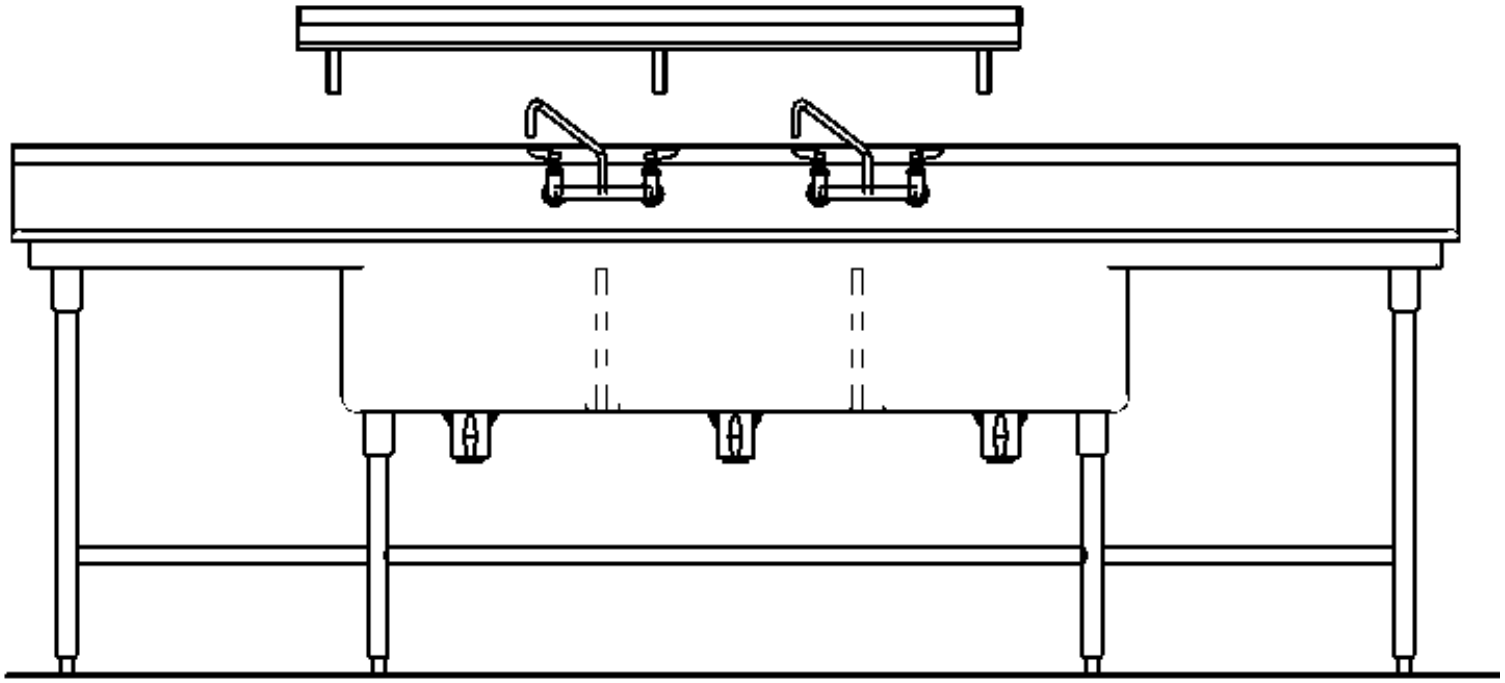
CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction
Size - Length per plan and specification Section 114000



FABRICATION SPECIFICATIONS:

TOP - 14 GA. S/S (TYPE 304) COVED CORNER CONSTRUCTION; 3" RAISED Ø 1½" ROLLED EDGE
SPLASH -14 GA. (TYPE 304) COVED CORNER CONSTRUCTION
SINKS - 14 GA. S/S (TYPE 304); FULLY WELDED COVED CORNER CONSTRUCTION; WELDED INTEGRAL TO TOP
FRAME - 1" X 1" X ⅛" THICK S/S CHANNEL FRAME CONSTRUCTION WITH CROSS MEMBERS NOT OVER 30" O.C.
GUSSETS - S/S CYLINDRICAL STEPPED GUSSETS; FULLY WELDED TO FRAMEWORK
LEGS - Ø 1⅝" 16 GA. (TYPE 304) S/S TUBING
CROSSBRACING - Ø1¼" 16 GA.(TYPE 304)S/S TUBING; FULLY WELDED TO LEGS
FEET - S/S ADJUSTABLE BULLET FEET
SOUND DEADENING - TACKY TAPE SOUND DEADENING APPLIED BETWEEN BRACING AND UNDERSIDE OF TOP; MASTIC SPRAY-ON SOUND MASTIC SPRAY-ON SOUND DEADENING APPLIED TO UNDERSIDE OF SINKS
WALL MOUNTED SHELF - 14 GA. S/S (TYPE 304) CONSTRUCTION; 1½" TURN DOWN W/ ½" @ 45° RETURN; 1" OFFSET IN REAR; W/ 1½" TURN UP ALONG WALLS; FRONT EDGES OF ENDS ANGLED BACK; MOUNTED ON 14 GA. S/S (TYPE 304) CANTILEVER BRACKETS



Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 44

Quantity: 1

CUSTOM FABRICATED EQUIPMENT

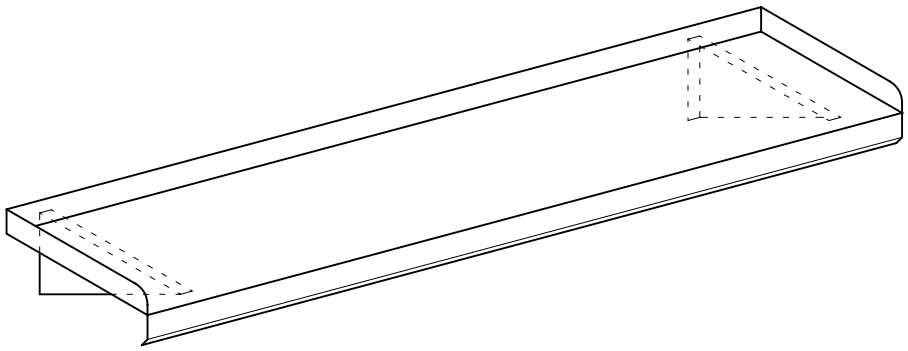
DESCRIPTION: Wall shelf

CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction

Size - Length per plan and specification Section 114000 x 10" mounted 54" above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.



T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.

B-0133-12-CRBJK

Item No.

This Space for Architect/Engineer Approval

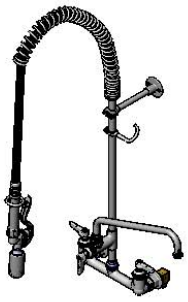
Job Name_____Date_____

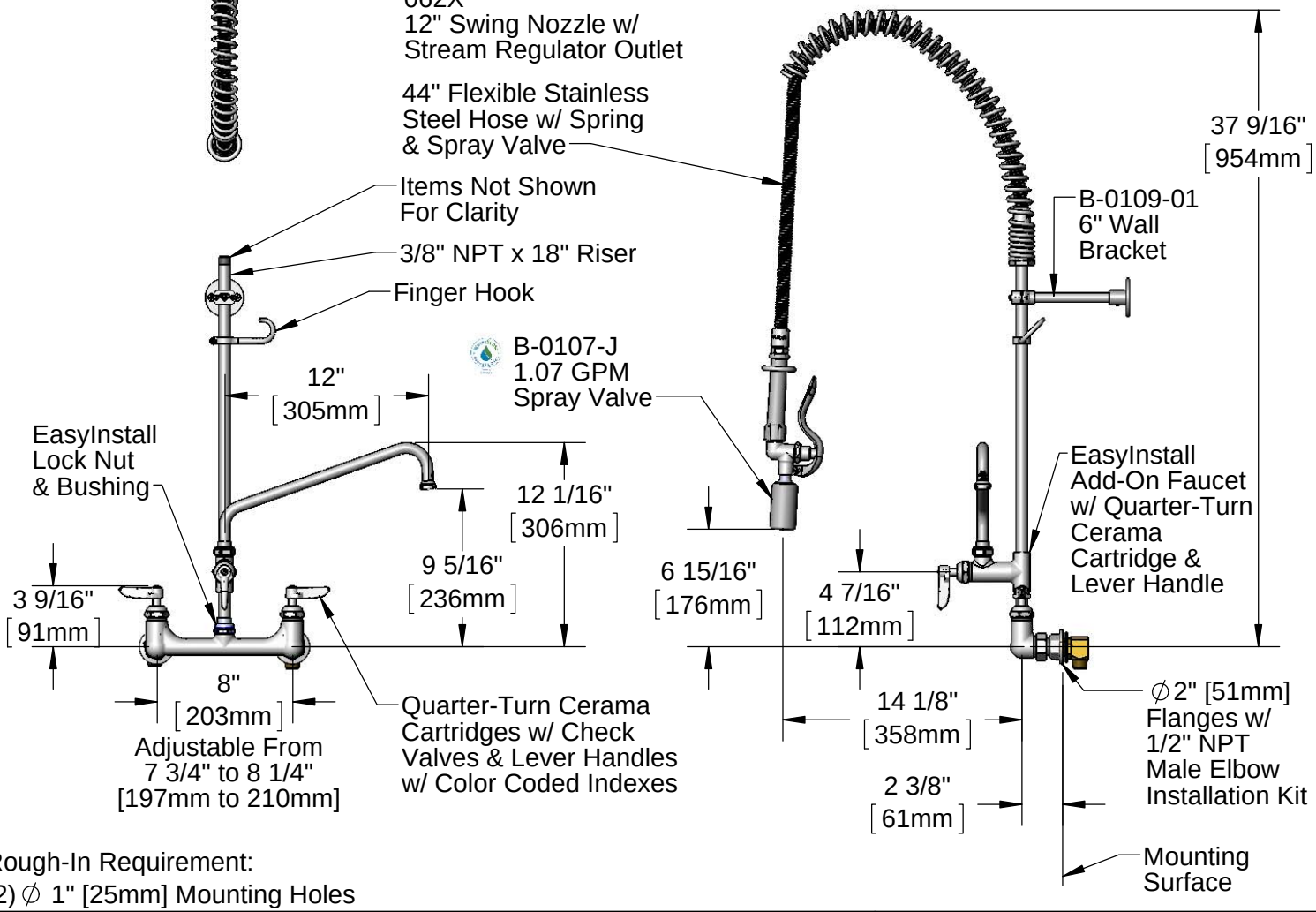
Model Specified_____ Quantity_____

Customer/Wholesaler_____

Contractor_____

Architect/Engineer_____





Rough-In Requirement:
(2) ∅ 1" [25mm] Mounting Holes

Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Cerama Cartridges w/ Check Valves, Lever Handles, Add-On Faucet w/ 12" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.07 GPM Spray Va

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Dra

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

Item #: 46

Quantity: 1

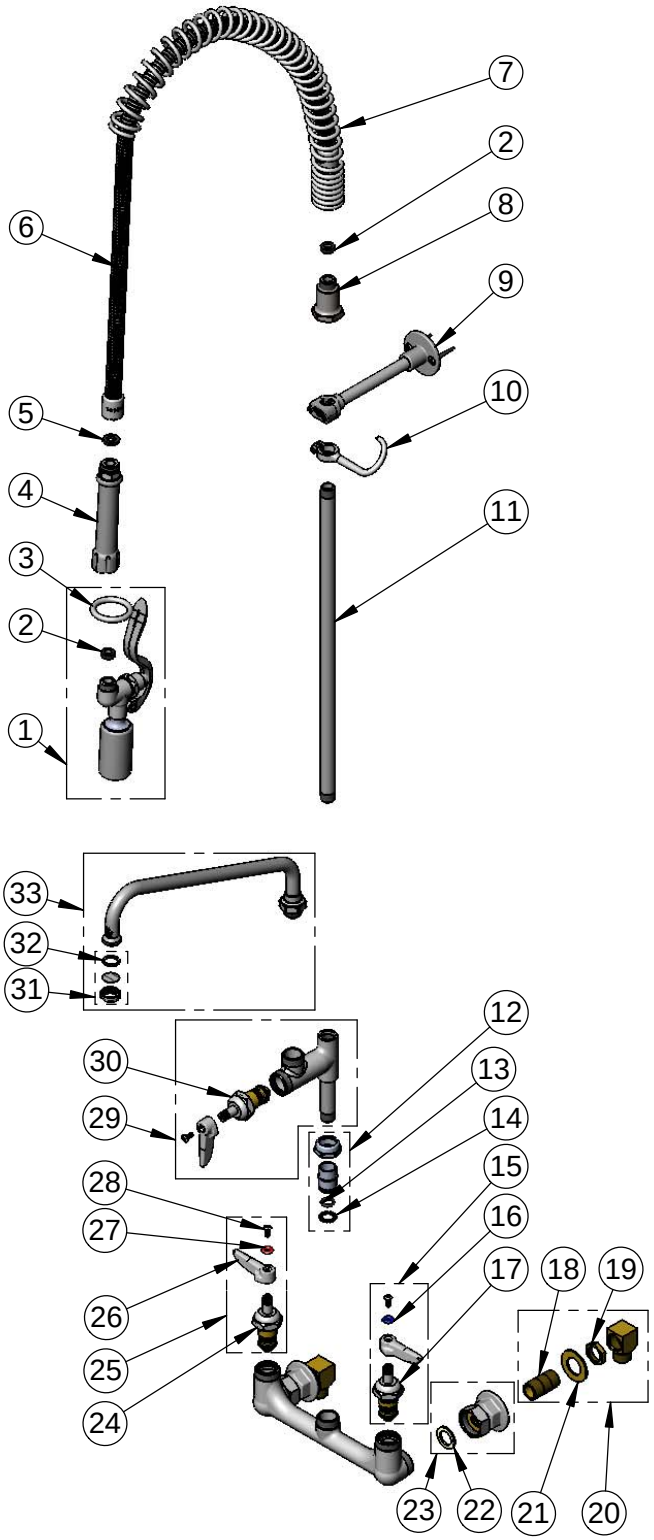
T&S BRASS AND BRONZE WORKS, INC.

2 Saddleback Cove / P.O. Box 1088
Travelers Rest, SC 29690

Travelers Rest, SC: 800-476-4103 • Simi Valley, CA: 800-423-0150 • Fax: 864-834-3518 • www.tsbrass.com

Model No.
B-0133-12-CRBJK

Item No.



ITEM NO.	SALES NO.	DESCRIPTION
1	B-0107-J	1.07 GPM Spray Valve
2	010476-45	#27 Washer
3	000907-45	Spray Valve Hold Down Ring
4	002987-40	Grip Handle
5	001014-45	Washer, B-0100 Hose Barrel
6	B-0044-H2A	44" Flexible Stainless Steel Hose, Less Handle
7	000888-45	EasyInstall Overhead Spring
8	000821-40	Spring Body
9	B-0109-01	6" Wall Bracket
10	004R	Finger Hook
11	000369-40	3/8" NPT x 18" Riser
12	EZ-K	EasyInstall Kit: Nut, Bushing, O-ring & Lock Washer
13	001065-45	O-Ring
14	014200-45	Star Washer, Anti-Rotation
15	012447-25	Quarter-Turn Cerama Cartridge, LTC w/ Check Valve, Handle, Index & Screw
16	001660-45	Blue Index-CW
17	012395-25	Quarter-Turn Cerama Cartridge, LTC w/ Check Valve
18	013357-20	1/2" NPT x 1-5/8" Lg. Close Nipple
19	002954-45	Shank Lock Nut
20	B-0230-K	Short Elbow Installation Kit
21	000999-45	Brass Lock Washer
22	001019-45	Coupling Nut Washer
23	00AA	1/2" NPT Female Eccentric Flange
24	012394-25	Quarter-Turn Cerama Cartridge, RTC w/ Check Valve
25	012446-25	Quarter-Turn Cerama Cartridge, RTC w/ Check Valve, Handle, Index & Screw
26	001638-45	Lever Handle
27	001661-45	Red Index-HW
28	000922-45	Lever Handle Screw
29	B-0155-CR-LN	Add-On Faucet w/ Quarter-Turn Cerama Cartridge, RTC & Lever Handle (Less Nozzle)
30	011278-25	Quarter-Turn Cerama Cartridge, RTC
31	B-PT	Stream Regulator Outlet
32	001048-45	Nozzle Tip Washer
33	062X	12" Swing Nozzle

Product Specifications:

Pre-Rinse Unit: EasyInstall 8" Wall Mount Mixing Faucet, Quarter-Turn Cerama Cartridges w/ Check Valves, Lever Handles, Add-On Faucet w/ 12" Swing Nozzle, 44" Flexible Stainless Steel Hose, 1.07 GPM Spray Valve, 6" Wa

Product Compliance:

ASME A112.18.1 / CSA B125.1
NSF 61 - Section 9
NSF 372 (Low Lead Content)

Dra

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 46
Quantity: 1

HOBART

Project _____

AIA # _____ SIS # _____

Item # _____ Quantity _____ C.S.I. Section 114000

COMMERCIAL DISHWASHERS

AM16VLT-BAS
TALL BASE ELECTRIC
High Temperature Ventless Door-Style Dishwashing Machine

SPECIFIER STATEMENT

Specified unit will be a Hobart AM16 Tall Base electric high temperature ventless dishwashing machine. Features include 3-sided pillarless hood, ventless operation & energy recovery, door lock, touchscreen controls with WiFi connectivity, NSF pot and pan rating for 2-, 4- & 6-minute cycles, 27" door opening, pumped drain, auto door start with auto fill, interchangeable stainless steel rinse arms and X-shaped wash arms, delime cycle, advanced diagnostics and service connection, up to 40 racks per hour, .67 U.S. gallons per rack pumped final rinse.

1 year parts and labor warranty.

STANDARD FEATURES

+ .67 gallons per rack pumped final rinse
+ 40 racks per hour – hot water sanitizing
+ Ventless energy recovery
+ User-friendly smart touchscreen controls
+ WiFi connectivity
+ SmartConnect app and cloud with machine status, temperature logs, error code reporting, and cost, consumption and usage analysis
+ Two stage filtration
+ Pillarless opening
+ 3-sided hood
+ Single point electrical connection standard, field convertible to dual point connection
+ 3 phase standard, field convertible to single phase
+ Temperature and chemical lock outs (with Hobart equipped chemical pumps)
+ Pumped drain
+ Door lock
+ Timed wash cycles for 1, 2, 4 or 6 minutes
+ NSF pot and pan rating for 2-, 4- & 6- minute cycles
+ Sense-A-Temp™ 70°F rise electric booster heater
+ Self-draining, high efficiency wash pump with stainless steel impeller
+ 27" door opening for 18" x 26" sheet pans or 60-quart mixing bowl
+ Stainless steel drawn tank, tank shelf, chamber, trim panels, frame and feet
+ Spring counterbalanced chamber with UHMW guides
+ X-shaped revolving, interchangeable upper and lower anticlogging wash arms
+ Revolving, interchangeable upper and lower rinse arms
+ Slanted, self-locating, one-piece scrap screen and basket system
+ Automatic fill
+ Door actuated start
+ AutoClean
+ Factory startup
+ Service diagnostics
+ Straight-through or corner installation
+ Delime cycle with notification (field activated)
+ Sheet pan rack

OPTIONS & ACCESSORIES (Available at extra cost)

- ❑ Peg rack
- ☑ Combination rack
- ❑ Chemical pumps
- ❑ Splash shield for corner installations
- ❑ Flanged and seismic feet
- ❑ Water hammer arrestor kit
- ❑ Rapid fill kit
- ❑ Sink integration kit
  - + Sink saddle & 3" leg extension
  - + Sink rail kit
  - + Fold down table
- ☑ Drain water tempering kit

AM16 SERIES – AM16VLT-BAS TALL BASE ELECTRIC

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

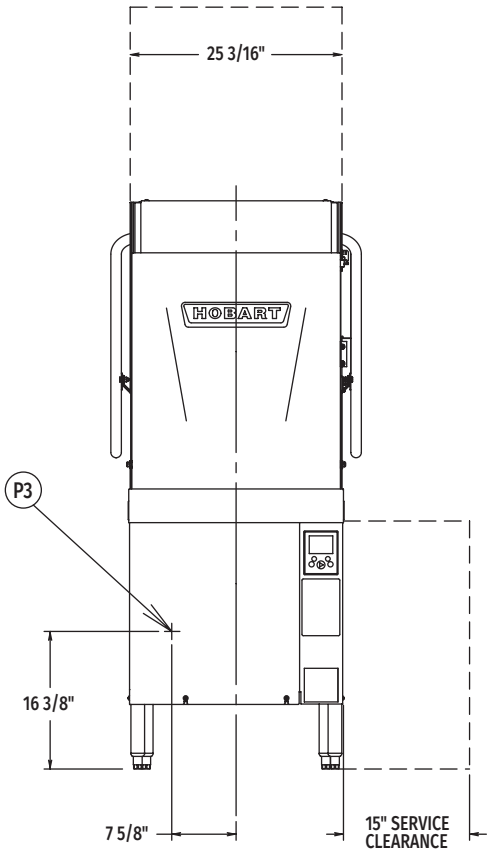
Bristol, CT

Item #: 47

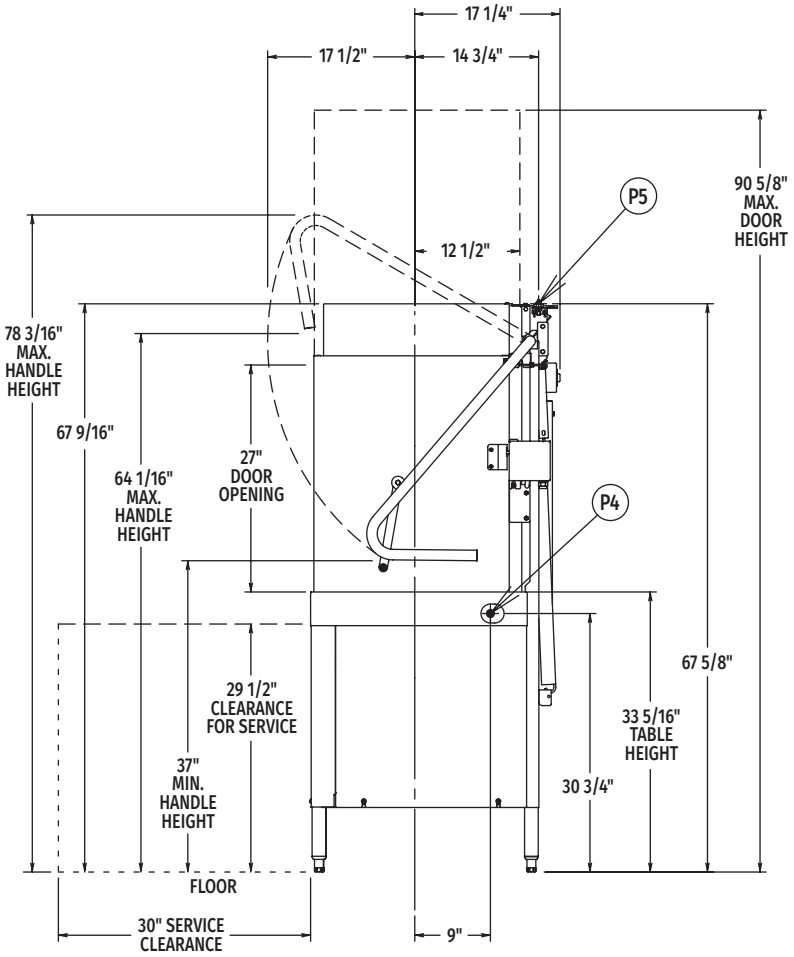
Quantity: 1

AM16VLT-BAS TALL BASE ELECTRIC

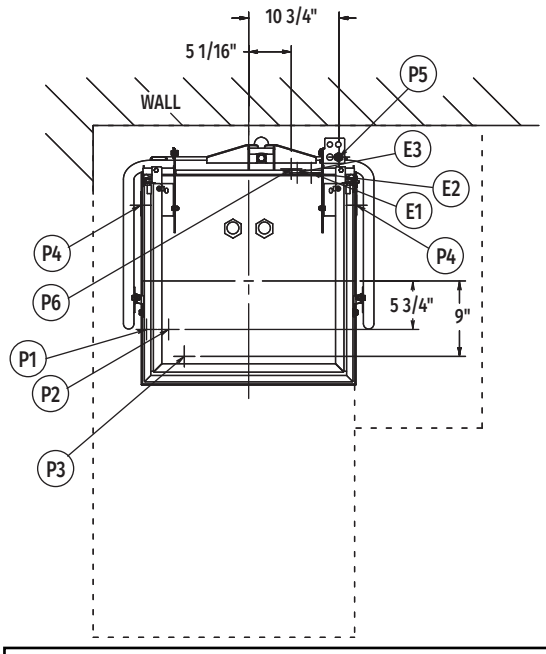
High Temperature Ventless Door-Style Dishwashing Machine

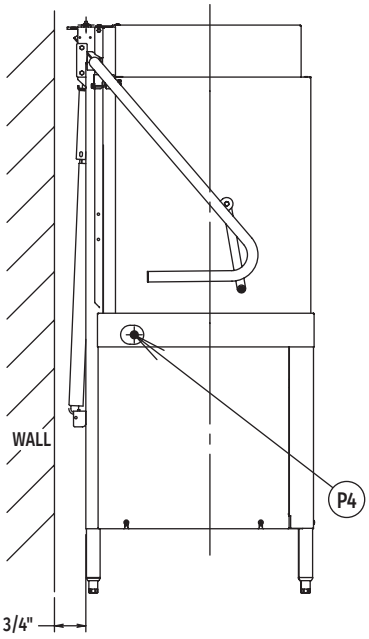


Front View



Right Side View





Left Side View

MODEL:
AM16VLT-BAS
E-950440

Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy

Bristol, CT

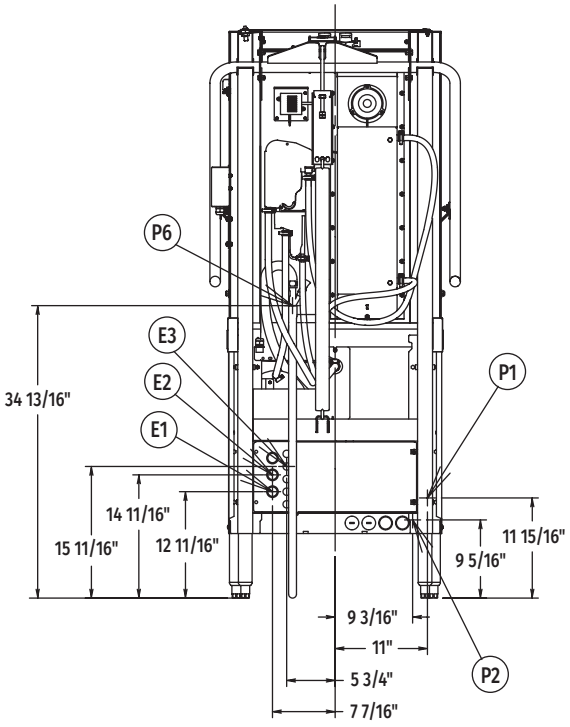
Item #: 47

Quantity: 1

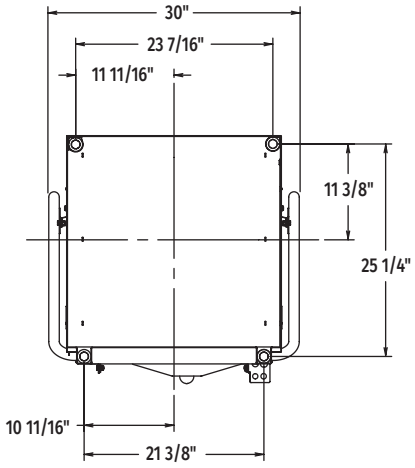
AM16VLT-BAS TALL BASE ELECTRIC

High Temperature Ventless Door-Style Dishwashing Machine

WARNING: Plumbing and electrical connections should be made by qualified personnel who will observe all the applicable plumbing, sanitary, safety codes and National Electrical Code.



Rear View



Bottom View

Miscellaneous Note: For optimal performance, Hobart recommends maintaining a dishroom temperature of 65°F (18°C) or higher, as lower temperatures may hinder the machine's capacity to operate effectively (with lower performance as ambient temperature decreases).

LEGEND

Electrical Connections	
E1	Electrical connection: wash pump motor & sump heater, 1" or 3/4" conduit hole; 12-11/16" AFF.
E2	Electrical connection: electric booster & controls only or single point electrical connection (3PH only), 1" or 3/4" conduit hole; 14-11/16" AFF.
E3	Electrical connection: detergent & rinse agent feeders, (DPS1 & DPS2) 1.5 amps @ nameplate supply voltage, (RPS1 & RPS2) 1.5 amps @ nameplate supply voltage; 1/2" conduit hole, 15-11/16" AFF.
Plumbing Connections	
P1	Common water connection including booster heater: 55°F water minimum; 15-65 PSI recommended; 3/4" female garden hose fitting on 6' long hose supplied with machine; 11-15/16".
P2	Hot water connection: 110°F water minimum (rapid fill accessory – when ordered); 3/4" female garden hose fitting on 6' long hose; 9-5/16" AFF.
P3	Detergent probe sensor: remove cap and stud assembly to access 7/8" hole; 16-3/8" AFF.
P4	Detergent feeder: two locations available. Remove cap and stud assembly to access 7/8" hole; 30-3/4" AFF.
P5	Rinse agent feeder: remove 1/8" NPT pipe plug to access 1/8" NPT tapped hole; 67-5/8" AFF.
P6	Drain connection: 5/8" barb fitting with 6' long hose supplied with machine; 34-13/16" AFF. Maximum height 40" AFF.

SPECIFICATIONS

Capacities
- Racks Per Hour (maximum) 40
- Dishes per Hour (average 25 per rack) 1,000
- Glasses per Hour (average 45 per rack) 1,800
- Wash Tank (U.S. gallons) 10.5

Motor Horsepower
- Rinse Pump 0.18
- Wash Pump 2
- Drain Pump 0.21
- Blower 0.05

Rinse
- Gallons per Rack 0.67
- Gallons per Hour (maximum consumption) 26.8

Peak Rate of Drain Flow (without drain water tempering)
- Gallons per Minute (initial rate with full tank) 14.5

Heating
- Electric Booster (kW) 7.1
- Electric Heating Unit (kW) 5.4

Shipping Weight (approximate) . . . . . 372 lbs.

Crated Dimensions . . . . . 73.75"H x 36.5"W x 36.5"L

AM16VLT-BAS TALL BASE ELECTRIC

High Temperature Ventless Door-Style Dishwashing Machine

E1	AM16 with Electric Heat (When Field Converted to Dual Point)		
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/1	39.6	50	50
208-240/60/3	26.9	30	30
480/60/3	10.5	15	15

E2	9.5 kW Booster & Controls Ampacity Ratings (When Field Converted to Dual Point)		
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/1	43.5	50	50
208-240/60/3	26.8	30	30
480/60/3	13.5	15	15

E2	AM16 Single Point Electrical Service Connection as Shown Below		
Voltage	Rated Amps	Minimum Supply Circuit Ampacity	Maximum Protective Device
208-240/60/3	53.7	60	60
480/60/3	24.0	30	30

Approximate Heat Gain to Space without Vent Hood	
Type	BTU/Hr.
Latent	6,800
Sensible	5,000

Miscellaneous Notes: All dimensions taken from floor line may increase 7/8" or decrease 3/8" depending on leg adjustment.

Vent hood (if required) to provide a minimum 450 CFM exhaust (ref installation instructions).

Net weight of machine including booster: 355 lbs.
Domestic shipping weight including booster: 372 lbs.

Size of racks – 19-3/4" x 19-3/4".

Plumbing Notes: Water hammer arrestor (meeting ASSE-1010 standard or equivalent) to be supplied (by others) in common water supply line at service connection.

Recommended water hardness to be 3 grains or less for best results.

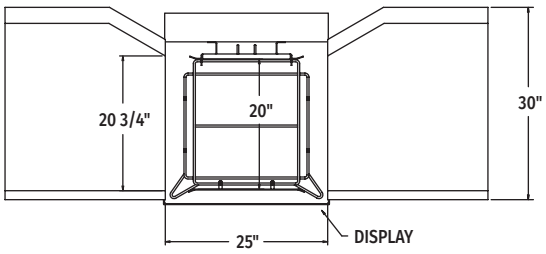
Note: Electric heating unit & booster (kW) calculated at 208V.

Recommended building flowing water pressure to the dishwasher at or above 15-65 PSI. Pressures lower than 15 PSI may affect machine fill/start-up times.

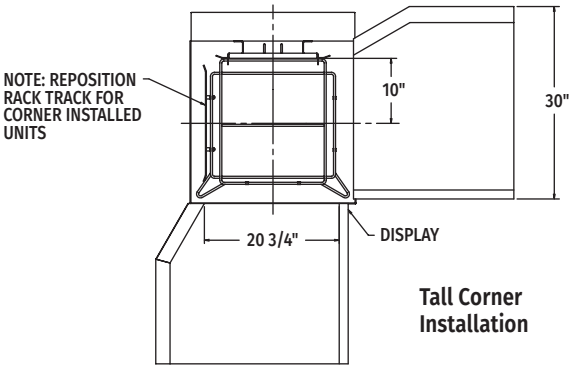
This is a pumped rinse machine. Pressure regulating valve is not necessary on hot or cold lines.

For convenience when cleaning, water tap should be installed near machine with heavy duty hose and squeeze valve.

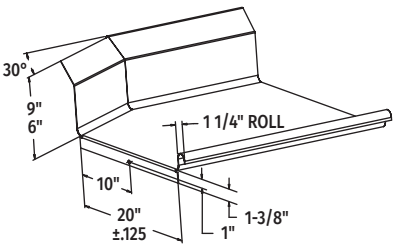
AM16VLT-BAS TABLING CONFIGURATIONS AND TRACK DESIGN



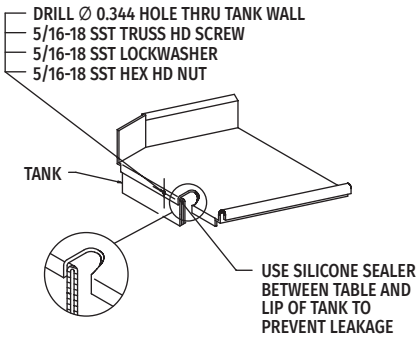
Pass Thru Installation



Tall Corner Installation



Suggested Table Design



Crabtree McGrath ASSOCIATES, INC.

Edgewood Pre-K Academy
Bristol, CT

Item #: 47
Quantity: 1

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Dish Table, Clean

CONSTRUCTION FEATURES:

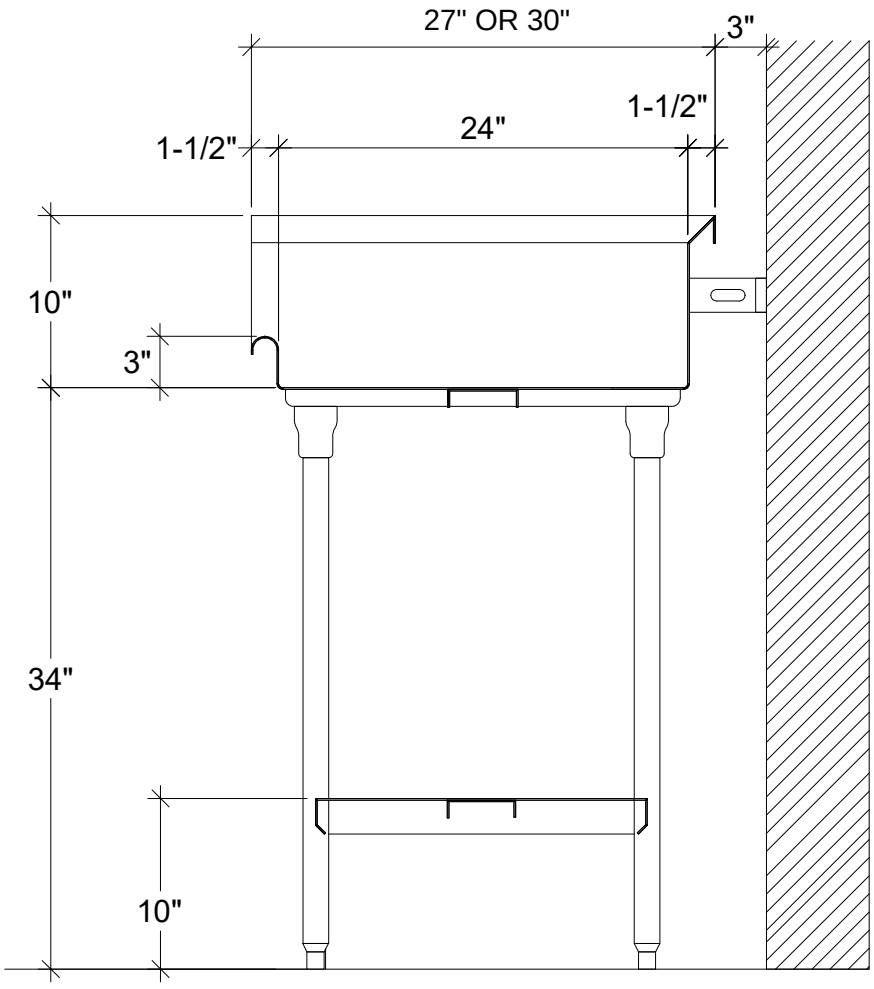
Make - Fabricate per General Construction this Section.

Size - Length per plan and specification Section 114000

Construction - 14 gauge stainless steel top and splash over channel frame with raised roll front and end, tall splash at rear, turned down into dishwasher and secured with stainless steel machine screws, and mounted on four legs with gussets, adjustable feet and undershelf. Secure table 3" off face of wall.

CUSTOM FABRICATED EQUIPMENT

DESCRIPTION: Dish Table, Clean



CUSTOM FABRICATED EQUIPMENT

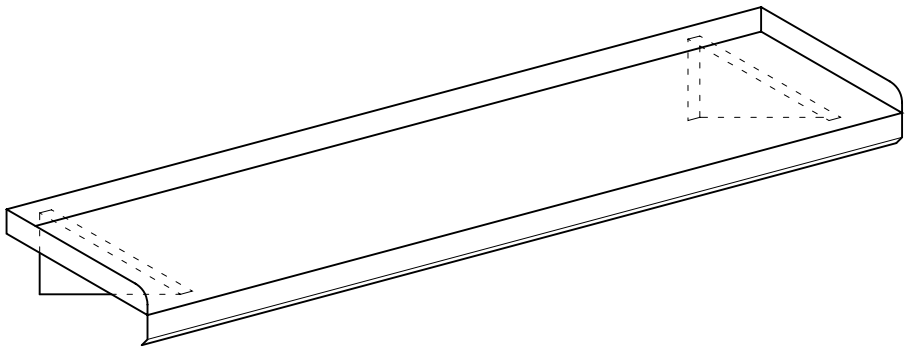
DESCRIPTION: Wall shelf

CONSTRUCTION FEATURES:

Make - Fabricate per specification Section 114000 General Construction

Size - Length per plan and specification Section 114000 x 10" mounted 54" above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.



Compliance Checklist-Schools

In order to demonstrate compliance, the reporting requirements detailed in Section 16a-38k-8 must be completed. The following checklist may be used to catalog compliance progress.

Mandatory Requirements

X	Section	Summary Description
X	16a-38k-3(a)	Building Commissioning
X	16a-38k-3(b)	Integrated Design Process
X	16a-38k-3(c)	Base Energy Performance 21% Better Than Code
X	16a-38k-3(d)	ENERGY STAR Products
X	16a-38k-3(e)	Indoor Air Quality Management Plan
X	16a-38k-3(f)	Water Efficiency
X	16a-38k-3(g)	Recycling of Materials
X	16a-38k-3(h)	Erosion and Sedimentation Control
X	16a-38k-3(i)	No Smoking Policy
X	16a-38k-3(j)	Integrated Pest Management Plan
X	16a-38k-3(k)	CFC Refrigerant Ban or Phase-out Plan
X	16a-38k-3(l)	Minimum Ventilation
X	16a-38k-5(a)	Acoustical Standards
X	16a-38k-5(b)	Properly Locate Outside Air Intakes
X	16a-38k-5(c)	Electronic Ignition on Natural Gas Equipment
X	16a-38k-5(d)	Use of Low VOC Products
X	16a-38k-5(e)	Environmental Site Assessment
X	16a-38k-5(f)	HEPA Vacuuming

Building Standard Options

(A minimum of 28 of the following strategies must be implemented.)

X	Section	Summary Description
		At least one measure in subsection (a) must be selected
X	16a-38k-6(a)(1)	Energy Performance 24.5% Better Than Code
X	16a-38k-6(a)(2)	Energy Performance 28% Better Than Code
X	16a-38k-6(a)(3)	Energy Performance 31.5% Better Than Code
X	16a-38k-6(a)(4)	Energy Performance 35% Better Than Code
	16a-38k-6(a)(5)	Energy Performance 38.5% Better Than Code
	16a-38k-6(a)(6)	Energy Performance 42% Better Than Code
	16a-38k-6(a)(7)	On-Site Renewable Energy – 3%
	16a-38k-6(a)(8)	On-Site Renewable Energy – 7%
	16a-38k-6(a)(9)	On-Site Renewable Energy – 10%
	16a-38k-6(a)(10)	Purchase Renewable Energy
	16a-38k-6(a)(11)	Energy Measurement and Verification Plan
		At least two measures in subsection (b) must be selected
X	16a-38k-6(b)(1)	Install Permanent Indoor Air Monitoring Systems

X	Section	Summary Description
	16a-38k-6(b)(2)	Provide Increased Outdoor Ventilation
	16a-38k-6(b)(3)	Building Flushout
	16a-38k-6(b)(4)	Composite Wood and Agrifiber Products
X	16a-38k-6(b)(5)	Individual Lighting Control
X	16a-38k-6(b)(6)	Individual Thermal Comfort Control
X	16a-38k-6(b)(7)	Building Occupant Survey
	16a-38k-6(b)(8)	Daylight Contribution
X	16a-38k-6(b)(9)	Visual Gazing – Views to the Outdoor Environment
X	16a-38k-6(b)(10)	Mold Prevention
X	16a-38k-6(b)(11)	Low VOC Furniture
X	16a-38k-6(b)(12)	Isolation of Chemical Use Areas
X	16a-38k-6(b)(13)	Control of Particulates at Pedestrian Entryways
		At least one measure in subsection (c) must be selected
X	16a-38k-6(c)(1)	Reduce Total Potable Water Usage by 30%
	16a-38k-6(c)(2)	Reduce Water Consumption for Landscaping 50%
	16a-38k-6(c)(3)	Eliminate Potable Water Usage for Landscaping
	16a-38k-6(c)(4)	Reduce Total Potable Water Usage by 50%
		At least two measures in subsection (d) must be selected
X	16a-38k-6(d)(1)	Maintain 75% of an Existing Building Structure
X	16a-38k-6(d)(2)	Maintain 95% of an Existing Building Structure
	16a-38k-6(d)(3)	Re-use Existing Non-Structural Building Elements
X	16a-38k-6(d)(4)	Recycle or Salvage 50% of Construction and Demolition Debris
	16a-38k-6(d)(5)	Recycle or Salvage 75% of Construction and Demolition Debris
	16a-38k-6(d)(6)	Use 5% Refurbished, Salvaged, or Reused materials
	16a-38k-6(d)(7)	Use 10% Refurbished, Salvaged, or Reused materials
X	16a-38k-6(d)(8)	Use 10% Recycled Content Materials
X	16a-38k-6(d)(9)	Use 20% Recycled Content Materials
X	16a-38k-6(d)(10)	Use 10% Local Materials
X	16a-38k-6(d)(11)	Use 20% Local Materials
	16a-38k-6(d)(12)	Use Building Materials Made from Short Harvest Cycle Plants
X	16a-38k-6(d)(13)	Use Forest Stewardship Council (FSC) Certified Wood Products
		At least two measures in subsection (e) must be selected
X	16a-38k-6(e)(1)	Re-develop a Local Site
X	16a-38k-6(e)(2)	Select a Site with Public Transportation Access
X	16a-38k-6(e)(3)	Encourage Bicycle Transportation
X	16a-38k-6(e)(4)	Encourage Low-Emission Vehicle Use with Preferred Parking
X	16a-38k-6(e)(5)	Encourage Car and Van-pooling
	16a-38k-6(e)(6)	Protect Natural Areas at the Construction Site
	16a-38k-6(e)(7)	Maximize Open Space
	16a-38k-6(e)(8)	Implement a Stormwater Management Plan Reducing Run-off by 25%

X	Section	Summary Description
	16a-38k-6(e)(9)	Implement a Stormwater Management Plan that Treats 90% of Annual Rainfall
	16a-38k-6(e)(10)	Reduce Heat Island Effect Through Landscaping Strategies
X	16a-38k-6(e)(11)	Select Roofing Materials to Reduce Heat Island Effect
X	16a-38k-6(e)(12)	Reduce Outdoor Light Pollution
	16a-38k-6(e)(13)	Orient Building for Daylighting and Energy Performance
	16a-38k-6(e)(14)	No Building in Floodplain and Sustainable Site Development
X	16a-38k-6(e)(15)	Site Building away from External Sources of Excessive Noise
No minimum requirement for measures in subsection (f)		
X	16a-38k-6(f)(1)	Eliminate the use of CFCs, HCFCs and Halons
	16a-38k-6(f)(2)	Building Innovation
	16a-38k-6(f)(3)	Curriculum on Sustainable Building Features
31	**Total Building Standard Optional Strategies (27 Needed for Compliance)**	

ENVIRONMENTAL MATERIALS REPORTING FORM (provide cut sheets for the data below)

PROJECT NAME: _____ **CONTRACTOR: _____**

SPEC SECTION: _____

CONTACT NAME: _____ TEL. NO: _____ SUBMITTAL NO: _____

Product Name	Vendor or Manufacturer	**REQUIRED for ALL products identified in Specs** CSI 2004 Divisions 3–10, 31.60 Foundations, 32.10 Paving, 32.30 Site Improvements, and 32.90 Planting. *MEP excluded.* Total Material Cost (excl. labor & equipment)	Percentage of the product salvaged, refurbished or reused[1]	Recycled Content[2] (for concrete, use separate form)		Location and distances from manufacturing point to project site AND raw material harvesting point to project site (miles)[3]	Percentage of product that is rapidly renew-able[4]	For all wood-based products[5]			
				% post-consumer	% pre-consumer			% New wood	% Certified Wood	FSC Tracking: COC #	Urea formaldehyde in composites (Y/N)
1.						Harvest: Manufacture:					
2.						Harvest: Manufacture:					
3.						Harvest: Manufacture:					
4.						Harvest: Manufacture:					

CONTRACTOR CERTIFICATION:

I, _____ a duly authorized representative of _____ hereby certify that the material information contained herein is an accurate representation of the material qualifications to be provided by us, as components of the final building construction. Furthermore, I understand that any change in such qualifications during the purchasing period will require prior written approval from the Construction Manager and Owner.

SIGNATURE OF AUTHORIZED REPRESENTATIVE: _____ DATE: _____

[1] ***Salvaged***: Material or product which has been recovered from existing buildings or construction sites and reused in other buildings (e.g., structural beams, doors, brick).

[2] ***Post-Consumer Recycled Content***: Portion of material or product which derives from discarded consumer waste that has been recovered for use as a raw material (e.g., plastic bottles, newspaper).
Pre-Consumer Recycled Content: Portion of material or product which derives from recovered industrial and mfg. materials that are diverted from municipal solid waste for use in a *different* mfg. process, prior to use by a consumer (e.g., fly-ash in concrete or synthetic gypsum board, both of which are by-products of coal-burning power plants). Note that spills and scraps from the original mfg. process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product do not qualify.

[3] ***Regional Materials:*** Materials are considered regional if harvested AND manufactured within 500 miles of the project site. Materials can travel more than 500 miles, provided materials always remain within a 500 mile radius of project site. For salvaged/recycled materials such as steel, you do not need to provide the original harvesting location, but rather the location the steel was sourced from. Distances are as the crow flies, not actual miles traveled via surface transport.

[4] ***Rapidly Renewable***: Materials and products made from raw materials that are harvested within a 10-year cycle (e.g., bamboo, cork, linoleum, fast-growing poplar, wheatboard, wool carpet)

[5] ***FSC Certified***: Wood-based products which are certified by the Forest Stewardship Council and carry a Chain-of-Custody certificate number from the vendor or manufacturing.
Composite Wood & Agrifiber Products: Any wood based products must not contain added urea-formaldehyde.

Connecticut
Building Standard Guidelines
Compliance Manual for High Performance Buildings

August 2009

Prepared For

The Connecticut Office of Policy and Management

by:

Northeast Energy Efficiency Partnerships

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This publication was commissioned and finalized by the Connecticut Office of Policy and Management, in consultation with the Department of Public Works, the Department of Public Safety, the Department of Environmental Protection, and the Institute for Sustainable Energy at Eastern Connecticut State University. It is designed to provide accurate and authoritative information with regard to the subject matter covered. However, although great care has been taken in the compilation and publication of this manual, it is published with the understanding that (1) the publisher and authors make no guarantee that the manual meets all federal, state, and local statutory, regulatory, or other requirements, and (2) the publisher and authors are not engaged in rendering professional advice via this manual or their work and/or affiliation with the State of Connecticut. The publisher and authors cannot be responsible for errors or omissions or any agency's interpretations, applications, and changes of regulations or specifications described in this publication. Use of any provision contained herein is the sole responsibility of the specifier and project owner.

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Introduction

This handbook has been developed to assist state and local building code officials, architects, and contractors in complying with State of Connecticut Regulation Section 16a-38k-1 through 9: The Establishment of High Performance Building Construction Standards for State-Funded Buildings. It contains guidelines and requirements for meeting both mandatory and optional strategies to ensure compliance with the regulation. This handbook was prepared to allow periodic updates as referenced materials are modified and updated.

These regulations were developed by the Connecticut Office of Policy and Management in consultation with the Department of Public Works, the Department of Environmental Protection, the Department of Public Safety, and the Institute for Sustainable Energy at Eastern Connecticut State University. The regulation sets environmental and energy efficiency standards for state-funded facilities that are newly constructed or are undergoing major renovations.

For state agency buildings, this regulation includes twelve mandatory requirements that must be met by all projects. In addition, there are sixty optional strategies, twenty-six of which must be met in order for the project to be in compliance. For schools, the regulation requires buildings to meet the twelve mandatory requirements that state agency buildings must meet **plus** six additional mandatory measures. Schools then must meet twenty-eight of fifty-nine optional strategies.

The regulations were adopted primarily to require state-funded buildings to be built utilizing a high performance building standard equivalent to that of the United States Green Buildings Council (USGBC) Leadership in Energy and Environment Design (LEED) Green Building Rating System™-Silver. This rating system primarily focuses on five areas of concern: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Complying with these regulations will produce buildings that consume less energy, conserve natural resources, are more comfortable, healthier, and are easier and less costly to maintain.

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State of Connecticut

REGULATION
of

NAME OF AGENCY

Office of Policy and Management

Concerning

SUBJECT MATTER OF REGULATION

The Establishment of High Performance Building Construction Standards for State-Funded Buildings

The Regulations of Connecticut State Agencies are amended by adding sections 16a-38k-1 to 16a-38k-9, inclusive, as follows:

(NEW) Section 16a-38k-1. Definitions

As used in section 16a-38k-1 to section 16a-38k-9, inclusive, of the Regulations of Connecticut State Agencies:

1) "ASHRAE" means the American Society of Heating, Refrigerating, and Air Conditioning Engineers;

2) "Building envelope systems" means the part of the building that represents the barrier between the outdoor and indoor environments, and includes such components as windows, doors, walls, and roofs.

3) "Carpet and Rug Institute" means a trade association that represents manufacturers and suppliers of carpets, rugs, and floor coverings;

4) "Chlorofluorocarbons" or "CFCs" means a class of chemical compounds containing chlorine, fluorine, and carbon that were commonly used as refrigerants and that damage the earth's ozone layer;

5) "Class I Renewable Energy Source" means "Class I Renewable Energy Source" as defined in section 16-1(a)(26) of the Connecticut General Statutes;

6) "Commissioner" means the commissioner of the Department of Public Works;

7) "Commissioning" means the process of verification that the building's systems perform as designed and according to project requirements and construction documents, including assurances that the specified systems are installed properly and adjusted correctly;

8) "Composite wood and agrifiber products" means particleboard, medium density fiberboard, plywood, wheatboard, strawboard, panel substrates, and door cores;

9) "Connecticut State Building Code" means the state building code as adopted under Section 29-252 of the Connecticut General Statutes**;**

10) "Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings" means a reference and support manual prepared to assist building teams to comply with sections 16a-38k-1 to 16a-38k-9 inclusive of the Regulations of Connecticut State Agencies, and available electronically on the Connecticut Office of Policy and Management website;

11) "Energy Star" means a program developed jointly by the United States Department of Energy and the United States Environmental Protection Agency that labels products to designate high levels of energy efficiency;

12) "Forest Stewardship Council" means a not-for profit, international membership-based organization that accredits third-party organizations to certify that forest managers and forest product producers support responsible forest management;

13) Green Globes system" means a green building design and management tool that includes a rating system and guide to encourage the integration of environmentally friendly design into buildings;

14) "Green Label Plus" means an independent testing program developed by the Carpet and Rug Institute to provide assurances that carpet and adhesive products meet stringent criteria for low chemical emissions;

15) "Halons" means a class of organic chemical compounds that contain carbon, fluorine and bromine and may contain chlorine and are destructive to the earth's ozone layer;

16) "Heat island effect" means local air and surface temperatures that are higher than nearby natural areas as a result of heat absorbing surfaces at a site;

17) "Hydrochlorofluorocarbons" or "HCFCs" means a class of chemical compounds containing hydrogen, chlorine, fluorine and carbon that are commonly used as substitute refrigerants to Chlorofluorocarbons because they are less damaging to the earth's ozone layer;

18) "Institute for Sustainable Energy" means the Institute for Sustainable Energy at Eastern Connecticut State University;

19) "Leadership in Energy and Environmental Design" or "LEED" means a rating system developed by the U. S. Green Building Council to encourage

environmental integrity, energy efficiency, healthy work spaces, and sustainable building practices in buildings;

20) "Low emitting and fuel efficient vehicles" means vehicles that are classified as zero emission vehicles by the California Air Resources Board or have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy annual vehicle rating guide;

21) "Minimum Efficiency Reporting Value" or "MERV" means a number ranging from one to sixteen that indicates the efficiency at which an air filter can remove particles, where one is the least efficient and sixteen is the most efficient at removing particles;

22) "New England Power Pool Generation Information System" or "NEPOOL-GIS" means a system that verifies and manages Renewable Energy Certificates that are the basis for environmental trading and investment incentives in the New England states;

23) "On-site renewable energy" means renewable energy systems located on the building or building site that produce electricity or hot water for use in the building. This includes solar photovoltaic systems, solar hot water systems, wind energy systems, and fuel cell systems;

24) "Pre-consumer recycled content" means that the materials used to make the product were recyclables from within the manufacturing process and never reached consumers;

25) "Preferred parking" means parking spots that are closest to the main entrance of the building, exclusive of handicap designated spaces;

26) "Project manager-facilitator" means whomever the Department of Public Works, Department of Transportation, Office of Legislative Management, the University of Connecticut, or municipality appoints as the lead individual responsible for a particular project;

27) "Post-consumer recycled content" means that the materials used to make a product were already used by a consumer and recycled;

28) "Renewable Energy Credit" or "REC" means a certificate representing one megawatt hour of renewable energy that is physically metered and verified from the generator or the renewable energy project;

29) "School renovation" means "renovation" as defined in section 10-282 of the Connecticut General Statutes;

30) "SDE Commissioner" means the commissioner of the State Department of Education;

31) "Secretary" means the secretary of the Office of Policy and Management;

32) "Solar Heat Gain Coefficient" or "SHGC" means a measure of how well a window blocks heat from sunlight. The SHGC is the fraction of the heat from the sun that enters through a window. It is expressed as a number between 0 and 1. The lower a window's SHGC, the less solar heat it transmits;

33) "Solar Reflectance Index" means a measure of a surface's ability to reflect solar heat, with white being one hundred and black being zero;

34) "State facility" means a building that is owned by the state of Connecticut;

35) "State facility renovation" means an undertaking whereby the designer manipulates the building envelope, electrical systems, mechanical systems, and efficiency of equipment for modification of performance, when costs are two million dollars or more. This includes entire buildings as well as isolated portions of the building;

36) "U. S. Green Building Council" means a membership organization dedicated to shaping the future of sustainable building design through the development of LEED rating system for building performance; and

37) "Volatile organic compound" or "VOC" means a class of chemicals that are emitted as gases from certain solids and liquids and that have short- and long-term adverse health effects.

(NEW) Section 16a-38k-2. Applicability

Sections 16a-35k-1 to 16a-35k-9 apply to:

(a) New construction of a state facility that is projected to cost five million dollars or more, and for which all budgeted project bond funds are allocated by the State Bond Commission on or after January 1, 2008;

(b) State facility renovation that is projected to cost two million dollars or more of which two million dollars or more is state funding, and is approved and funded on or after January 1, 2008;

(c) New construction of public school buildings costing five million dollars or more of which two million dollars or more is state funding, and is authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009; and

(d) School renovation that is projected to cost two million dollars or more of which two million dollars or more is state funding, and is authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009.

(NEW) Section 16a-38k-3. Mandatory Building Project Requirements

All building projects pursuant to section 16a-38k-2 of the Regulations of Connecticut State Agencies shall meet the minimum building standards outlined in subsections (a) through (*l*) of this section:

(a) Building commissioning shall be an integral part of the building project. Such commissioning shall be performed by an independent third-party, called a commissioning agent, who shall be certified as a commissioning agent by the Building Commissioning Association or the Association of Energy Engineers, and shall either be a Professional Engineer or have an S-1 license. This individual shall be included in the beginning stages of the building process through a post-occupancy evaluation. The commissioning agent shall not be an employee of the architectural, engineering, or construction firm that implements the project, and shall be hired directly by the state, municipality, or regional school district. For state facility projects, the commissioning agent may be an employee of the Department of Public Works provided such person shall act independently of the other staff
assigned to oversee the design and construction of the project. The commissioning agent shall report all findings and recommendations to the owner of the state facility or the municipal or regional school district. Coordination and oversight of the training of facility management and maintenance personnel on proper equipment operation as well as verification of proper development of systems manuals shall be overseen by the commissioning agent in cooperation with the project manager-facilitator and with the building owner, designer, contractor, and subcontractors who installed the systems. The commissioning process, at minimum, shall include the following energy-related systems: (1) heating, ventilating, air conditioning, and refrigeration systems and associated controls, (2) lighting and day-lighting controls, (3) domestic hot water systems, and (4) renewable energy systems. It is required that the commissioning process also include water using systems and the building envelope systems. **(page 1)**

(b) All building construction projects shall follow an integrated design process to set environmental and building performance goals. This process, at minimum, shall include at least one collaborative session of the design team consisting of the architect, mechanical engineer, electrical engineer, civil engineer, commissioning agent, the project manager-facilitator representing the building owner, and representative(s) of the building tenant state agency or municipality, as applicable, prior to the preparation of contract documentation. The meeting shall include the owner's project requirements, the basis of design, commissioning plan, performance verification documentation, commissioning report, and post commissioning requirements. Prior to the start of the construction phase, at least one collaborative session among the designers, owner, and contractors, including any selected electrical, mechanical, and controls subcontractors shall be held to insure knowledge of design intent, required approval processes, and commissioning procedures. All records of decisions from the collaborative sessions

shall be shared among the design team. The owner of the state facility or the municipal or regional school district shall have final decision making authority. **(page 6)**

(c) The base minimum energy performance for all building projects shall be twenty-one percent better than the most current Connecticut State Building Code or ASHRAE Standard 90.1-2004, whichever is more stringent. Base minimum energy performance shall be determined using approved building modeling software that is identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* **(page 9)**

(d) Energy consuming products installed in the building shall be Energy Star compliant if the product category has an Energy Star specification. **(page 11)**

(e) The project manager-facilitator shall develop an indoor air quality management plan for the construction phase of the project. As part of the plan, the following shall be addressed:

(1) Periodic inspections of materials stored on-site to ensure that all installed or stored absorptive materials are protected from moisture and mold damage. If resting on the ground, spacers shall be provided to allow air to circulate between the ground and the materials. All water-damaged materials shall be removed from the site and disposed of properly.
(2) Surface grades, drainage systems, and heating, ventilating and air conditioning condensate drainage systems shall be designed so as to prevent accumulation of water under, in, or near the building. Irrigation systems shall be designed so as to prevent spraying of the building.
(3) Ductwork shall be sealed from outside elements during transport and storage, and interior surfaces shall be wiped down immediately prior to installation. During installation, open ends of ductwork shall be temporarily sealed and ductwork shall be protected with surface wrapping. No installed ductwork shall contain internal porous insulation materials or lining.
(4) Heating, ventilation, and air conditioning (HVAC) equipment shall be covered and protected from moisture during transportation and on-site storage. For permanently installed air handlers used during construction, use filtration media in air handlers with a Minimum Efficiency Reporting Value (MERV) of ten, except for unit ventilator systems which shall have a minimum MERV of seven. All filtration media shall be replaced immediately prior to building occupancy with media having a MERV rating of equal or greater value to existing media.
(5) Materials that off-gas toxic or potentially toxic fumes shall be pre-conditioned for at least seventy-two hours prior to installation within the building. Such materials shall also be installed
prior to the installation of porous building materials to reduce absorption and adsorption of those toxins by the porous materials. Prior to installation of porous materials and materials vulnerable to mold, the building enclosure shall be watertight.
(6) In the event that any portion of the building is occupied during construction or renovation activities, the Sheet Metal and Air Conditioning Contractor's National

Association (SMACNA) *Indoor Air Quality Guidelines for Occupied Buildings Under Construction* shall be followed. **(page 13)**

(f) Use low-flow fixtures to consume twenty percent less water in aggregate as compared to base levels calculated by meeting the Federal Energy Policy Act of 1992 fixture performance requirements. Calculations shall be based on estimates of occupant usage and shall include the following building fixtures only: showers, urinals, toilets, bathroom sink faucets, and kitchen sink faucets. **(page 15)**

(g) The building or building site shall contain convenient areas to serve as collection points for recyclable materials and shall include an area for the sorting and storage of such materials for pick-up by recyclers. **(page 17)**

(h) All construction shall include a plan for erosion and sediment control, as required by sections 22a-325 through 22a-329 of the Connecticut General Statutes. **(page 18)**

(i) No smoking shall be permitted in any building or portion of a building owned and operated or leased and operated by the state or any political subdivision thereof as mandated by section 19a-342 of the Connecticut General Statutes. All exterior designated smoking areas shall be located at least twenty-five feet away from outdoor air intakes, operable windows, and building entrances. **(page 20)**

(j)A plan for integrated pest management as defined in section 22a-47 of the Connecticut General Statues, shall be established as required under section 22a-66*l* for general pest control in state buildings. Schools shall comply with sections 10-231d and 22a-66*l* of the Connecticut General Statutes. **(page 21)**

(k) Chlorofluorocarbon (CFC)-based refrigerants shall not be utilized for energy systems in new construction. For renovation projects where existing heating, ventilating and air conditioning equipment is reused, a CFC phase-out conversion shall be undertaken. **(page 23)**

(*l*) Buildings shall be designed to meet the minimum ventilation requirements of the current ASHRAE Standard 62.1 using the Ventilation Rate Procedure for mechanical systems. If the current Connecticut State Building Code contains more stringent requirements, it shall be used to meet minimum ventilation requirements. **(page 25)**

(NEW) Section 16a-38k-4. Building Standard Strategies for State Facilities

All building projects as defined in sections 16a-38k-2 (a) and 16a-38k-2 (b) of the Regulations of Connecticut State Agencies shall implement a minimum of twenty-six of the sixty strategies in subsections (a) through (f) of this section.

(a) (Energy efficiency and Renewable Energy- A minimum of one strategy in this subsection is required.

(1) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by three and one-half percent. **(page 26)**

(2) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by seven percent. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (a)(1) of this section. **(page 26)**

(3) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by ten and one-half percent. Selection of this strategy shall count as implementing three strategies since it is inclusive of the strategies listed in subsections (a)(1) and (a)(2) of this section. **(page 26)**

(4) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by fourteen percent. Selection of this strategy shall count as implementing four strategies since it is inclusive of the strategies listed in subsections (a)(1) through (a)(3) of this section. **(page 26)**

(5) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by seventeen and one-half percent. Selection of this strategy shall count as implementing five strategies since it is inclusive of the strategies listed in subsections (a)(1) through (a)(4) of this section. **(page 26)**

(6) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by twenty-one percent. Selection of this strategy shall count as implementing six strategies since it is inclusive of the strategies listed in subsections (a)(1) through (a)(5) of this section. **(page 26)**

(7) The installation of on-site renewable energy shall provide at least three percent of the building energy needs based upon the most recent version of the U. S. Department of Energy Commercial Buildings Energy Consumption survey for estimated electricity usage or by using modeling software that is identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* The facility shall retain ownership of associated renewable energy credits (RECs) for a period of two years. **(page 26)**

(8) Same as in section 16a-38k-4(a)(7) except at least seven percent of the building energy needs are met through on-site renewable energy. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (a)(7) of this section. **(page 26)**

(9) Same as in section 16a-38k-4(a)(7) except at least ten percent of building energy needs are met through on-site renewable energy. Selection of this strategy shall count as implementing three strategies since it is inclusive of the strategies listed in subsections (a)(7) and (a)(8) of this section. **(page 26)**

(10) The facility shall have a two-year contract to purchase at least thirty-five percent of the building's annual electricity consumption from a Class I renewable energy source. Alternately, the purchase may be in the form of New England Power Pool Generation Information System (NEPOOL-GIS) renewable energy credits (RECs); or if procuring RECs outside of the NEPOOL-GIS, the RECs shall be equivalent to Class I renewable resources and certified by a nationally recognized certification organization as identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* Baseline electric usage can be determined using either the most recent

version of the U. S. Department of Energy Commercial Buildings Energy Consumption survey for estimated electricity usage or by using building modeling software that is identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*. RECs purchased to comply with this subsection shall not be purchased from a facility that has installed renewable energy systems for credit under subsections (a)(7) through (a)(9) of this section. **(page 28)**

(11) Develop a measurement and verification plan for energy usage, to cover a period of at least one year after occupancy. **(page 30)**

(b) Indoor Environment -A minimum of two strategies in this subsection are required.

(1) Install permanent indoor air monitoring systems to provide performance feedback on ventilation systems. Such monitoring systems, at minimum, shall include devices to measure temperature, relative humidity, carbon dioxide, and dew point. Carbon dioxide measurement sensors shall measure both interior and exterior levels of CO2. **(page 31)**

(2) Provide increased outdoor ventilation by designing mechanical ventilation systems to exceed the minimum rates required by the current Connecticut State Building Code or the current version of the ASHRAE Standard 62.1, whichever is more stringent, by thirty percent. **(page 31)**

(3) After construction ends and with all interior finishes installed but prior to building occupancy, flush the building continuously for at least ten days with outside air while maintaining an internal temperature between 60°F and 78°F and relative humidity no higher than 60%. Do not “bake out” the building by increasing the temperature of the space. Alternatively, use the following strategy: Flush out each space separately until 3,500 cubic feet of outside air per square foot of floor space has been delivered to that space. The space shall then be ventilated at the rate of 0.3 cubic feet per minute per square foot of floor space or the design minimum outside air rate, whichever is greater. This shall be performed for a minimum of three hours prior to occupancy and then during occupancy until a total of 14,000 cubic feet of outside air per square foot of floor area has been delivered to that space. **(page 32)**

(4) Adhesives and sealants used in the interior of the building shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* **(page 32)**

(5) Paints and coatings used in the interior of the building shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.*6) All carpet, carpet adhesive products and carpet cushion installed in the building interior shall meet current testing and product requirements of the Carpet and Rug Institute’s Green Label Plus program. **(page 32)**

(6) All carpet, carpet adhesive products and carpet cushion installed in the building interior shall meet current testing and product requirements of the Carpet and Rug Institute's Green Label Plus program. **(page 33)**

(7) All composite wood and agrifiber products used within the shell of the building shall meet the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers*, including 2004 Addenda. **(page 33)**

(8) To protect building occupants from potentially hazardous particulates and pollutants, building design shall control entry of pollutants and excess moisture into buildings and later cross-contamination of regularly occupied areas at all entries directly connecting to the outdoors through the use of permanent entryway systems to capture, dirt, particulates, and moisture. Such entryway systems shall be a minimum of six feet long and may be permanently installed grates, grills, or slotted systems that allow for cleaning underneath. Outside air intakes shall be located a minimum of twenty-five feet from any hazard or noxious contaminants such as vents, chimneys, plumbing vents, exhaust fans, cooling towers, street alleys, parking lots, loading docks, dumpster areas, or any area where vehicle idling occurs. If locating an air intake within twenty-five feet of a contaminant source is unavoidable, the intake must be located a minimum of ten feet horizontal distance and two feet lower than the contaminant source. **(page 33)**

(9) Allow for individual lighting control for ninety percent or more of the building occupants to allow for adjustments to suit individual tasks and preferences and provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences. **(page 34)**

(10) Using conditions for thermal comfort described in the current version of the ASHRAE Standard 55, allow for individual thermal comfort control for fifty percent or more of the building occupants to allow for adjustments to suit individual tasks and preferences and provide thermal system comfort controllability for all shared multi-occupant spaces to enable adjustment that meets group needs and preferences. **(page 34)**

(11) Building facility personnel, under direction of the building owner, shall administer an anonymous survey for building occupants within the first twelve months after initial occupancy to assess occupant satisfaction and implement corrective actions for recurrent issues. At minimum, the survey shall cover thermal building comfort, lighting, security issues, indoor air quality, functionality of space, and acoustics. If greater than 20% of the respondents express dissatisfaction with any specific issue, the building owner shall prepare a plan for remedial action. **(page 34)**

(12) Demonstrate through computer software simulations or through recording of indoor light measurements that a minimum illumination level of twenty-five foot-candles has been achieved from daylight in at least seventy-five percent of all regularly occupied areas. **(page 34)**

(13) There shall be a direct line of sight to the outdoor environment via window glazing between two and one-half to seven and one half feet above the finished floor for seventy percent of all regularly occupied areas. **(page 35)**

(13) Where chemical use occurs, including housekeeping areas, chemical storage and mixing areas, and copy/print rooms, use dedicated exhaust to ventilate the space at a minimum of 0.5 cubic feet per minute per square foot with adequate make-up air. No recirculation is permitted and such spaces shall have a negative air pressure of at least five pascal (.02 inches of water gauge) to a minimum of one pascal (0.004 inches of water gauge) when the doors are closed. **(page 35)**

(c) Water efficiency- A minimum of one strategy in this subsection is required.

(1) Same as in section 16a-38k-3(f), except that the conserving strategies use thirty percent less water in aggregate. **(page 36)**
(2) Reduce by fifty percent the amount of water required for landscaping from a modeled, mid-summer baseline usage case. Reductions may be attributed to the use of captured rainwater, recycled waste (grey) water, efficiency of irrigation strategies, and use of drought resistant plant species. This strategy only applies to renovation projects. **(page 36)**
(3) Use landscaping that does not require a permanent irrigation system or uses non-potable water for irrigation. Any system installed for irrigation using potable water shall only be utilized for plant establishment and be removed prior to one year of building occupancy. **(page 36)**
(4) Reduce potable water use by half through water conserving fixtures and/or use of non-potable water using methodologies stated in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* This strategy only applies to renovation projects. **(pages 15 and 36)**

(d) Recycling, Reuse, and Sustainability- A minimum of two strategies in this subsection are required.

(1) Retain at least seventy-five percent, by surface area, of an existing building structure, including structural floor and roof decking, exterior framing, and envelope surface, but excluding window assemblies and non-structural roofing material. This strategy only applies to renovation projects. **(page 38)**
(2) Same as in section 16a-38k-4(d)(1), except that a total of ninety-five percent of the building structure is retained. This strategy only applies to renovation projects. This strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(1) of this section. **(page 38)**
(3) Use existing non-structural elements such as interior walls, doors, floor coverings and ceiling systems in at least half (by square footage) of the completed building. This strategy only applies to renovation projects. **(page 38)**
(4) Recycle or salvage at least half of non-hazardous construction and demolition debris. **(page 38)**
(5) Same as in section 16a-38k-4(d)(4), except that a total of seventy-five percent of non-hazardous construction and demolition debris is recycled or salvaged. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(4) of this section. **(page 38)**

(6) Use five percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project. Only permanently installed materials can by used in calculations. **(page 38)**

(7) Same as in section 16a-38k-4 (d)(6), except that a total of ten percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project shall be used. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(6) of this section. **(page 38)**

(8) Use materials where the weighted average of recycled materials content is ten percent, based on cost, of the total value of the materials in the project. Recycled content value of a material assembly shall be determined by weight. The weighted average shall be determined using the following formula:
Weighted average of recycled materials equals the percentage of post consumer content plus one-half the percentage of pre-consumer content. **(page 39)**

(9) Same as section 16a-38k-4(d)(8), except that the weighted average of recycled materials shall constitute at least twenty percent , based on cost, of the total value of the materials in the project. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(8) of this section. **(page 39)**

(10) Use a minimum of ten percent of building materials extracted or manufactured within a five-hundred mile radius of the building site. **(page 39)**

(11) Same as in section 16a-38k-4(d)(10), except that a minimum of twenty percent of building materials extracted or manufactured within a five-hundred mile radius of the building site shall be used. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(10) of this section. **(page 39)**

(12) Use building materials and products that are made from plants harvested in a ten-year or shorter cycle. Two and one-half percent of the total value of building materials and products, based on costs, must be used in the project. **(page 39)**

(13) At least half of permanently installed wood and wood-based products shall be certified in accordance with the current Forest Stewardship Council (FSC) principles and criteria. **(page 40)**

(e) Site Selection and Development- A minimum of two strategies in this subsection are required.

(1) Construct or renovate the building on a previously developed site and within one-half mile of a residential zone/neighborhood with an average density of ten units per acre net and within one half mile of a minimum of ten basic services as described in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings* and with pedestrian access between the building and the services. **(page 41)**

(2) Develop on a site that is defined as a brownfield by a local, state, or federal government agency. **(page 41)**

(3) Select a site that has access to public transportation. Public transportation is considered accessible if the site is located within one-third of a mile to an existing

commuter rail station or located within one quarter mile of a public commuter bus line. **(page 42)**

(4) Encourage bicycle transportation by providing secure bicycle racks or storage within five-hundred feet of a building entrance for a minimum of five percent of building users at peak times and shower and changing facilities must be provided in the building or within five-hundred feet of the building. For residential buildings, covered storage facilities shall be provided for securing bicycles for a minimum of fifteen percent of building occupants. **(page 42)**

(5) Encourage the use of low-emitting and fuel efficient vehicles by providing preferred parking for low-emitting and fuel efficient vehicles for five percent of the total parking capacity at the site. **(page 42)**

(6) Reduce pollution from single occupancy vehicle use by sizing parking capacity to meet, but not exceed minimum local zoning requirements; provide designated preferred parking for carpools or vanpools for five percent of the total provided parking spaces; and provide infrastructure and support programs to facilitate shared vehicle usage such as ride sharing bulletin boards and shuttle services to mass transit. **(page 42)**

(7) Protect existing natural areas or restore damaged areas to promote biodiversity. Any site disturbances shall be limited to no more than forty feet beyond the building perimeter; ten feet beyond surface walkways, patios, surface parking and utilities less than twelve inches in diameter; fifteen feet beyond primary roadway curbs and main utility branch trenches; and twenty-five feet beyond constructed areas with permeable surfaces, such as playing fields, that require additional staging areas in order to limit compaction in the constructed area. For previously developed or graded sites, restore or protect to a minimum of fifty percent of the site area, excluding the building footprint, to plant species indigenous to the locality or to cultivars of native plants adapted to the local climate conditions and not considered invasive species or noxious weeds. Except for playing fields and picnic areas, minimize lawn areas to less than ten percent of the building site landscape. **(page 43)**

(8) Maximize open space at the site. Provide vegetated open space within the project boundary to exceed the local zoning's open space requirement by twenty-five percent; where there is no local zoning requirement, provide vegetated open space adjacent to the building that, at minimum, is equal to the building footprint. **(page 43)**

(9) Design the site to minimize storm water runoff by implementing a storm water management plan that results in a twenty-five percent reduction in peak run-off rates for a two-year, twenty-four hour storm design from pre-construction to developed conditions; and implement a storm water management plan that results in a twenty-five percent decrease in run-off volume of storm water runoff from the one hundred-year, twenty-four hour storm design from existing to developed conditions. **(page 43)**

(10) Design the site to minimize pollutants in storm water runoff by implementing a storm water management plan that reduces impervious cover, promotes infiltration, redirects water to pervious areas or storage reservoirs that treats storm water runoff from ninety percent of the average annual rainfall. **(page 44)**

(11) Reduce heat island effect at the site by utilizing any combination of the use of native shade species, paving materials with a solar reflectance index of at least twenty-nine, and/or an open grid pavement system for fifty percent or more of the site parking, sidewalk and road areas; or place at least fifty percent of parking spaces under a covering, such as the a deck, a roof, underground or the building itself. Any roof used to cover parking spaces must have a solar reflectance index of at least twenty-nine. **(page 44)**

(12) Reduce heat island effect through roofing selection by either installing native vegetation on at least fifty percent of the roof area or by using a roofing material that has a solar reflectance index equal to or greater than the values in the following table on at least seventy-five percent of the roof surface **(page 44)**:

Roof Type	**Slope**	**Solar Reflectance Index**
Low-Sloped Roof	**≤ 2:12**	**78**
Steep-Sloped Roof	**> 2:12**	**29**

(13) Reduce light pollution from the site. In addition to requirements mandated in Section 4b-16 of the Connecticut General Statutes, automatic controls to turn off lights during non-business hours shall be installed on all non-emergency interior lighting. Manual override capability may be provided for after hours use. Exterior lighting shall be provided only in areas where lighting is required for safety and comfort. Light fixtures shall not be installed where the main purpose is to light building facades or landscape features. Exterior building-mounted lighting fixtures that are only needed during building operation shall be controlled by a time-clock with an easily accessible manual control. Lighting of flags, signs, and monuments shall be limited to fifty watts per fixture and shall incorporate shielding devices to minimize light pollution. No more than two fixtures may be used for each flag, sign or monument. **(page 44)**

(14) Building orientation shall be such that the east/west glazing exposure is minimized. South windows shall have an external overhang to entirely shade adjacent windows during the summer solstice or shall utilize glazing with a solar heat gain coefficient of less than or equal to 0.4. Shading mechanisms or glazing with a solar heat gain coefficient less than or equal to 0.4 shall be installed at eastern and western exposure windows to minimize solar heat gain early and late in the day respectively. **(page 45)**

(15) Buildings, roads, parking areas, sidewalks, or other impervious surfaces shall not be built in any area that is inconsistent with the state plan of conservation and development. **(page 45)**

(f) Operations and Procedures/Innovation – No minimum number of strategies are required for this subsection.

(1) Do not install fire suppression systems that contain chlorofluorocarbons (CFCs), hydro chlorofluorocarbon (HCFCs) or halons. Select refrigerants and heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems that minimize

or eliminate compounds contributing to ozone layer depletion and global warming. If refrigerants are used, the mechanical room shall have leak detection equipment installed. **(page 48)**

(2) Utilize innovative high performance features or technologies that exceed any existing mandatory requirement as specified in Section 16a-38k-3 or optional measure within Section 16a-38k-4. **(page 49)**

(3) In settings where a central plant provides energy to multiple buildings or in cases where multiple buildings are fed from the same fuel source, new construction or major renovation shall include metering and other such equipment necessary to evaluate energy and water consumption. **(page 49)**

(NEW) Section 16a-38k-5. Additional Mandatory Building Project Requirements for Schools.

In addition to complying with the requirements set forth in Section16a-38k-3 of the Regulations of Connecticut State Agencies, all building projects as defined in sections 16a-38k-2(c) and 16a-38k-2(d) of the Regulations of Connecticut State Agencies shall meet the following mandatory requirements.

(a) All classrooms, including art rooms, music rooms, science rooms, computer rooms, and special needs, remedial and library space shall meet the acoustical standards as required under section 10-285g of the Connecticut General Statutes. **(page 50)**

(b) Outside air intakes shall be located a minimum of twenty-five feet from any hazard or noxious contaminants such as vents, chimneys, plumbing vents, exhaust fans, cooling towers, street alleys, parking lots, loading docks, dumpster areas, bus loops, or any area where vehicle idling occurs. If locating an air intake within twenty-five feet of a contaminant source is unavoidable, the intake must be located a minimum of ten feet horizontal distance and two feet lower than the contaminant source. **(page 51)**

(c) Only electronic ignitions shall be specified for gas-fired water heaters, boilers, furnaces, air handling units, and stovetops/ovens. **(page 52)**

(d) The following materials shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*:

(1) 50% of adhesives and sealants used in the interior of the building;
(2) Acoustic ceiling tiles and wall panels;
(3) Interior paints;
(4) Wall coverings;
(5) Carpet systems and associated adhesives;
(6) Composite and solid wood flooring;
(7) Resilient flooring and associated adhesives. **(page 53)**

(e) The town or regional board of education and the building committee of such town or district, shall provide for a Phase I environmental site assessment in accordance with

the American Society for Testing and Materials Standard #1527, Standard Practice for Environmental Site Assessments: Phase I Site Assessment Process, or similar subsequent standards, as required pursuant to Section 10-291 of the Connecticut General Statutes. If a town, regional board of education or the building committee of such town or district suspect contamination, a Phase II Environmental Site Assessment shall be undertaken as described in American Society for Testing and Materials Standard E1903-97 or similar subsequent standards. Any contamination found shall be remedied. **(page 54)**

(f) Prior to substantial completion of the building, vacuum all carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum. For phased or occupied renovations, HEPA vacuum the carpet daily in occupied areas. **(page 56)**

(NEW) Section 16a-38k-6. Building Standard Strategies for Schools.

All building projects as defined in sections 16a-38k-2(c) and 16a-38k-2(d) of the Regulations of Connecticut State Agencies shall implement a minimum of twenty-eight of the fifty-nine strategies in subsections (a) through (f) of this section:

(a) Energy efficiency and Renewable Energy- A minimum of one strategy in this subsection is required.
  (1) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by three and one-half percent. **(page 57)**
  (2) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by seven percent. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (a)(1) of this section. **(page 57)**
  (3) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by ten and one-half percent. Selection of this strategy shall count as implementing three strategies since it is inclusive of the strategies listed in subsections (a) (1) and (a)(2) of this section. **(page 57)**
  (4) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by fourteen percent. Selection of this strategy shall count as implementing four strategies since it is inclusive of the strategies listed in subsections (a)(1) through (a)(3) of this section. **(page 57)**
  (5) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by seventeen and one-half percent. Selection of this strategy shall count as implementing five strategies since it is inclusive of the strategies listed in subsections (a)(1) through (a)(4) of this section. **(page 57)**
  (6) Same as in section 16a-38k-3(c) except that the percentage improvement over base is increased by twenty-one percent. Selection of this strategy shall count as implementing six strategies since it is inclusive of the strategies listed in subsections (a)(1) through (a)(5) of this section. **(page 57)**
  (7) The installation of on-site renewable energy shall provide at least three percent of the building energy needs based upon the most recent version of the U. S. Department of Energy Commercial Buildings Energy Consumption survey for

estimated electricity usage or by using modeling software that is identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*. **(page 57)**

(8) Same as in section 16a-38k-6(a)(7) except at least seven percent of the building energy needs are met through on-site renewable energy. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (a)(7) of this section. **(page 57)**

(9) Same as in section 16a-38k-6(a)(7) except at least ten percent of building energy needs are met through on-site renewable energy. Selection of this strategy shall count as implementing three strategies since it is inclusive of strategies listed in subsections (a)(7) and (a)(8) of this section. **(page 57)**

(10) The facility shall have a two-year contract to purchase at least thirty-five percent of the building's annual electricity consumption from a Class I renewable energy source. Alternately, the purchase may be in the form of New England Power Pool Generation Information System (NEPOOL-GIS) renewable energy credits (RECs); or if procuring RECs outside of the NEPOOL-GIS, the RECs shall be equivalent to Class I renewable resources and certified by a nationally recognized certification organization as identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* Baseline electric usage can be determined using either the most recent version of the U. S. Department of Energy Commercial Buildings Energy Consumption survey for estimated electricity usage or by using building modeling software that is identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* **(page 59)**

(11) Develop a measurement and verification plan for energy usage, to cover a period of at least one year after occupancy. **(page 61)**

(b) Indoor Environment- A minimum of two strategies in this subsection are required.

(1) Install permanent indoor air monitoring systems to provide performance feedback on ventilation systems. Such monitoring systems, at minimum, shall include devices to measure temperature, relative humidity, carbon dioxide, and dew point. Carbon dioxide measurement sensors shall measure both interior and exterior levels of CO2. **(page 62)**

(2) Provide increased outdoor ventilation by designing mechanical ventilation systems to exceed the minimum rates required by the current Connecticut State Building Code or the current version of the ASHRAE Standard 62.1, whichever is more stringent, by thirty percent. **(page 62)**

(3) After construction ends and with all interior finishes installed but prior to building occupancy, flush the building continuously for at least ten days with outside air while maintaining an internal temperature between 60°F and 78°F and relative humidity no higher than 60%. Do not "bake out" the building by increasing the temperature of the space. Alternatively, use the following strategy: Flush out each space separately until 3,500 cubic feet of outside air per square foot of floor space has been delivered to that space. The space shall then be ventilated at the rate of 0.3 cubic feet per minute per square foot of floor space or the design minimum outside air rate, whichever is greater. This shall be performed for a

minimum of three hours prior to occupancy and then during occupancy until a total of 14,000 cubic feet of outside air per square foot of floor area has been delivered to that space. **(page 62)**

(4) All composite wood and agrifiber products used within the shell of the building shall meet the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers*, including 2004 Addenda. **(page 63)**

(5) For administrative offices and other regularly occupied spaces, allow for individual lighting control for ninety percent or more of the building occupants in workspaces to allow for adjustments to suit individual tasks and preferences. For classroom and core learning spaces, with the exception of chemistry laboratories, art and music rooms, shops, and gyms, install two modes of illumination: general illumination and audio visual illumination. General illumination mode shall achieve desk level illumination of 30-50 foot-candles; audio visual mode shall achieve a desk level illumination of 10 to 20 foot-candles while limiting vertical illumination at a projection screen of no more than seven foot-candles. All lighting fixtures shall include glare control features. **(page 63)**

(6) Using the current version of the ASHRAE Standard 55, allow for individual thermal comfort control in administrative areas for fifty percent or more of the building occupants to allow for adjustments to suit individual tasks and preferences and provide thermal system comfort controllability for all shared multi-occupant spaces such as classrooms, auditoriums, and gyms to enable adjustment that meets group needs and preferences. **(page 64)**

(7) Building facility personnel, under direction of the building owner, shall administer an anonymous survey for building occupants within the first twelve months after initial occupancy to assess occupant satisfaction and implement corrective actions for recurrent issues. At minimum, the survey shall cover thermal building comfort, lighting, security issues, indoor air quality, functionality of space, and acoustics. If greater than 20% of the respondents express dissatisfaction with any specific issue, the building owner shall prepare a plan for remedial action. **(page 64)**

(8) Demonstrate through computer software simulations or through recording of indoor light measurements that a minimum illumination level of twenty-five foot-candles has been achieved from daylight in at least seventy-five percent of all regularly occupied areas. **(page 64)**

(9) There shall be a direct line of sight to the outdoor environment via window glazing between two and one-half to seven and one half feet above the finished floor for seventy percent of all regularly occupied areas. **(page 64)**

(10) To prevent mold, heating, ventilating and air conditioning systems (HVAC) shall be designed to limit space relative humidity to 60% or less during load conditions whether the building is occupied or non-occupied; an ongoing indoor air quality management plan shall be implemented as required under section 10-220 of the Connecticut General Statutes, using the U. S. Environmental Protection Agency's (EPA) Indoor Air Quality *Tools for Schools* Program; and the criteria of sections

16a-38k-6(b)(6) and 16a-38k-6(b)(7) of the Regulations of Connecticut State Agencies shall be met. **(page 64)**

(11) Student and teacher classroom chairs, desks, and tables manufactured, refurbished or refinished within one year prior to building occupancy and used within the building interior shall be certified for low chemical emissions by the certifying organization listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*. **(page 65)**

(12) Where chemical use occurs, including housekeeping areas, chemical mixing areas, photo labs, science labs, art rooms, and copy/print rooms, use dedicated exhaust to ventilate the space at a minimum of 0.5 cubic feet per minute per square foot with adequate make-up air. No recirculation is permitted and such spaces shall have a negative air pressure of at least five pascal (.02 inches of water gauge) to a minimum of one pascal (0.004 inches of water gauge) when the doors are closed. **(page 65)**

(13) Building design shall control entry of pollutants and excess moisture into buildings and later cross-contamination of regularly occupied areas at all high volume entryways and those adjacent to playing fields and locker rooms through the use of three-part walk-off systems and the proper placement of outside air intakes. Walk-off systems shall include a grate or grill outside the entryway for removing dirt and snow, a drop through mat system within the vestibule, and a fifteen foot interior walk-off mat. **(page 65)**

(c) Water efficiency- A minimum of one strategy in this subsection is required.

(1) Same as in section 16a-38k-3(f), except that the conserving strategies use thirty percent less water in aggregate. **(page 67)**

(2) Reduce by fifty percent the amount of water required for landscaping from a modeled, mid-summer baseline usage case. Reductions may be attributed to the use of captured rainwater, recycled waste (grey) water, efficiency of irrigation strategies, and use of drought resistant plant species. This strategy only applies to renovation projects. **(page 67)**

(3) Use landscaping that does not require a permanent irrigation system or uses non-potable water for irrigation. Any system installed for irrigation using potable water shall only be utilized for plant establishment and be removed prior to one year of building occupancy. **(page 67)**

(4) Reduce potable water use by half through water conserving fixtures and/or use of non-potable water using methodologies stated in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.* This strategy only applies to renovation projects. **(pages 15 & 67)**

(d) Recycling, Reuse, and Sustainability-A minimum of two strategies in this subsection are required.

(1) Retain at least seventy-five percent, by surface area, of an existing building structure, including structural floor and roof decking, exterior framing, and

envelope surface, but excluding window assemblies and non-structural roofing material. This strategy only applies to renovation projects. **(page 69)**

(2) Same as section 16a-38k-6(d)(1), except that a total of ninety-five percent of the building structure is retained. This strategy only applies to renovation projects. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d) (1) of this section. **(page 69)**

(3) Use existing non-structural elements such as interior walls, doors, floor coverings and ceiling systems in at least half (by square footage) of the completed building. This strategy only applies to renovation projects. **(page 69)**

(4) Recycle or salvage at least half of non-hazardous construction and demolition debris. **(page 69)**

(5) Same as section 16a-38k-6(d)(4), except that a total of seventy-five percent of non-hazardous construction and demolition debris is recycled or salvaged. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(4) of this section. **(page 69)**

(6) Use five percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project. Only permanently installed materials can by used in calculations. **(page 69)**

(7) Same as section 16a-38k-6(d)(6), except that a total of ten percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project shall be used. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(6) of this section. **(page 69)**

(8) Use materials where the weighted average of recycled materials content is ten percent, based on cost, of the total value of the materials in the project. Recycled content value of a material assembly shall be determined by weight. The weighted average shall be determined using the following formula:
Weighted average of recycled materials equals the percentage of post consumer content plus one-half the percentage of pre-consumer content. **(page 70)**

(9) Same as section 16a-38k-6(d)(8), except that the weighted average of recycled materials shall constitute at least twenty percent , based on cost, of the total value of the materials in the project. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(8) of this section. **(page 70)**

(10) Use a minimum of ten percent of building materials extracted or manufactured within a five-hundred mile radius of the building site. **(page 70)**

(11) Same as in section 16a-38k-6(d)(10), except that a minimum of twenty percent of building materials extracted or manufactured within a five-hundred mile radius of the building site shall be used. Selection of this strategy shall count as implementing two strategies since it is inclusive of the strategy listed in subsection (d)(10) of this section. **(page 70)**

(12) Use building materials and products that are made from plants harvested in a ten-year or shorter cycle. Two and one-half percent of the total value of building materials and products, based on costs, must be used in the project. **(page 70)**

(13) At least half of permanently installed wood and wood-based products shall be certified in accordance with the current Forest Stewardship Council (FSC) principles and criteria. **(page 71)**

(e) Site Selection and Development- A minimum of two strategies in this subsection are required.

(1) Construct or renovate the building on a previously developed site and within one-half mile of a residential zone/neighborhood with an average density of ten units per acre net and within one half mile of a minimum of ten basic services as described in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings* and with pedestrian access between the building and the services. **(page 72)**

(2) Select a site that has access to public transportation. Public transportation is considered accessible if the site is located within one-third of a mile to an existing commuter rail station or located within one quarter mile of a public commuter bus line. **(page 72)**

(3) Encourage bicycle transportation by providing secure bicycle racks or storage within five-hundred feet of a building entrance for a minimum of five percent of building users at peak times and shower and changing facilities must be provided in the building or within five-hundred feet of the building. **(page 73)**

(4) Encourage the use of low-emitting and fuel efficient vehicles by providing preferred parking for low-emitting and fuel efficient vehicles for five percent of the total parking capacity at the site. **(page 73)**

(5) Reduce pollution from single occupancy vehicle use by sizing parking capacity to meet, but not exceed minimum local zoning requirements; provide designated preferred parking for carpools or vanpools for five percent of the total provided parking spaces; and provide infrastructure and support programs to facilitate shared vehicle usage such as ride sharing bulletin boards and shuttle services to mass transit. **(page 73)**

(6) Protect existing natural areas or restore damaged areas to promote biodiversity. Any site disturbances shall be limited to no more than forty feet beyond the building perimeter; ten feet beyond surface walkways, patios, surface parking and utilities less than twelve inches in diameter; fifteen feet beyond primary roadway curbs and main utility branch trenches; and twenty-five feet beyond constructed areas with permeable surfaces, such as playing fields, that require additional staging areas in order to limit compaction in the constructed area. For previously developed or graded sites, restore or protect to a minimum of fifty percent of the site area, excluding the building footprint, to plant species indigenous to the locality or to cultivars of native plants adapted to the local climate conditions and not considered invasive species or noxious weeds. Except for playing fields and picnic areas, minimize lawn areas to less than ten percent of the building site landscape. **(page 73)**

(7) Maximize open space at the site. Provide vegetated open space within the project boundary to exceed the local zoning's open space requirement by twenty-five percent; where there is no local zoning requirement, provide vegetated open space

adjacent to the building that, at minimum, is equal to the building footprint. **(page 74)**

(8) Design the site to minimize storm water runoff by implementing a storm water management plan that results in a twenty-five percent reduction in peak run-off rates for a two-year, twenty-four hour storm design from pre-construction to developed conditions; and implement a storm water management plan that results in a twenty-five percent decrease in run-off volume of storm water runoff from the one hundred-year, twenty-four hour storm design from existing to developed conditions. **(page 74)**

(9) Design the site to minimize pollutants in storm water runoff by implementing a storm water management plan that reduces impervious cover, promotes infiltration, and redirects water to pervious areas or storage reservoirs that treats storm water runoff from ninety percent of the average annual rainfall. **(page 74)**

(10) Reduce heat island effect at the site by utilizing any combination of the use of native shade species, paving materials with a solar reflectance index of at least twenty-nine, and/or an open grid pavement system for fifty percent or more of the site parking, sidewalk and road areas; or place at least fifty percent of parking spaces under a covering, such as the a deck, a roof, underground or the building itself. Any roof used to cover parking spaces must have a solar reflectance index of at least twenty-nine. **(page 74)**

(11) Reduce heat island effect through roofing selection by either installing native vegetation on at least fifty percent of the roof area or by using a roofing material that has a solar reflectance index equal to or greater than the values in the following table on at least seventy-five percent of the roof surface **(page 74)**:

Roof Type	**Slope**	**Solar Reflectance Index**
Low-Sloped Roof	**≤ 2:12**	**78**
Steep-Sloped Roof	**> 2:12**	**29**

(12) Reduce light pollution from the site. In addition to requirements mandated in Section 4b-16 of the Connecticut General Statutes, automatic controls to turn off lights during non-business hours shall be installed on all non-emergency interior lighting. Manual override capability may be provided for after hours use. Exterior lighting shall be provided only in areas where lighting is required for safety and comfort. Light fixtures shall not be installed where the main purpose is to light building facades or landscape features. Exterior building-mounted lighting fixtures that are only needed during building operation shall be controlled by a time-clock with an easily accessible manual control. Lighting of flags, signs, and monuments shall be limited to fifty watts per fixture and shall incorporate shielding devices to minimize light pollution. No more than two fixtures may be used for each flag, sign or monument. Sports field lighting shall be controlled automatically for shut-off no later than eleven PM, with manual override to prevent disruption of school-sponsored events. **(page 75)**

(13) Building orientation shall be such that the east/west glazing exposure is minimized. South windows shall have an external overhang to entirely shade

adjacent windows during the summer solstice or shall utilize glazing with a solar heat gain coefficient of less than or equal to 0.4. Shading mechanisms or glazing with a solar heat gain coefficient less than or equal to 0.4 shall be installed at eastern and western exposure windows to minimize solar heat gain early and late in the day respectively. **(page 75)**

(14) Buildings shall not be constructed on land that is lower than five feet above the elevation of the 100 year flood as defined by the Federal Emergency Management Agency or its successor agency; and buildings, roads, parking areas, sidewalks, or other impervious surfaces shall not be built in any area that is inconsistent with the applicable municipal plan of conservation and development prepared in accordance with section 8-23 of the Connecticut General Statutes. **(page 76)**

(15) The school building shall be sited on land away from sources of unreasonable excess noise, such as highways, airport flight paths, and areas that are subject to unreasonable noise from agricultural or industrial equipment use. **(page 76)**

(f) Operations and Procedures/Innovation – No minimum number of strategys are required for this subsection.

(1) Do not install fire suppression systems that contain chlorofluorocarbons (CFCs), hydro chlorofluorocarbon (HCFCs) or halons. Select refrigerants and heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems that minimize or eliminate compounds contributing to ozone layer depletion and global warming. If refrigerants are used, the mechanical room shall have leak detection equipment installed. **(page 78)**

(2) Utilize innovative high performance features or technologies that exceed any existing mandatory requirements as specified in sections 16a-38k-3 and 16a-38k-5 or optional measures within Section 16a-38k-6. **(page 78)**

(3) Integrate the sustainable features of the school building into the educational curriculum within the first full year of school operation. **(page 78)**

(NEW) Section 16a-38k-7 Alternative Strategies to Section 16a-38k-4 of the Regulations of Connecticut State Agencies or Section 16a-38k-6 of the Regulations of Connecticut State Agencies. (page 80)

(a) As an alternate to meeting the criteria in section 16a-38k-4 of the Regulations of Connecticut State Agencies, a project as defined by sections 16a-38k-2(a) and 16a-38k-2(b) of the Regulations of Connecticut State Agencies may meet the requirements under section 16a-38k-4 of the Regulations of Connecticut State Agencies by receiving a Leadership in Energy and Environmental Design (LEED) Silver level certification from the United States Green Building Council, or by receiving a Two-Globe rating from the Green Globe system self certification program, providing that the project includes all mandatory requirements within sections 16a-38k-3 and 16a-38k-8 of the Regulations of Connecticut State Agencies.

(b) As an alternate to meeting the criteria in section 16a-38k-6 of the Regulations of Connecticut State Agencies, a project as defined by sections 16a-38k-2(c) and 16a-38k-2(d) of the Regulations of Connecticut State Agencies may meet the requirements under section 16a-38k-6 of the Regulations of Conneticut State Agencies by receiving a Leadership in Energy and Environmental Design (LEED) Silver level certification from the United States Green Building Council, or by meeting the criteria set forth in the Northeast Collaborative for High Performance School Protocol, also known as NE-CHPS, providing that the project includes all mandatory requirements within sections 16a-38k-3, 16a-38k-5, and 16a-38k-8 of the Regulations of Connecticut State Agencies.

(NEW) Section 16a-38k-8. Reporting Requirements

(a) For projects as defined in sections 16a-38k-2(a) and 16a-38k-2(b) of the Regulations of Connecticut State Agencies:

(1) Upon successful awarding of the design contract, the design team shall provide a letter to both the commissioner and the secretary listing the project timeline and members of the design team and indicating understanding of the requirements of sections 16a-38k-1 through 16a-38k-9 of the Regulations of Connecticut State Agencies.

(2) Upon design development completion, a report shall be submitted to the Secretary and the Commissioner by the project manager facilitator on behalf of and signed off by the agency/municipality that will be responsible for the ongoing care, operation, and maintenance of the building. This submittal shall include details of how the agency is complying with the
mandatory measures under section 16a-38k-3 of the Regulations of Connecticut State Agencies. Documentation shall also include which of the twenty-six measures of the sixty measure strategies are planned for implementation; or if the project is utilizing the alternative strategy outlined in section 16a-38k-7(a) of the Regulations of Connecticut State Agencies, the project manager-facilitator shall document how the design team intends to meet the alternative paths to compliance.

(3) At the end of the construction document phase, a report shall be prepared by the design team to include energy modeling for the current Connecticut State Building Code requirements versus the proposed building project and cost differentials and operational savings for the project. The report is to be provided to the project manager-facilitator for submittal to the secretary and the commissioner.

(4) If, at any time during the construction process, substitutions for the any of the twenty-six stated measure strategies are made, the commissioner and the secretary shall be notified by the project manager-facilitator in writing of the changes. These substitutions must be in conformance with the general requirements of the

project manual. Such changes shall be agreed to by the secretary and the commissioner. A pre-occupancy commissioning report shall be prepared by the commissioning agent that demonstrates that the project has met all of the requirements spelled out in sections 16a-38k-3 and 16a-38k-4 of the Regulations of Connecticut State Agencies; or alternatively, in sections 16a-38k-3 and 16a-38k-7 of the Regulations of Connecticut State Agencies. The report is to include all design elements of the project that
address each completed strategy in sections 16a-38k-3 and 16a-38k-4 of the Regulations of Connecticut State Agencies; or alternatively, in sections 16a-38k-3 and 16a-38k-7 of the Regulations of Connecticut State Agencies. The report shall be submitted to the commissioner and to the secretary with the seal of the professional engineer and signed off by the project manager-facilitator indicating that "this report certifies that the material contained herein is true and correct."

(5) A post-occupancy commissioning report shall be prepared by the commissioning agent and submitted by the agency that is responsible for the ongoing care, operation, and maintenance of the building to the secretary and the commissioner within one hundred eighty days after one year of occupancy. The report shall include results of any post-occupancy survey of building occupants, a description of any adjustments made to equipment or building operation and the reasons for which the changes were made, and one year of all energy usage by source and water usage.

(b) For projects as defined in sections 16a-38k-2(c) and 16a-38k-2(d) of the Regulations of Connecticut State Agencies:

(1) Upon successful awarding of the design contract, the design team shall provide a letter to the SDE commissioner listing the project timeline and members of the design team and indicating understanding of the requirements of sections 16a-38k-1 through 16a-38k-9 of the Regulations of Connecticut State Agencies.

(2) Upon design development completion, a report shall be submitted to the SDE commissioner by the project manager facilitator on behalf of and signed off by the agency/municipality that will be responsible for the ongoing care, operation, and maintenance of the building. This submittal shall include details of how the project is complying with the mandatory measures under sections 16a-38k-3 and 16a-38k-5 of the Regulations of Connecticut State Agencies. Documentation shall also include which of the twenty-eight measures of the fifty-nine measure strategies are planned for implementation; or if the project is utilizing the alternative strategy outlined in section 16a-38k-7(b) of the Regulations of Connecticut State Agencies, the project manager-facilitator shall document how the design team intends to meet the alternative paths to compliance.

(3) At the end of the construction document phase, a report shall be prepared by the design team to include energy modeling for the current Connecticut State Building Code requirements versus the proposed building project and cost differentials and operational savings for the project. The report is to be provided to the project manager-facilitator for submittal to the SDE commissioner.

(4) If, at any time during the construction process, substitutions for the any of the twenty-eight measure strategies are made, the SDE commissioner shall be notified by the project manager-facilitator in writing of the changes. These substitutions must be in conformance with the general requirements of the project manual. Such changes shall be agreed to by the SDE commissioner. A pre-occupancy commissioning report shall be prepared by the commissioning agent that demonstrates that the project has met all of the requirements spelled out in sections 16a-38k-3, 16a-38k-5, and 16a-38k-6 of the Regulations of Connecticut State Agencies; or alternatively, in sections 16a-38k-3, 16a-38k-5, and 16a-38k-7 of the Regulations of Connecticut State Agencies. The report is to include all design elements of the project that address each completed strategy in sections 16a-38k-3, 16a-38k-5, and 16a-38k-6 of the Regulations of Connecticut State Agencies; or alternatively, in sections 16a-38k-3, 16a-38k-5, and 16a-38k-7 of the Regulations of Connecticut State Agencies. The report shall be submitted to the SDE commissioner with the seal of the professional engineer and signed off by the project manager-facilitator indicating that "this report certifies that the material contained herein is true and correct."

(5) A post-occupancy commissioning report shall be prepared by the commissioning agent and submitted by the agency that is responsible for the ongoing care, operation, and maintenance of the building to the SDE commissioner within one hundred eighty days after one year of occupancy.. The report shall include results of any post-occupancy survey of building occupants, a description of any adjustments made to equipment or building operation and the reasons for which the changes were made, and one year of all energy usage by source and water usage.

(NEW) Section 16a-38k-9. Exemptions

Any exemption request shall be submitted to the secretary with the signature of the agency commissioner, deputy commissioner, president or vice president of the agency, or the chief operating officer of the municipality or school district that is responsible for the ongoing care, operation, and maintenance of the building. Within no more than forty-five days of submittal of an exemption request, the secretary, in consultation with the commissioner and the Institute of Sustainable Energy, may exempt a facility from complying with these regulations if the secretary finds, in a written analysis, that the cost of such compliance significantly outweighs its benefits. Requests for exemptions shall be

submitted to the secretary with cost/benefit calculations and life-cycle analysis and shall include:

(a) for projects as defined in sections 16a-38k-2(a) and 16a-38k-2(b) of the Regulations of Connecticut State Agencies:

(1) a description of the building project,
(2) documentation for such costs required to minimally meet the provisions of sections 16a-38k-3 and 16a-38k-4 of the Regulations of Connecticut State Agencies or, alternatively, sections 16a-38k-3 and 16a-38k-7 of the Regulations of Connecticut State Agencies,
(3) what efforts have been made to comply with the provisions of sections 16a-38k-3 and 16a-38k-4 of the Regulations of Connecticut State Agencies or, alternatively, sections 16a-38k-3 and 16a-38k-7 of the Regulations of Connecticut State Agencies,
(4) health and safety impacts of the building occupants and building management personnel, and
(5) the reason(s) for which such an exemption is necessary. In the case of an historic building, documentation of the building being on the State Register of Historic Places or the National Register of Historic Places shall be submitted.

(b) for projects as defined in sections 16a-38k-2(c) and 16a-38k-2(d) of the Regulations of Connecticut State Agencies:

(1) a description of the building project,
(2) documentation for such costs required to minimally meet the provisions of sections 16a-38k-3, 16a-38k-5 and 16a-38k-6 of the Regulations of Connecticut State Agencies or, alternatively, sections 16a-38k-3, 16a-38k-5 and 16a-38k-7of the Regulations of Connecticut State Agencies,
(3) what efforts have been made to comply with the provisions of sections 16a-38k-3, 16a-38k-5 and 16a-38k-6 of the Regulations of Connecticut State Agencies or, alternatively, sections 16a-38k-3, 16a-38k-5 and 16a-38k-7 of the Regulations of Connecticut State Agencies,
(4) health and safety impacts of the building occupants and building management personnel, and
(5) the reason(s) for which such an exemption is necessary. In the case of an historic building, documentation of the building being on the State Register of Historic Places or the National Register of Historic Places shall be submitted. If the secretary approves of any such exemption, the secretary shall notify the SDE commissioner in writing of such exemption.

STATEMENT OF PURPOSE

To adopt regulations establishing high performance construction standards for state owned buildings pursuant to Public Act 06-187, section 70 (a) and (b), and amended by Public Acts 07-213, 07-242 and 07-249. (1) State facility construction projects that are

projected to cost $5 million or more, and of which $2 million or more is state funding and is approved and funded on or after January 1, 2008; (2) renovation of state facilities that are projected to cost $2 million or more of which $2 million or more is state funding and is approved and funded on or after January 1, 2008; (3) new construction of school facilities projected to cost $5 million or more, and of which $2 million or more is state funding and is authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009; and (4) renovation of public school facilities costing $2 million or more of which $2 million or more is state funding and is authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009, are required to meet minimum standards for: energy efficiency & renewable energy; indoor environment; water efficiency; recycling, reuse & sustainability; site selection & development; and operations & procedures. Sections 16a-38k-1 through 16a-38k-9 establishes the criteria new building projects and renovations are expected to meet.

Building Commissioning

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(a)	Building commissioning shall be an integral part of the building project. Such commissioning shall be performed by an independent third-party, called a commissioning agent, who shall be certified as a commissioning agent by the Building Commissioning Association or the Association of Energy Engineers, and shall either be a Professional Engineer or have an S-1 license. This individual shall be included in the beginning stages of the building process through a post-occupancy evaluation. The commissioning agent shall not be an employee of the architectural, engineering, or construction firm that implements the project, and shall be hired directly by the state, municipality, or regional school district. For state facility projects, the commissioning agent may be an employee of the Department of Public Works provided such person shall act independently of the other staff assigned to oversee the design and construction of the project. The commissioning agent shall report all findings and recommendations to the owner of the state facility or the municipal or regional school district. Coordination and oversight of the training of facility management and maintenance personnel on proper equipment operation as well as verification of proper development of systems manuals shall be overseen by the commissioning agent in cooperation with the project manager-facilitator and with the building owner, designer, contractor, and subcontractors who installed the systems. The commissioning process, at minimum, shall include the following energy-related systems: (1) heating, ventilating, air conditioning, and refrigeration systems and associated controls, (2) lighting and day-lighting controls, (3) domestic hot water systems, (4) renewable energy systems. It is required that the commissioning process also include water using systems and the building envelope systems.

Purpose

Verify that fundamental building elements and systems are designed, installed, and calibrated to operate as intended and provide for the ongoing accountability and optimization of building energy performance over time.

Compliance Assistance for Mandatory Requirement

Definition of Commissioning

ASHRAE Guideline 0-1995: *The Commissioning Process*, defines commissioning as "a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria."

Commissioning uncovers deficiencies in design or installation using peer review and field verification. Proper commissioning reduces energy consumption and improves indoor air quality, environmental health, and occupant comfort and safety. Commissioning should provide preventive and predictive maintenance plans, tailored operating manuals, and operator training procedures. Properly completed, the commissioning process assures that project expectations are met, and that facility personnel are equipped to evaluate and maintain building systems.

Selecting a Commissioning Agent

Third party commissioning requires that the commissioning agent not be an employee of the architectural, engineering, or construction firm that implements the project. Many design teams now have a continuing relationship with a commissioning agent. Two sources to locate and hire an independent commissioning agent are the Building Commissioning Association and the Association of Energy Engineers. Both organizations maintain certification programs for commissioning agents.

Commissioning Goals

The goals of a commissioning plan for a newly constructed building should include:

- ❑ Defining commissioning requirements clearly at the outset of each phase and update through the process
- ❑ Verifying and documenting compliance at each completion level
- ❑ Establishing and documenting commissioning process tasks for subsequent phase delivery team members
- ❑ Delivering a project that meets the owner's needs at the time of completion
- ❑ Verifying that operation and maintenance personnel and occupants are properly trained
- ❑ Maintaining facility performance across its life cycle

The Commissioning Plan

A commissioning plan should do the following:

- ❑ Establish goals for quality, efficiency, and functionality
- ❑ Establish a commissioning approach and scope
- ❑ Establish commissioning budgets
- ❑ Establish commissioning plans
- ❑ Establish commissioning schedules
- ❑ Establish testing and inspection plans
- ❑ Develop commissioning specifications
- ❑ Determine special testing needs
- ❑ Establish re-commissioning plans

Commissioning Documentation

- ❑ Document all levels of project development and acceptance
- ❑ Document inspection, testing, and training activities on commissioned systems
- ❑ Create an operations manual for all commissioned equipment

Industry Guidelines

It is highly recommended that project teams who employ the Building Commissioning Process should follow the process outlined in *ASHRAE Guideline 0*. *Guideline 0* has been adopted by both ASHRAE and NIBS (see resource section below) and does not focus upon specific systems or assemblies, but presents a standard process that can be followed to commission any building system that may be critical to the function of a project. The NIBS Total Building Commissioning Program is currently working with industry organizations to develop commissioning guidelines for various systems and assemblies.

Enhanced Building Commissioning

This expands the role of the CA to include review of the design, construction documents, and submittals. In addition, the CA must develop and provide a system and energy management manual to help staff understand the equipment and operating procedures. The commissioning services must be performed by an independent entity – one that is separate from both the design firm and the contractors. For continuity in the commissioning process, it is recommended that the same agent be selected to perform all commissioning-related tasks.

The following are examples of tasks performed and documented in a commissioning report:

Conduct a focused review of the design prior to the construction documents phase. This review early in the design process should be focused on an assessment of how well the design meet's the owner's design intent. Assessment should be made as to how the design meets the functionality, utility performance, maintainability, sustainability, cost, and indoor environmental quality requirements outlined in the design intent.

Conduct a focused review of the construction documents. This review should be conducted prior to issuing the construction documents for bid. This review should answer these questions:

- ❑ Does the design meet the owner's design intent?
- ❑ Does the design allow for proper maintenance access?
- ❑ Do the construction documents clearly detail the construction requirements?
- ❑ Do the construction documents clearly define the commissioning requirements?

Conduct a selective review of contractor submittals of equipment to be commissioned. Contractor submittals for the systems and equipment included in the commissioning scope shall be reviewed by the CA in conjunction with the designer's review. The review shall focus on the ability of the submitted product to meet the owner's requirements and review comments shall be provided to the owner and the design team.

Develop a system and energy management manual. This manual is intended to improve and enhance the documentation of system intent and operation and to help the

building owner continue to operate the building systems as efficiently and effectively as possible throughout the life of the facility. The manual should cover the operations and maintenance of all HVAC and lighting systems, and the facility staff should be trained in the use of the manual. (Note that relative to schools, Section 10-220 of the Connecticut General Statutes **requires** that local or regional boards of education properly maintain school buildings and to "implement an indoor air quality program that provides for **ongoing maintenance** and facility reviews necessary for the maintenance and improvement of the indoor air quality of its facilities", and shall report on "the action taken to implement its long-term school building program and indoor air quality program".)

Conduct a near-warranty end, or post-occupancy, review. This review is intended to bring the design, construction, commissioning and O&M staff together to solicit the O&M staff comments, suggestions, and areas of concern regarding the systems in their first year of operation. Any warranty items should be identified and a plan for resolution developed.

Resources

- ❑ Building Commissioning (Whole Building Design Guide) http://www.wbdg.org/project/buildingcomm.php
- ❑ National Institute of Building Sciences (NIBS) http://www.nibs.org/
- ❑ Working Buildings, http://www.workingbuildings.com/home.jsp
- ❑ *CHPS Best Practices Manual*, vol. 2, Guideline GC5: Contractor's Commissioning Responsibilities, http://www.chps.net/
- ❑ ASHRAE Guideline 1-1996: *The HVAC Commissioning Process* and ASHRAE Guideline 4-1993: *Preparation of Operations & Maintenance Documentation for Building Systems*, http://www.ashrae.org.
- ❑ *LEED Reference Guide,* Energy and Atmosphere, U.S. Green Building Council, http://www.usgbc.org/

Relevant Codes and Standards

- ❑ *ASHRAE Guideline 0 - 2005: The Commissioning Process*—the industry-accepted Commissioning Guideline
- ❑ *The Building Commissioning Guide*, U.S. General Services Administration, 2005

Organizations and Associations

- ❑ ASHRAE—A leading organization in the development of standardized commissioning guidelines
- ❑ Building Commissioning Association—A leading professional association for membership and certification of building commissioning practitioners
- ❑ The Association of Energy Engineers (AEE) offers commissioning courses and maintains a certification program: http://www.aeecenter.org/certification/CBCPpage.htm
- ❑ U.S. Green Building Council

Publications

- *Building Commissioning: The Key to Quality Assurance* (PDF 1.0MB) U.S. Department of Energy Rebuild America Guide Series, 1998. Commissioning retrofits and existing buildings: overview, process, and case studies. 77 pp, PECI.
- *The Building Commissioning Handbook* 2nd Edition, by John A. Heinz, PE and Richard B. Casault, PE. Alexandria, VA: APPA: The Association of Higher Education Facilities Officers, Phone: (703) 684-1446, ISBN: 1-890956-28-7.
- Commissioning Four New Science Laboratory Buildings (U. of WA) by Bonneville Power Admin. / Phoebe Caner, Portland Energy Conservation Inc., 1997. Commissioning case studies with detailed "lessons learned" information. ~70 pp. Phone: (503) 230-7334.
- *The Cost-Effectiveness of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States* by Evan Mills, Norman Bourassa and Mary Ann Piette of Lawrence Berkeley National Laboratory, Hannah Friedman and Tudi Haasl of Portland Energy Conservation Inc., Tehesia Powell and David Claridge of Energy Systems Laboratory, Texas A&M University. December 2004.
- *Guidelines for Incorporating Commissioning into Energy Savings Performance Contracts* PECI, October 2000.
- *A Practical Guide for Commissioning Existing Buildings* by Tudi Haasl of Portland Energy Conservation Inc. and Terry Sharp of Oak Ridge National Laboratory. April 1999.
- *What Commissioning Can Do For Your Building?* PECI, 1997. Derived from a database of 175 case studies of commissioning of new construction, equipment replacements, and upgrades in existing facilities. 12 pp. Phone: (503) 248-4636.

Tools

- GSA Project Planning Tools—A publicly available website that creates automated commissioning plans based on typical GSA delivery practices and processes

Integrated Design Process

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38 -3(b)	All building construction projects shall follow an integrated design process to set environmental and building performance goals. This process, at minimum, shall include at least one collaborative session of the design team consisting of the architect, mechanical engineer, electrical engineer, civil engineer, commissioning agent, a representative of the building owner, and representative(s) of the building tenant state agency prior to the preparation of contract documentation. The meeting shall include the owner's project requirements, the basis of design, commissioning plan, performance verification documentation, commissioning report, and post commissioning requirements. Prior to the start of the construction phase, at least one collaborative session among the designers, owner, and contractors, including the electrical, mechanical, and controls subcontractors shall be held to insure knowledge of design intent, required approval processes, and commissioning procedures. All records of decisions from the collaborative sessions shall be shared among the design team. The owner of the state facility or the municipal or regional school district shall have final decision making authority.

Purpose

Integrated design brings together the various disciplines involved in designing a building and reviews their recommendations as a whole. It also recognizes that each discipline's recommendation has an impact on other aspects of the building project. Design integration is the best way to avoid redundancy or conflicts with aspects of the building project planned by others. The design integration approach allows for optimization of both building performance and cost. It also allows professionals to take advantage of efficiencies that are not apparent when they are working in isolation.

Compliance Assistance for Mandatory Requirement

The earlier the integration is introduced in the design process, the greater the benefit. For a high performance building, project team collaboration and integration of design choices should begin during the early planning stages.

The integrated design process often includes integrating green design strategies into conventional design criteria for building form, function, performance, and cost. The goal is to achieve high performance and multiple benefits at a lower cost than the total for all the design components combined.

As an example, in an integrated design approach, the mechanical engineer will calculate energy use and cost very early in the design, informing designers of the energy-use

implications of building orientation, configuration, fenestration, mechanical systems, and lighting options.

The design and analysis process for developing integrated building designs includes:

- ❑ Establishing a base case—for example, a performance profile showing energy use and costs for a typical facility that complies with code (energy code compliance software COM*check* may be used to check compliance of the base case) and other measures for the project type, location, size, etc.
- ❑ Identifying a range of solutions—all those that appear to have potential for the specific project
- ❑ Evaluating the performance of individual strategies—one by one through sensitivity analysis or a process of elimination parametrics
- ❑ Grouping strategies that are high performers into different combinations to evaluate performance
- ❑ Selecting strategies, refining the design, and reiterating the analysis throughout the process

The integrated design process for high performance buildings should emphasize the following:

- ❑ Production of at least two, and preferably three, concept design alternatives using energy simulations, cost benefit calculations, and life-cycle analysis as a test of progress and then selecting the most promising of these for further development. The design alternatives should be modeled using a simulation tool that predicts the annual energy performance of the building on an hourly basis, as this will provide the basis for compliance with the energy efficiency requirements of this regulation. Acceptable energy modeling software programs include: DOE-2, VisualDOE, PowerDOE, EnergyPlus, and eQUEST. (see the Energy Performance section of this document for further information on building simulation modeling)
- ❑ Minimization of heating and cooling loads and the maximization of daylighting potential through building orientation and configuration and the design of an efficient building envelope with careful consideration given to the amount, type, and location of fenestration
- ❑ Fulfillment of heating and cooling loads through the maximum use of solar and other renewable technologies and the use of efficient HVAC systems
- ❑ Maintenance of performance targets for indoor air quality, thermal comfort, illumination levels and quality, and noise control. The design team should consider employing the services of a Certified Industrial Hygienist to ensure that indoor air quality goals are met.

Resources

- ❑ U.S. Environmental Protection Agency: http://www.epa.gov/iaq/schooldesign/predesign.html
- ❑ U.S. Department of Energy: Office of Energy Efficiency and Renewable Energy: http://www.eere.energy.gov/buildings/info/design/integratedbuilding/

- International Initiative for a Sustainable Built Environment: http://greenbuilding.ca/down/gbc2005/Other_presentations/IDP_overview.pdf
- COM*check* software for commercial code compliance http://www.energycodes.gov/comcheck/ez_download.stm
- The American Board of Industrial Hygiene www.abih.org/general/cihcaih.html

Energy Performance

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(c)	The base minimum energy performance for all building projects shall be 21 percent better than the most current Connecticut State Building Code or ASHRAE 90.1-2004, whichever is more stringent. Base minimum energy performance shall be determined using approved building modeling software that is identified in the following sections.

Purpose

To reduce total energy usage in the building, lowering operating costs, conserving valuable natural resources, and minimizing environmental impacts.

Compliance Assistance for Mandatory Requirement

The energy efficiency requirements (energy code) of the current Connecticut State Building Code are based on the 2003 International Energy Conservation Code, which references the requirements of ASHRAE Standard 90.1 2001 version with all approved and published amendments.

ASHRAE Standard 90.1 2004 version is substantially identical to the requirements in the current Connecticut State Building Code except that in ASHRAE 90.1-2004 there is only one heating zone instead of the three heating zones in the current code.

The code offers both prescriptive and building simulation methodologies for demonstrating compliance. In order to meet this requirement of the High Performance Building Construction Standards for State-Funded Buildings, the building simulation methodology must be used to demonstrate that the building will perform better than the same building built to energy code standards. This compliance methodology is typically referred to as a "systems analysis" approach, and is termed in the energy code as the "energy cost budget method," and "total building performance."

In order to utilize this approach, the building must be modeled using a simulation tool that predicts the annual energy performance of the building on an hourly basis. Acceptable energy modeling software programs include: DOE-2, VisualDOE, PowerDOE, EnergyPlus, Trace™ 700, and eQUEST.

Although the energy code allows optional prescriptive compliance paths, it is recommended that the "energy cost budget method" be used for both compliance with the code and this regulation, easing burdens on the design team. Upon completion of the building simulation modeling, the documentation requirements as stipulated in the energy code may be submitted to document compliance with this regulation.

Resources

- Electronic version of the Connecticut State Building Code – Connecticut Supplement is available from the Office of State Building Inspector Web page that can be accessed through the State of Connecticut, Department of Public Safety website: http://www.ct.gov/dps/
- Paper and electronic versions of the Connecticut Building Code (International Building Code Portion of the State Building Code, State of Connecticut) and the International Energy Conservation Code are available from the International Code Council on their website http://www.iccsafe.org under ICC Store and State/Local Codes.
- Main page: http://www.iccsafe.org/

ENERGY STAR Specification

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(d)	Energy consuming products installed in the building shall be ENERGY STAR compliant if the product category has an ENERGY STAR specification.

Purpose

To reduce the energy use of equipment installed in the building. Building energy use is not only associated with heating, cooling, and lighting, but also with the supplementary equipment utilized in normal operations. Plug-loads have become a rapidly growing portion of operating budgets because of the reliance on computer systems and other equipment.

Background Information

The ENERGY STAR program was established jointly by the U.S. Department of Energy and the U.S. Environmental Protection Agency to provide accuracy and consistency in energy usage ratings and to encourage the purchase of efficient equipment. The program includes ratings for many types of equipment commonly used in commercial and government buildings, including:

- ❑ Computers
- ❑ Monitors
- ❑ Printers
- ❑ Scanners
- ❑ Copy machines
- ❑ Water coolers
- ❑ Refrigerators
- ❑ Ceiling fans
- ❑ Washing machines
- ❑ Vending machines
- ❑ Compact fluorescent lamps
- ❑ Exit signs
- ❑ Residential/small commercial HVAC equipment

Compliance Assistance for Mandatory Requirement

ENERGY STAR compliant equipment is readily available and can be identified by an ENERGY STAR "mark" on the appliance, its packaging, or on the "EnergyGuide" label. In addition, the ENERGY STAR program maintains a database of eligible equipment (see the resources section below).

All product categories having an ENERGY STAR specification that are installed in the building must be ENERGY STAR compliant. This includes plug-in devices as well as permanently installed "hard-wired" equipment.

Compliance Considerations for Lighting and HVAC Systems

While permanently installed products or systems must be ENERGY STAR compliant if the product/system has an ENERGY STAR specification, complying with Section 16a-38k-3 subsection (c) and/or with Section 16a-38k-4 subsections (a) 1 through 6 may require higher efficiencies than the ENERGY STAR minimums. Complying with this section does not relieve you from complying with Section 16a-38k-3 subsection (c).

Resources

The ENERGY STAR program offers many resources to assist in choosing and purchasing energy efficient equipment:

- ❑ General information and links to all ENERGY STAR resources: http://www.energystar.gov/
- ❑ Bulk purchasing: http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing
- ❑ Government purchasing: http://www.energystar.gov/ia/business/bulk_purchasing/Govt_FactSheet.pdf.
- ❑ ENERGY STAR stores: http://www.energystar.gov/index.cfm?fuseaction=store.store_locator

Indoor Air Quality Management Plan

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(e)	The project manager-facilitator shall develop an indoor air quality management plan for the construction phase of the project. As part of the plan, the following shall be addressed: (1) Periodic inspections of materials stored on-site to ensure that all installed or stored absorptive materials are protected from moisture and mold damage. If resting on the ground, spacers shall be provided to allow air to circulate between the ground and the materials. All water-damaged materials shall be removed from the site and disposed of properly. (2) Surface grades, drainage systems, and heating, ventilating and air conditioning condensate drainage systems shall be designed so as to prevent accumulation of water under, in, or near the building. Irrigation systems shall be designed so as to prevent spraying of the building. (3) Ductwork shall be sealed from outside elements during transport and storage, and interior surfaces shall be wiped down immediately prior to installation. During installation, open ends of ductwork shall be temporarily sealed and ductwork shall be protected with surface wrapping. No installed ductwork shall contain internal porous insulation materials or lining. (4) Heating, ventilation, and air conditioning (HVAC) equipment shall be covered and protected from moisture during transportation and on-site storage. For permanently installed air handlers used during construction, use filtration media in air handlers with a Minimum Efficiency Reporting Value (MERV) of ten, except for unit ventilator systems which shall have a minimum MERV of seven. All filtration media shall be replaced immediately prior to building occupancy with media having a MERV rating of equal or greater value to existing media. (5) Materials that off-gas toxic or potentially toxic fumes shall be pre-conditioned for at least seventy-two hours prior to installation within the building. Such materials shall also be installed prior to the installation of porous building materials to reduce absorption and adsorption of those toxins by the porous materials. Prior to installation of porous materials and materials vulnerable to mold, the building enclosure shall be watertight. (6) In the event that any portion of the building is occupied during construction or renovation activities, the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) *Indoor Air Quality Guidelines for Occupied Buildings Under Construction* shall be followed.

Purpose

Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in buildings, which will contribute to the comfort and well-being of the occupants.

Compliance Assistance for Mandatory Requirement

In order to assure compliance with the IAQ requirements, project owners should be sure that construction documents specify that the mandatory requirements are met. The project manager-facilitator shall be designated to supervise and oversee the construction site for compliance with these requirements during all phases of construction. Consulting with a Certified Industrial Hygienist should be considered. Photo documentation is necessary.

ASHRAE Standard 62.1-2004 and the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) *IAQ Guideline for Occupied Buildings Under Construction* both contain detailed guidance for complying with these IAQ requirements.

Resources

- ASHRAE Standard 62.1-2004: http://sspc621.ashraepcs.org/
- Sheet Metal and Air Conditioning National Contractors Association (SMACNA) *IAQ Guideline for Occupied Buildings Under Construction*, 1995: http://www.smacna.org/newsletters/index.cfm?fuseaction=view_article&id=3197
- LEED-NC, Green Building Rating System For New Construction & Major Renovations, Version 2.2, October 2005: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220
- LEED for Schools-for New Construction and Major Renovation, First Edition, November 2007 http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1586
- The American Board of Industrial Hygiene www.abih.org/general/cihcaih.html
- Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA): http://www.smacna.org/

Water Usage

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(f)	Use low-flow fixtures to consume twenty percent less water in aggregate as compared to base levels calculated by meeting the Federal Energy Policy Act of 1992 fixture performance requirements. Calculations shall be based on estimates of occupant usage and shall include the following building fixtures only: showers, urinals, toilets, bathroom sink faucets, and kitchen sink faucets.

Purpose

Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Compliance Assistance for Mandatory Requirement

Develop a water-use baseline including all water-consuming fixtures, equipment, and seasonal conditions according to methodology outlined below. Specify water-conserving plumbing fixtures that exceed the Energy Policy Act (EPAct) of 1992's fixture requirements in combination with ultra high efficiency or dry fixture and control technologies. Specify high water efficiency equipment (e.g., dishwashers, faucets, cooling towers, composting toilet systems and non-water using urinals, and occupant sensors to reduce the potable water demand). Consider reuse of stormwater and greywater for non-potable applications such as toilet and urinal flushing and custodial uses. Check all local and state codes before proceeding with a greywater or stormwater reuse system

To calculate water use reductions, use spreadsheets similar to those displayed in the following tables, detailing baseline and design water uses. List each water-using appliance or fixture, the amount of daily uses, number of occupants, and total water use. A base design and a water-efficient design for a building with 500 occupants are illustrated below.

Table 1: Proposed Design Indoor Water Consumption Calculation

Fixture Type	Flow-rate	Duration	Occupants	Daily uses	Water use
Low-flow toilet (male)	1.6 gal/flush	1 flush	500	1	800
Waterless urinal	0.0 gal/flush	1 flush	500	2	0
Low-flow toilet (female)	1.6 gal/flush	1 flush	500	3	2400
Bathroom sink	0.5 gal/min	0.17 min	1000	3	255
Low-flow shower	1.8 gal/min	5 min	100	1	900
Low-flow kitchen sink	1.8 gal/min	45 min	2	2	324
Efficient clothes washer	20 gal/load	1 load	-	10	200
Total daily volume					4879
Building operating days					180
Subtotal					878,220
Minus collected rainwater					(396,000)
Design total annual volume					482,220

For the baseline calculation, create a similar spreadsheet but change the type of fixture and its associated design details. The baseline calculation for this example would therefore be:

Table 2 – Baseline Indoor Water Consumption Calculation

Fixture Type	Flow-rate	Duration	Occupants	Daily uses	Water use
Conventional toilet (male)	1.6 gal/flush	1 flush	500	1	800
Conventional urinal (male)	1.0 gal/flush	1 flush	500	2	1000
Conventional toilet (female)	1.6 gal/flush	1 flush	500	3	2400
Bathroom sink	0.5 gal/min.	0.5 min	1000	3	750
Conventional shower	2.5 gal/min	5 min	100	1	1250
Kitchen sink	2.5 gal/min	45 min	2	2	450
Clothes washer	40 gal/load	1 load	-	10	400
Total daily volume					7,050
Building operating days					180
Baseline total annual volume					1,269,000

Comparing the two spreadsheets, the water-efficient fixtures reduced potable water use by:

% Savings = 1 – (Design Total Annual Volume / Baseline Total Annual Volume)

= 1 – (482,220/1,269,000) = 0.62 = 62%

Therefore, this design would qualify because overall potable water use has been reduced by over 20%.

Recyclable Materials

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(g)	The building or building site shall contain convenient areas to serve as collection points for recyclable materials and shall include an area for the sorting and storage of such materials for pick-up by recyclers.

Purpose

To facilitate the reduction of waste generated by building occupants that is hauled to and disposed of at a resource recovery facility or in a landfill and to reduce the consumption of new raw materials, thereby reducing energy required for the virgin production.

Compliance Assistance for Mandatory Requirement

The recycling program is part of the state's Solid Waste Management Plan, which examines the state of solid waste management in Connecticut, establishes goals and objectives, identifies problems and barriers, and outlines strategies for achieving the goals.

Information on materials recycling and recommended procedures is provided in the Recycling Law and Regulation, under the municipal solid waste recycling program (§§22a-241 through 22a-256 of the Connecticut General Statutes). Compliance with these requirements is mandatory.

Resources

- ❑ Contact the Connecticut DEP for materials and resources on reduce/reuse/recycle issues, http://www.ct.gov/dep/cwp/view.asp?a=2714&q=324882&depNav_GID=1645&depNav=|
- ❑ DEP main site: http://www.ct.gov/dep
- ❑ Regulation relating to recycling in State of Connecticut http://www.cga.ct.gov/2005/pub/Chap446d.htm

Erosion and Sedimentation Control

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(h)	All construction shall include a plan for erosion and sediment control, as required by sections 22a-325 through 22a-329 of the Connecticut General Statutes.

Purpose

To reduce the loss of soil from the site and to prevent pollution from construction activities by controlling soil erosion, waterway sedimentation, and airborne dust generation.

Compliance Assistance for Mandatory Requirement

Soil erosion and sedimentation pollute water and air by clogging the storm drains and streams, depositing pesticides and nutrients into the water, and causing particles of matter to loosen and enter the air. An erosion and sedimentation control (E&SC) plan describes the measures associated with controlling soil erosion and sedimentation during construction. The following are basic principles for effective soil erosion and sedimentation control:

- ❑ Use effective site planning to avoid sensitive areas such as wetlands and watercourses.
- ❑ Keep land disturbance to a minimum.
- ❑ Stabilize disturbed areas.
- ❑ Phase land disturbance on larger projects, starting subsequent phases after disturbed areas are stabilized.
- ❑ Keep runoff velocities low.
- ❑ Protect disturbed areas from stormwater runoff.
- ❑ Incorporate proper perimeter control practices.
- ❑ Limit construction during months when runoff rates are higher due to decreased infiltration or extreme rainfall events.
- ❑ Assign responsibility for and implement a thorough maintenance and follow-up program.

Information on soil erosion and sedimentation control practices and recommended procedures for developing an effective E&SC Plan are provided in the 2002 Guidelines for Soil Erosion and Sediment Control (Connecticut DEP Bulletin 34). The guidelines fulfill the requirements of Connecticut's Soil Erosion and Sedimentation Control Act (§§ 22a-325 through 22a-329 of the Connecticut General Statutes). Compliance with these requirements is mandatory for many municipal planning regulations and land development permits in Connecticut.

Copies of the 2002 Guidelines for Soil Erosion and Sediment Control can be purchased from the Connecticut DEP Inland Water Resources Div. For current availability of printed or electronic copies please call (860) 424-3706.

Resources

- Connecticut Department of Environmental Protection, Stormwater Program: http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654
- CHPS Best Practices Manual, vol. 2, Guideline GC4: Site Protection During Construction: http://www.chps.net/
- LEED Reference Guide, Site Prerequisite 1: Erosion and Sedimentation Control: http://www.usgbc.org/
- U.S. Environmental Protection Agency Stormwater Management for Construction Activities: http://cfpub.epa.gov/npdes/stormwater/swppp.cfm
- U.S. Environmental Protection Agency Construction General Permits: http://cfpub1.epa.gov/npdes/stormwater/cgp.cfm
- U.S. Environmental Protection Agency Construction General Permit Information: http://www.epa.gov/NE/npdes/stormwater/construction_act_ma.html

No Smoking

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(i)	No smoking shall be permitted in any building or portion of a building owned and operated or leased and operated by the state or any political subdivision thereof as mandated by section 19a-342 of the Connecticut General Statutes. All exterior designated smoking areas shall be located at least twenty-five feet away from outdoor air intakes, operable windows, and building entrances.

Resources

Connecticut General Assembly – Statutes:
http://search.cga.state.ct.us/dtsearch_pub_statutes.html

Integrated Pest Management Plan (IPM)

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(j)	A plan for integrated pest management as defined in section 22a-47 of the Connecticut General Statutes, shall be established as required under section 22a-66*l* for general pest control in state buildings. Schools shall comply with sections 10-231 and 22a-66*l* of the Connecticut General Statutes.

Purpose

To protect the health of building occupants and prevent structural damage by excluding pests from buildings with limited use of harmful chemicals. Insect and rodent allergens are known triggers for asthma, and pest infestation affects a range of other human health issues. In addition pest infestation can be damaging to building structure and systems.

Compliance Assistance for Mandatory Requirement

Integrated pest management (IPM) is defined in Section 22a-47 of the Connecticut General Statutes as "the use of all available pest control techniques including judicious use of pesticides, when warranted, to maintain a pest population at or below an acceptable level, while decreasing the unnecessary use of pesticides".

Section 22a-66*l* of the Connecticut General Statutes directs that "each state department, agency, or institution shall use integrated pest management at facilities under its control if the Commissioner of Environmental Protection has provided model pest control management plans pertinent to such facilities". The Department of Environmental Protection has established model integrated pest plans to assist with the development of comprehensive integrated pest management programs at state departments, agencies, and institutions.

The primary goal of IPM is to reduce the amounts of pesticides applied by using alternative methods of pest control which may include structural maintenance, sanitation, and mechanical or biological control. These methods will help to eliminate conditions that are favorable to pest infestation, making their survival more difficult.

IPM seeks to exclude pests from buildings and to destroy the habitat of pests by limiting their access to food, water, and free movement without dependence upon chemicals that are harmful to human health. Regular monitoring and record keeping is used to determine when treatments are needed to keep pest numbers low enough to prevent damage. Chemical controls should be used only when necessary and in the least toxic and volatile formulations that are effective.

Research demonstrates that the use of insecticides and rodenticides helps to limit infestations, but does not eliminate them. Over time, repeated application of pesticides may lead to resistance among targeted species, requiring greater amounts, or the use of more toxic materials to achieve the same effect.

The general pest control referenced in this regulation is intended for the control of cockroaches, ants (other than carpenter ants), winged termite swarmers emerging indoors,

incidental/occasional invaders including bees and wasps entering from out of doors, and flies and other arthropod pests. Populations of these pests that are located immediately outside of a specified building and pose a possible infestation problem to that building are included.

For control of other pests, the state also provides model plans for rodent control and for turf management.

Additional IPM Measures

In addition to the mandated IPM measures, the following pest management measures will help to reduce the reliance on pesticides:

- ❑ For all exterior walls, foundations, attics, roofs, utility chases, interior partitions and ceilings in food storage, preparation, and disposal areas, and penetrations:

Block all openings in the enclosure larger than 1/4 inch by 1/4 inch with concrete or mesh reinforced caulk or copper or stainless mesh, or screen over openings that must allow air flow.

Caulk all cracks larger than 1/16th inch, including all plumbing and electrical penetrations.

- ❑ Keep all shrubbery a minimum of 3 feet from the building structure.
- ❑ Utilize dumpsters and other rubbish containers that seal tightly and locate them as far away from the building as practicably possible.
- ❑ Do not allow debris to collect near doors and other building openings.
- ❑ Design building facades so that pigeons cannot roost.
- ❑ Maintain a schedule for the cleaning and degreasing of stoves, refrigerators, cabinets, floors, and walls in kitchens, bathrooms, teacher lounges, etc.

Resources

- ❑ Connecticut Department of Environmental Protection Model IPM Plans: http://www.ct.gov/dep/cwp/view.asp?a=2710&q=324300
- ❑ Connecticut Department of Environmental Protection Pest Management Information: http://www.ct.gov/dep/cwp/view.asp?a=2710&q=324266&depNav_GID=1712
- ❑ University of Connecticut Extension Service Integrated Pest Management Program: http://www.hort.uconn.edu/IPM/
- ❑ EPA: *IPM for Schools: A How-to Manual:* http://www.epa.gov/pesticides/ipm/schoolipm/index.html
- ❑ EPA Pesticides Program Information: http://www.epa.gov/pesticides/

Chlorofluorocarbon (CFC)-Based Refrigerants

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(k)	Chlorofluorocarbon (CFC)-based refrigerants shall not be utilized for energy systems in new construction. For renovation projects where existing HVAC-R equipment is reused, a CFC phase-out conversion shall be undertaken.

Purpose

The purpose of this measure is to reduce the harmful effects of CFCs on the environment and public health. The phase-out of CFCs will enable Earth's stratospheric ozone layer to recover, thereby reducing the harmful effects of excessive UV exposure to plants and animals. The phase-out is also expected to reduce the numbers of incidence of skin cancer, cataracts, and non-melanoma skin cancer.

Background Information

CFCs: CFCs are any of various halocarbon compounds consisting of carbon, hydrogen, chlorine, and fluorine, used widely as aerosol propellants and refrigerants.

Some Alternatives to CFCs	**Uses**
HCFC 22	Refrigeration
HCFC 123	Refrigeration
HFC 23	Fire Extinguishers
HFC 32	Refrigeration
HFC 125	Refrigeration
HFC 134a	Refrigeration, foams, air conditioning, medical aerosols

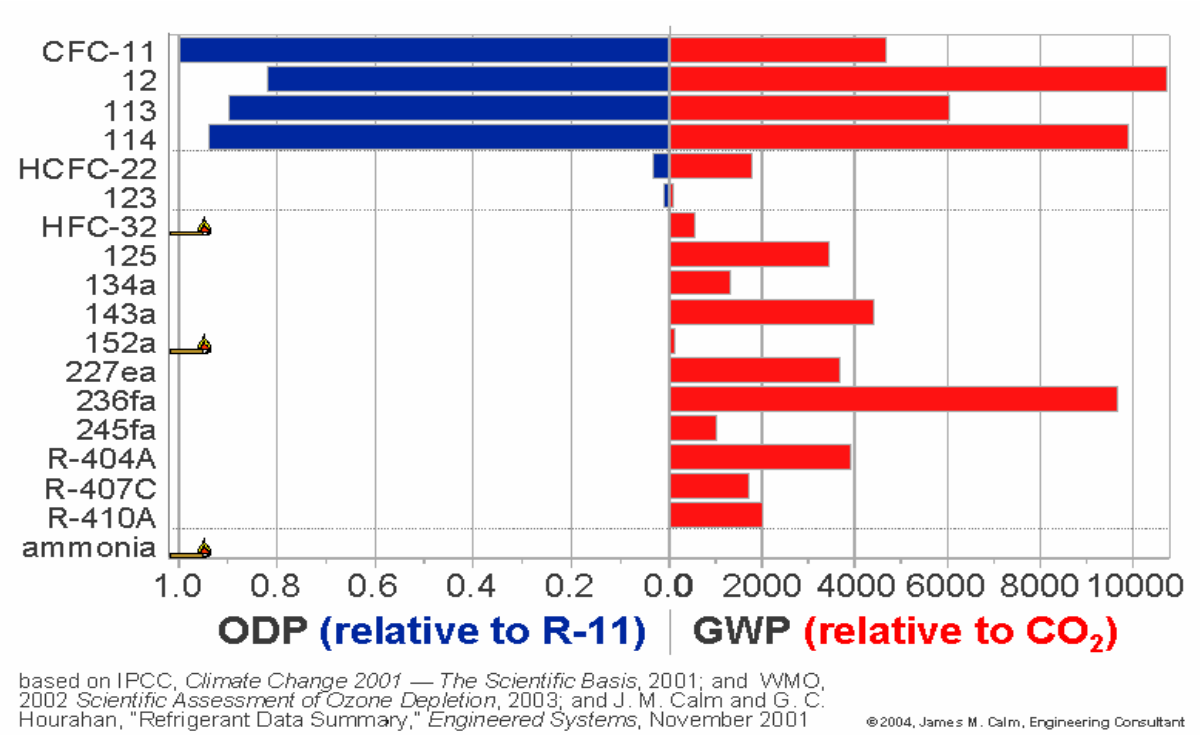
HCFCs: Hydrochlorofluorocarbons (HCFCs) are one class of chemicals being used to replace CFCs. They contain chlorine and thus deplete stratospheric ozone, but to a much lesser extent than CFCs. Different HCFCs have different effects on ozone depletion and global warming potential (see table, next page). HCFC-22 is scheduled to be phased out in 2010 for new equipment and 2020 for service applications. HCFC-123 can be manufactured until 2030, while recycled/recovered or stockpiled product can be used after that date. Project owners should consider the phase-out dates and the effects on the ozone layer and global warming when selecting equipment.

The National Oceanic and Atmospheric Administration provides more detailed information about HCFCs on their website (see the resources section).

HFCs: Hydrofluorocarbons (HFCs) are a class of chemicals that were developed to replace the CFC's. The HFCs contain no chlorine, and have almost no impact on the stratospheric ozone layer, and are therefore not controlled under the Montreal Protocol. HFCs do have an impact on global warming, and HFC's are one of the classification of chemicals that that have been called out for reduction in the Kyoto Protocol due to

their contribution to global warming. There is currently no phase out date for HFC's in the United States

OZONE DEPLETION POTENTIAL VS. GLOBAL WARMING POTENTIAL



Compliance Assistance for Mandatory Requirement

New construction shall include HVAC and refrigeration units that are CFC free. Project owners should direct the design team and/or the mechanical engineering design firm to specify all HVAC and refrigeration equipment to be CFC free. Alternative refrigerants may be any of the non-CFC alternatives.

Renovation projects must include a replacement schedule for CFC refrigerants. It is recommended that at a minimum, the replacement schedule mandates that when a CFC unit fails, it be replaced by a CFC free unit. Because modern HVAC and refrigeration units are significantly more efficient than older equipment, a more aggressive replacement schedule may prove to be desirable.

Minimum Ventilation Requirement

Mandatory Requirement—All Buildings

Mandatory Requirement Section 16a-38k-3(*l*)	Buildings shall be designed to meet the minimum ventilation requirements of the current ASHRAE Standard 62.1 using the Ventilation Rate Procedure for mechanical systems. If the current Connecticut State Building Code contains more stringent requirements, it shall be used to meet minimum ventilation requirements.

Purpose

To establish a baseline for minimum indoor air quality performance contributing to the health and comfort of the building occupants.

Building Standard Optional Strategies- State Facilities

Energy Efficiency and Renewable Energy

The following eleven strategies are available for demonstrating within the energy efficiency and renewable energy category. At least one option in this category must be selected:

Section 16a-38k-4(a)(1): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 3 1/2 percent.

Section 16a-38k-4(a)(2): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 7 percent.

Section 16a-38k-4(a)(3): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 10 1/2 percent.

Section 16a-38k-4(a)(4): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 14 percent.

Section 16a-38k-4(a)(5): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 17 1/2 percent

Section 16a-38k-4(a)(6): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 21 percent.

Compliance Assistance for Optional Strategies (a)(1) through (a)(6)

The above options use the same compliance methodologies and tools as the requirements outlined in Section 16a-38k-3 (see pages 9 of this document), and they may be used cumulatively. For example, complying with option 3 also puts you in compliance with options 1 and 2 and thus provides 3 (as opposed to just 1) of the 25 total strategies needed for project compliance.

Section 16a-38k-4 (a)(7): The installation of on-site renewable energy shall provide at least 3 percent of the building energy needs based upon the most recent version of the U. S. Department of Energy Commercial Buildings Energy Consumption Survey for estimated electricity usage or by using the same modeling software used to demonstrate compliance with the energy efficiency section of this document. Any facility that installs renewable energy systems must retain associated RECs for a period of two years.

Section 16a-38k-4(a)(8): Same as in subsection (a)(7) except at least 7 percent of the building energy needs are met through on-site renewable energy.

Section 16a-38k-4(a)(9): Same as in subsection (a)(7) except at least 10 percent of building energy needs are met through on-site renewable energy.

Compliance Assistance for Optional Strategies (a)(7) through (a)(9)

Renewable energy is classified as:

- ❑ Solar thermal systems
- ❑ Solar electric (photovoltaic systems)
- ❑ Wind power
- ❑ Methane landfill gas

- ❑ Low-impact hydropower (free-flow/no-head, or low-head systems)
- ❑ Biomass from locally available sources
- ❑ Biodiesel
- ❑ Fuel Cells

Geothermal heat pumps are not considered renewable energy systems for the purposes of this option. See "Building Innovations"

Solar thermal systems often offer the best investment in solar energy. Meeting a portion of the building's space heating, domestic water heating, or both loads combined is possible with a variety of system types and configurations. Systems dedicated to domestic water heating needs are often a good choice, as there is a demand for hot water year round.

Photovoltaic systems collect solar energy and directly convert it to electricity. The electricity generated is direct current (DC) and is either used to power DC devices or, more commonly, is converted (inverted) to alternating current (AC) to be used on-site for AC devices and/or supplied to the local electrical grid. Building and ground mounted systems are available.

Wind energy has been rapidly gaining in popularity, and many countries now meet significant portions of their electrical needs with wind generators. Today's slow rpm generators have solved many of the maintenance concerns and have greatly reduced the negative effects on bird life. The siting of wind generators is a long-term process, so planning must begin early. It is not unusual for the available wind to be monitored for at least a one-year period before selecting a site.

Methane landfill gas can be used to directly power boilers or may be used as a fuel source for fuel cells. The gas is corrosive so precautions must be taken to protect system components.

Low-impact hydroelectric power systems take advantage of the natural flow of rivers and streams, rather than utilizing dams to control the flow of water.

Qualifying biomass energy systems use locally grown biomass that is cultivated and harvested in a sustainable manner. Waste wood products and/or wood products from sustainable practices are eligible fuel sources.

Biodiesel is a fuel made from plant materials and/or waste cooking oils. Most commercially available biodiesel is produced from soybeans. Various biodiesel products are available including 100% biodiesel (commonly referred to as B100). Fuel mixes of biodiesel and conventional diesel are also commercially available including B20, B50, and B80 with 20%, 50%, and 80% biodiesel content respectively. In calculating the percentage of renewable energy utilized at the facility, only the actual biodiesel content is to be included. For example, if 10% of the energy is supplied by B50 biodiesel, the renewable contribution to the total energy consumption is 5%.

Resources

- ❑ General information and links to Connecticut Clean Energy Fund: www.ctcleanenergy.com
- ❑ Resources for building modeling software: http://www.eere.energy.gov/buildings/highperformance/simulation_software.html
- ❑ Database of state incentives for renewable energy and efficiency: http://www.dsireusa.org/
- ❑ U. S. Department of Energy Commercial Buildings Energy Consumption Surveys: http://www.eia.doe.gov/emeu/consumption/index.html
- ❑ CHPS Best Practices Manual, vol. 2: Guideline OS1: http://www.chps.net/
- ❑ LEED Reference Guide, Energy and Atmosphere Credit 2: Renewable Energy: http://www.usgbc.org/
- ❑ Advanced Buildings Reference Guide: Renewable Energy: http://www.poweryourdesign.com/refguide.htm

Renewable Energy Credit (REC) Options

Section 16a-38k-4(a)(10): The facility shall have a two-year contract to purchase at least 35 percent of the building's annual electricity consumption from a Class I renewable energy source. Alternately, the purchase may be in the form of New England Power Pool Generation Information System (NEPOOL-GIS) renewable energy credits (RECs); if procuring RECs outside of the NEPOOL-GIS, the RECs shall be equivalent to Class I renewable energy source and certified by a nationally recognized certification organization as identified in the *Connecticut State Facilities Building Standard Guidelines Compliance Manual for High Performance Buildings*; or the purchase may be through the CTCleanEnergyOptions™ program . Baseline electric usage can be determined using either the most recent version of the U. S. Department of Energy Commercial Buildings Energy Consumption survey for estimated electricity usage or by using building modeling software that is identified in the *Connecticut State Facilities Building Standard Guidelines Compliance Manual for High Performance Buildings.* RECs purchased to comply with this section cannot be purchased from a facility that has installed renewable energy systems for credit under 16a-38k-3(a)(7 through 9).

Compliance Assistance for Optional Strategy (a)(10)

Determine the energy needs of the building and comply with one of the following three methodologies:

1. Sign a two-year contract with a clean energy provider to purchase renewable energy credits representing at least 35% of the building's annual electricity consumption from a Class 1 renewable energy source. Connecticut Light and Power (CL&P) and United Illuminating (UI) both offerclean energy contracts. See the resources section for more information.

Class I renewable energy source is defined as energy derived from:

- ❑ Solar power
- ❑ Wind power

- ❑ Fuel cells
- ❑ Methane gas from landfills
- ❑ Ocean thermal power
- ❑ Wave or tidal power
- ❑ Low emission advanced renewable energy conversion technologies
- ❑ Waste heat recovery systems installed on or after July 1, 2006, that produce electrical or thermal energy by capturing preexisting waste heat or pressure from industrial or commercial processes
- ❑ Run-of-the-river hydropower facilities with generating capacities of not more than five megawatts, do not cause an appreciable change in the river flow, and began operation after July 1, 2003
- ❑ Biomass facilities, including, but not limited to, biomass gasification plants that utilize land clearing debris, tree stumps, or other biomass that regenerates and/or will not result in a depletion of resources, provided such biomass is cultivated and harvested in a sustainable manner and the average emission rate for such facility is equal to or less than .075 pounds of nitrogen oxide per million Btu of heat input for the previous calendar quarter, except that energy derived from a biomass facility with a capacity of less than five hundred kilowatts that began construction before July 1, 2003, may be considered a Class I renewable energy source, provided such biomass is cultivated and harvested in a sustainable manner. (NOTE: Sustainable biomass does not mean construction and demolition waste, finished biomass products from sawmills, paper mills or stud mills, organic refuse derived separately from municipal solid waste, or biomass from old growth timer stands.)

2. Purchase Class 1 renewable energy credits through the New England Power Pool Generation Information System (NEPOOL-GIS) equal to at least 35% of the building's annual electricity consumption. The credits are offered through brokers. See the resources section for a link to NEPOOL certificate brokers.

3. Purchase renewable energy credits through an independent source. The credits must be equivalent to Class I renewable resources and certified by a nationally recognized certification organization such as the Green-e Program offered by the Center for Resource Solutions. See the resources section for a link to the Green-e certificate program.

Renewable Energy Credits

Renewable Energy Credits (RECs) also known as Tradable Renewable Certificates (TRCs) allow a user of electricity to purchase credits for the production of renewable energy that offsets the generation of electricity by conventional means. This allows purchasers to participate in the renewable energy marketplace when locally produced renewable energy is not available. The purchase of RECs allows renewable energy generating facilities to be built where they are most cost-effective, while allowing customers anywhere to participate.

RECs may have monetary value and can be traded on the open market. Participants purchasing RECs to meet the requirements of this regulation may not

sell the RECs unless meeting the renewable energy requirement through an alternative method.

Resources

- Renewable energy credit (REC) New England Power Pool (NEPOOL) program: http://www.nepoolgis.com/
- Renewable energy credit (REC) Certificate Brokers NEPOOL program: http://www.nepoolgis.com/newsRoom/update02.asp
- Green-e renewable energy credit (REC) purchasing and certification program: http://www.green-e.org/base/re_products?cust=b
- The following article describes the NEPOOL REC system as it applies to the State of Connecticut: http://www.evomarkets.com/assets/evobriefs/nw_1062599800.pdf
- Details of the CT Clean Choice™ clean energy program offered by the DPUC for customers of CL&P and UI can be found at: http://www.sterlingplanet.com/bizBuyCT.php
- Details of the Community Energy clean energy program offered by the DPUC for customers of CL&P and UI can be found at: http://www.newwindenergy.com/
- CL&P's clean energy program information is available at: http://www.cl-p.com/community/environment/clean.asp
- Information on UI's clean energy program can be found at: http://www.uinet.com/index.asp

Energy Resource Management: The following strategy is available for renewable and non-renewable energy consumption.

Section 16a-38k-4(a)(11): Develop a measurement and verification plan for energy usage, to cover a period of at least one year after occupancy.

Compliance Assistance for Optional Strategy (a)(11)

This point can be obtained by instituting a plan to monitor and record energy usage for at least one year. A variety of data logging equipment and services are available for the measurement and verification (M&V) of the energy consumption of various systems throughout the building. Contact your electric and gas suppliers for assistance with establishing an M&V process for your facility.

Building Standard Optional Strategies- State Facilities

Indoor Environment

The following fourteen strategies are available for improving indoor environment. At least two strategies in this category must be selected:

Section 16a-38k-4(b)(1): Install permanent indoor air monitoring systems to provide performance feedback on ventilation systems. Such monitoring systems, at minimum, shall include devices to measure temperature, relative humidity, carbon dioxide, and dew point. Carbon dioxide measurement sensors shall measure both interior and exterior levels of CO2.

Compliance Assistance for Optional Strategy (b)(1)

Air monitoring is an indicator of potential problems within a building. Continuous air sampling allows the building operator to identify potentially unhealthy conditions so that adjustments can be made to resolve the conditions.

According to the LEED New Construction Rating System, carbon dioxide should be monitored in mechanically ventilated spaces with design occupant densities greater than or equal to 25 people per 1000 square feet. For naturally ventilated spaces, CO_2 concentrations should be monitored within all spaces. CO_2 monitoring shall be located within the room between 3 feet and 6 feet above the floor. One CO_2 sensor may be used to represent multiple spaces if the natural ventilation design uses passive stack(s) or other means to induce airflow through those spaces equally and simultaneously without intervention by building occupants.

Measurement of temperature, relative humidity, and dew point can help identify conditions that can lead to condensation and potential mold problems within the building shell.

Calibration of all monitoring system equipment is critically important, and should be done at least as often as the manufacturer recommends.

Section 16a-38k-4 (b)(2): Provide increased outdoor ventilation by designing mechanical ventilation systems to exceed the minimum rates required by the current Connecticut State Building Code or the most recent version of the ASHRAE Standard 62.1 , whichever is more stringent, by thirty percent.

Compliance Assistance for Optional Strategy (b)(2)

If appropriate, use heat recovery equipment to minimize the additional energy consumption associated with higher ventilation rates in mechanical systems.

Section 16a-38k-4 (b)(3): After construction ends and with all interior finishes installed but prior to building occupancy, flush the building continuously for at least ten days with outside air while maintaining an internal temperature between 60°F and 78°F and relative humidity no higher than 60%. Do not "bake out" the building by increasing the temperature of the space. Alternatively, use the following strategy: Flush out each space separately until 3,500 cubic feet of outside air per square foot of floor space has been delivered to that space. The space shall then be ventilated at the rate of 0.3 cubic feet per minute per square foot of floor space or the design minimum outside air rate, whichever is greater. This shall be performed for a minimum of three hours prior to occupancy and then during occupancy until a total of 14,000 cubic feet of outside air per square foot of floor area has been delivered to that space.

Compliance Assistance for Optional Strategy (b)(3)

Perform a building flush-out by supplying outside air continuously for ten days while maintaining an internal temperature of at least 60˚F but no warmer than 78°Fand relative humidity no higher than 60%.

OR

Alternative Compliance Pathway for Optional Strategy (b)(3)

Flush out each space separately with outside air until 3,500 cubic feet of outside air has been delivered for each square foot of floor area. Then ventilate the area at the rate of 0.3 cubic feet of outside air per square foot of floor space or the design outside air rate, whichever is greater, at least three hours prior to occupancy. Maintain that ventilation rate until a total of 14,000 cubic feet of outside air per square foot of floor areas has been delivered to the space.

Section 16a-38k-4 (b)(4): Adhesives and sealants used in the interior of the building shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.*

Section 16a-38k-4 (b)(5): Paints and coatings used in the interior of the building shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings.*

Compliance Assistance for Optional Strategies (b)(4) and (b)(5)

Products shall meet the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers*, including 2004 Addenda.

OR

Alternative Compliance Pathway for Optional Strategies (b)(4) and (b)(5)

Products shall be certified as low VOC products by one of the programs listed below:

- ❑ Scientific Certification Systems - Indoor Advantage-Gold
- ❑ GREENGUARD Certification Program

Resources

- ❑ Scientific Certification Systems: http://www.scscertified.com/ecoproducts/index.html
- ❑ Greenguard Environmental Institute: http://www.greenguard.org/
- ❑ California Indoor Air Quality Program (for download of the *Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers:* http://www.cal-iaq.org/VOC/

Section 16a-38k-4(b)(6): All carpet, carpet adhesive products and carpet cushion installed in the building interior shall meet current testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.

Compliance Assistance Optional Strategy (b)(6)

The carpet and rug institute maintains a list of qualifying products: http://www.carpet-rug.org/

Section 16a-38k-4(b)(7): All composite wood and agrifiber products used within the shell of the building shall meet the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers,* including 2004 Addenda.

Compliance Assistance for Optional Strategy (b)(7)

The State of California has a downloadable version of the *Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers,* including 2004 Addenda at http://www.cal-iaq.org/VOC/

Section 16a-38k-4(b)(8): To protect building occupants from potentially hazardous particulates and pollutants, building design shall control entry of pollutants and excess moisture into buildings and later cross-contamination of regularly occupied areas at all entries directly connecting to the outdoors through the use of permanent entryway systems to capture, dirt, particulates, and moisture. Such entryway systems shall be a minimum of six feet long and may be permanently installed grates, grills, or slotted systems that allow for cleaning underneath. Outside air intakes shall be located a minimum of twenty-five feet from any hazard or noxious contaminants such as vents, chimneys, plumbing vents, exhaust fans, cooling towers, street alleys, parking lots, loading docks, dumpster areas, or any area where vehicle idling occurs. If locating an air intake within twenty-five feet of a contaminant source is unavoidable, the intake must be located a minimum of ten feet horizontal distance and two feet lower than the contaminant source.

Compliance Assistance for Optional Strategy (b)(8)

Installing permanent architectural entryway systems that are at least six feet long will minimize the transport of dirt, particulates, and moisture into the building.

Locating air intakes away from potential sources of air pollution will help to ensure that indoor air quality is not compromised. If located facing a street or driveway, the 25 foot measurement shall be taken from the centerline of the street or driveway.

Section 16a-38k-4(b)(9): Allow for individual lighting control for 90% or more of the building occupants to allow for adjustments to suit individual tasks and preferences and provide lighting system controllability for all shared multi-occupant spaces to enable lighting adjustment that meets group needs and preferences.

Compliance Assistance for Optional Strategy (b)(9)

This option can be met by specifying the installation of multilevel switching for at least 90% of the occupied spaces. Multilevel switching typically allows 1, 2, or 3 lamps in a 3-lamp fixture to be illuminated. Lighting fixtures that incorporate bi-level, hi/low or continuous dimming ballasts may also be specified to comply with this option.

Section 16a-38k-4(b)(10): Using conditions for thermal comfort described in the current version of the ASHRAE Standard 55, allow for individual thermal comfort control for fifty percent or more of the building occupants to allow for adjustments to suit individual tasks and preferences and provide thermal system comfort controllability for all shared multi-occupant spaces to enable adjustment that meets group needs and preferences.

Compliance Assistance for Optional Strategy (b)(10)

Installing adjustable thermostats in each workspace will comply with this option. Programmable thermostats should be considered for all thermostat installations except work areas that are occupied 24/7.

Section 16a-38k-4(b)(11): Building facility personnel, under direction of the building owner, shall administer an anonymous survey for building occupants within the first twelve months after initial occupancy to assess occupant satisfaction and implement corrective actions for recurrent issues. At minimum, the survey shall cover thermal building comfort, lighting, security issues, indoor air quality, functionality of space, and acoustics. If greater than 20% of the respondents express dissatisfaction with any specific issue, the building owner shall prepare a plan for remedial action.

Section 16a-38k-4(b)(12): Demonstrate through computer software simulations or through recording of indoor light measurements that a minimum illumination level of

twenty-five footcandles has been achieved from daylight in at least 75% of all regularly occupied areas.

Compliance Assistance for Optional Strategy (b)(12)

Most lighting design firms and many electrical engineering firms utilize simulation software to predict daylight levels. Lighting design firms and energy efficiency consulting firms will be able to assist with recording light meters to measure daylight contribution.

Section 16a-38k-4(b)(13): There shall be a direct line of sight to the outdoor environment via window glazing between 2 1/2 and 7 1/2 feet above the finished floor for 70% of all regularly occupied areas.

Compliance Assistance for Optional Strategy (b)(13)

Installing windows at normal window heights in 75% of regularly occupied areas will meet this requirement. Rooms without an exterior wall may be excluded from this calculation.

Section 16a-38k-4(b)(14): Where chemical use occurs, including housekeeping areas, chemical storage and mixing areas, and copy/print rooms, use dedicated exhaust to ventilate the space at a minimum of 0.5 cubic feet per minute per square foot with adequate make-up air. No recirculation is permitted and such spaces shall have a negative air pressure of at least five pascal (.02 inches of water gauge) to a minimum of one pascal (0.004 inches of water gauge) when the doors are closed.

Compliance Assistance for Optional Strategy (b)(14)

Physically isolate activities and storage areas that are associated with emissions of hazardous or potentially hazardous contaminants. Design chemical storage and mixing areas and copy rooms with dedicated exhaust ventilation systems.

Additional Indoor Environment Considerations

The following list represents practices that are not specifically addressed in the above sections, but nevertheless will result in creating better indoor air quality in a facility.

- ❑ Avoid pilot lights and install only electric ignitions for gas-fired appliances.
- ❑ Do not use fossil-fuel-powered, mobile, machinery inside the building. This is to prevent accumulation of exhaust inside the building from equipment such as polishers and burnishers.

Building Standard Optional Strategies- State Facilities

Water Efficiency

The following four strategies are available for improving water efficiency; at least one option in this category must be selected:

Section 16a-38k-4(c)(1): Same as in Section 16a-38k-3(g), except that the conserving strategies use 30 percent less water in aggregate.

Section 16a-38k-4(c)(2): Reduce by 50 percent the amount of water required for landscaping from a mid-summer baseline usage case. Reductions may be attributed to the use of captured rainwater, recycled waste (grey) water, efficiency of irrigation strategies, and use of drought resistant plant species. This strategy only applies to renovation projects.

Section 16a-38k-4(c)(3): Use landscaping that does not require a permanent irrigation system or uses non-potable water for irrigation. Any system installed for irrigation using potable water shall only be utilized for plant establishment and be removed prior to one year of building occupancy.

Section 16a-38k-4(c)(4): Reduce potable water use by half through water conserving fixtures and/or use of non-potable water using methodologies stated in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*. This strategy only applies to renovation projects.

Compliance Assistance for Optional Strategies (c)(1) and (c)(4)

Develop a water-use baseline using the same methodology described for the mandatory requirement 16a-38k-3(f) (see page 15 of this document). Careful selection of water-conserving plumbing fixtures, dry fixtures and efficient control technologies will be needed to meet these more stringent water reduction targets. Composting toilet systems, non-water using urinals, and occupant sensors will all help to reduce the potable water demand. Consider reuse of stormwater and greywater for non-potable applications such as toilet and urinal flushing and custodial uses. Check all local and state codes before proceeding with a greywater or stormwater reuse system.

Compliance Assistance for Optional Strategies (c)(2) and (c)(3)

The use of potable water for irrigation can be minimized or eliminated by specifying drought resistive plants and grasses, collecting and using rainwater for irrigation, and/or using highly water-efficient irrigation systems. When specifying water conservative plants, determine soil composition and ensure that existing soils will support the plants to be specified. Consider all operating and maintenance costs of any irrigation equipment specified. If irrigation is necessary, make arrangements to irrigate during morning hours to maximize irrigation benefits and minimize evaporation.

In order to reduce water demand for sewage conveyance and irrigation, rainwater catchment systems with cisterns or underground storage tanks could be used. These supplementary systems can significantly decrease water demand by drawing on stored water instead of municipal water supplies or drinking water wells.

Rainwater catchment systems should be designed with a water storage capacity for sewage conveyance and/or irrigation in typical years under average conditions. In other words, oversizing water storage to meet drought conditions may be costly and could increase maintenance requirements. On the other hand, undersizing storage may simply result in a system that is too small to significantly offset potable water consumption. Rainwater collection and storage systems should be designed to avoid mold growth, bacterial accumulation, and stagnation.

Resources

- ❑ US Environmental Protection Agency: http://www.epa.gov/oaintrnt/water/index.htm
- ❑ State of Connecticut Department of Environmental Protection: http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325520&depNav_GID=1654&depNav=|
- ❑ State of Connecticut Department of Public Health : http://www.dph.state.ct.us/
- ❑ LEED Reference Guide, Water Credit 2: Innovative Waste Water Technologies and Water Credit 1: Water Efficient Landscaping: http://www.usgbc.org/
- ❑ American Water Works Association: http://www.awwa.org/waterwiser/links/index.cfm?LinkCategoryID=6
- ❑ California Urban Water Conservation council: http://www.h2ouse.org/
- ❑ CHPS Best Practices Manual, vol. 2, Guideline SP6: Drought Tolerant and Pest-Resistant Plants, Guideline SP10: Water-Efficient Irrigation Systems, Guideline SP12: Reclaimed Water for Irrigation: http://www.chps.net/
- ❑ The Irrigation Association: http://www.irrigation.org/

Building Standard Optional Strategies- State Facilities

Recycling, Reuse, and Sustainability

The following thirteen strategies are available for improving recycling, reuse, and sustainability. At least two options within this category must be selected:

Section 16a-38k-4 (d)(1): Retain at least 75 percent, by surface area, of an existing building structure, including structural floor and roof decking, exterior framing, and envelope surface, but excluding window assemblies and non-structural roofing material. This strategy only applies to renovation projects.

Section 16a-38k-4 (d)(2): Same as subsection (d)(1) above, except that a total of 95 percent of the building structure is retained. This strategy only applies to renovation projects.

Section 16a-38k-4 (d)(3): Use existing non-structural elements such as interior walls, doors, floor coverings and ceiling systems in at least half (by square footage) of the completed building. This strategy only applies to renovation projects.

Compliance Assistance for Optional Strategies (d)(1) through (d)(3)

Consider reusing existing, previously occupied buildings, including structure, envelope, and elements. Remove any elements that pose a contamination risk to building occupants and upgrade the components that would improve energy and water efficiency such as windows, mechanical systems, and plumbing fixtures

Section 16a-38k-4 (d)(4): Recycle or salvage at least half of non-hazardous construction and demolition debris.

Section 16a-38k-4 (d)(5): Same as subsection (d)(4) above, except that a total of 75 percent of non-hazardous construction and demolition debris is recycled or salvaged.

Compliance Assistance for Optional Strategies (d)(4) and (d)(5)

Establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet, and insulation. Designate a specific area(s) on the construction site for segregated collection of recyclable materials and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

Section 16a-38k-4 (d)(6): Use 5 percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project. Only permanently installed materials can be used in calculations.

Section 16a-38k-4 (d)(7): Same as subsection (d)(6) above, except that a total of 10 percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project shall be used.

Compliance Assistance for Optional Strategies (d)(6) and (d)(7)

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams

and posts, flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items. Note that mechanical, electrical, and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project

Section 16a-38k-4 (d)(8): Use materials where the weighted average of recycled materials content is 10 percent, based on cost, of the total value of the materials in the project. Recycled content value of a material assembly shall be determined by weight. The weighted average shall be determined using the following formula:

Weighted average of recycled materials= % post consumer content + 1/2(% of pre-consumer content).

Section 16a-38k-4 (d)(9): Same as subsection (d)(8) above, except that the weighted average of recycled materials must constitute at least 20 percent, based on cost, of the total value of the materials in the project.

Compliance Assistance for Optional Strategies (d)(8) and (d)(9)

Identify the project goal for recycled content materials and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed. Consider a range of environmental, economic, and performance attributes when selecting products and materials.

Post-consumer material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Section 16a-38k-4(d)(10): Use a minimum of 10 percent of building materials extracted or manufactured within a five-hundred mile radius of the building site.

Section 16a-38k-4(d)(11): Same as (d)(10) above, except that a minimum of 20 percent of building materials extracted or manufactured within a five-hundred mile radius of the building site shall be used.

Compliance Assistance for Optional Strategies (d)(10) and (d)(11)

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed. Consider a range of environmental, economic, and performance attributes when selecting products and materials. Note that if only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value. Mechanical, electrical, and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project.

Section 16a-38k-4(d)(12): Use building materials and products that are made from plants harvested in a ten-year or shorter cycle. Two and one-half percent of the total value of building materials and products, based on costs, must be used in the project.

Compliance Assistance for Optional Strategy (d)(12)

Establish a project goal for rapidly renewable materials and identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, and cork. During construction, ensure that the specified renewable materials are installed.

Section 16a-38k-4(d)(13): At least half of permanently installed wood and wood-based products shall be certified in accordance with the current Forest Stewardship Council (FSC) principles and criteria.

Compliance Assistance for Optional Strategy (d)(13)

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed. Note that these components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. Only include materials permanently installed in the project

Resources

- ❑ LEED-NC, Green Building Rating System for New Construction & Major Renovations, version 2.2, October 2005: http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220
- ❑ Contact the Connecticut DEP for materials and resources reduce/reuse/recycle issues: http://www.ct.gov/dep/cwp/view.asp?a=2714&q=324882&depNav_GID=1645&depNav=|
- ❑ DEP main site: http://www.ct.gov/dep
- ❑ Regulation relating to recycling in State of Connecticut http://www.cga.ct.gov/2005/pub/Chap446d.htm

Building Standard Optional Strategies- State Facilities

Site Selection and Development

The following fifteen strategies are available for improving the site selection process. A minimum of two options within this category must be selected:

Section 16a-38k-4(e)(1): Construct or renovate the building on a previously developed site and within one-half mile of a residential zone/neighborhood with an average density of ten units per acre net and within one half mile of a minimum of ten basic services as described in the *State Facilities Building Standard Guidelines Compliance Manual for High Performance Buildings* (this document) and with pedestrian access between the building and the services.

Compliance Assistance for Optional Strategy (e)(1)

Building on a previously developed site, renovating an existing building saves valuable open space. Building within ½ mile of a densely populated area will reduce bus and car traffic, encouraging walking and biking to work. Build within ½ mile of 10 of the following basic services:

1. Community Center
2. Post Office
3. Bank
4. Pharmacy
5. Supermarket
6. Convenience Store
7. School
8. Day Care Center
9. Health Care Facility
10. Laundromat or Dry Cleaner
11. Hardware Store
12. Fitness Center
13. Public Park
14. Government Service Building
15. Senior Center
16. Hair Salon/Barber Shop
17. Library
18. Museum

Section 16a-38k-4(e)(2): Develop on a site that is defined as a brownfield by a local, state, or federal government agency. ("Brownfields**"** are abandoned, idled, or under-used industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contaminations. Environmental concerns should be addressed before building, but builders are encouraged to re-use these sites.)

Compliance Assistance for Optional Strategy (e)(2)

The Connecticut Brownfields Redevelopment Authority (CBRA) operates programs that encourage brownfields redevelopment by reducing costs, eliminating environmental uncertainty and simplifying the regulatory process. They have identified brownfield sites eligible for redevelopment, and offer grants and financing that lower the financial risks and eliminate the legal, regulatory and environmental risks of redevelopment. See the resources section for a link.

Section 16a-38k-4(e)(3): Select a site that has access to public transportation. Public transportation is considered accessible if the site is located within one-third of a mile to an existing commuter rail station or located within one quarter mile of a public commuter bus line.

Compliance Assistance for Optional Strategy (e)(3)

The Connecticut Dept. of Transportation's Public Transportation Division can provide information on train and bus service as well as van pooling and ride sharing programs. A link is listed in the resources section.

Section 16a-38k-4(e)(4): Encourage bicycle transportation by providing secure bicycle racks or storage within five-hundred feet of a building entrance for a minimum of 5 percent of building users at peak times and shower and changing facilities must be provided in the building or within five-hundred feet of the building. For residential buildings, covered storage facilities shall be provided for securing bicycles for a minimum of 15 percent of building occupants.

Compliance Assistance for Optional Strategy (e)(4)

Many companies manufacture heavy duty bike racks designed for schools and commercial buildings. A web-search using the words "bicycle racks parking" will reveal numerous sources. Local bicycle shops may also be able to supply heavy duty racks.

Section 16a-38k-4(e)(5): Encourage the use of low-emitting and fuel efficient vehicles by providing preferred parking for low-emitting and fuel efficient vehicles for 5 percent of the total parking capacity at the site.

Compliance Assistance for Optional Strategy (e)(5)

To comply provide parking close to the building entrance that represents at least 5% of the total parking capacity, assigning these areas for low emission and fuel efficient vehicles only. Low-emitting, fuel-efficient vehicles may include: hybrids and vehicles using bio-diesel, compressed natural gas, or other low-emitting fuel or technology. Simply assigning parking spaces for compact cars does not satisfy the criteria.

Section 16a-38k-4(e)(6): Reduce pollution from single occupancy vehicle use by sizing parking capacity to meet, but not exceed minimum local zoning requirements; provide

designated preferred parking for carpools or vanpools for 5 percent of the total provided parking spaces; and provide infrastructure and support programs to facilitate shared vehicle usage such as ride sharing bulletin boards and shuttle services to mass transit.

Compliance Assistance for Optional Strategy (e)(6)

The Connecticut Dept. of Transportation's Public Transportation Division can provide information on van pooling and ride sharing programs. A link is listed in the resources section.

Section 16a-38k-4(e)(7): Protect existing natural areas or restore damaged areas to promote biodiversity. Any site disturbances shall be limited to no more than forty feet beyond the building perimeter; ten feet beyond surface walkways, patios, surface parking and utilities less than twelve inches in diameter; fifteen feet beyond primary roadway curbs and main utility branch trenches; and twenty-five feet beyond constructed areas with permeable surfaces, such as playing fields, that require additional staging areas in order to limit compaction in the constructed area. For previously developed or graded sites, restore or protect to a minimum of 50 percent of the site area, excluding the building footprint, to plant species indigenous to the locality or to cultivars of native plants adapted to the local climate conditions and not considered invasive species or noxious weeds. Except for playing fields and picnic areas, minimize lawn areas to less than 10 percent of the building site landscape.

Compliance Assistance for Optional Strategy (e)(7)

The University of Connecticut Cooperative Extension System can assist with the protection of natural areas, the availability/suitability of native plants, water conserving grasses and a wealth of related information on sustainable site design. A link is located in the resource section. Keep lawn areas to less than ten percent of the building site landscape to reduce fuel usage related to mowing.

Section 16a-38k-4(e)(8): Maximize open space at the site. Provide vegetated open space within the project boundary to exceed the local zoning's open space requirement by 25 percent; where there is no local zoning requirement, provide vegetated open space adjacent to the building that, at minimum, is equal to the building footprint.

Compliance Assistance for Optional Strategy (e)(8)

Vegetated open space refers to areas of natural vegetation with native plants. Lawns are not considered "vegetated open space." As with Strategy 7, the University of Connecticut Cooperative Extension System can assist with this strategy.

Section 16a-38k-4(e)(9): Design the site to minimize storm water runoff. Implement a storm water management plan that results in a 25 percent reduction in peak run-off rate for a two year, twenty-four hour storm design from pre-construction to developed conditions; and implement a storm water management plan that results in a 25 percent decrease in run-off volume of storm water runoff from the one hundred-year, twenty-four hour storm design from existing to developed conditions.

Section 16a-38k-4(e)(10): Design the site to minimize pollutants in storm water runoff by implementing a storm water management plan that reduces impervious cover, promotes infiltration, redirects water to pervious areas or storage reservoirs that treats storm water runoff from 90 percent of the average annual rainfall.

Compliance Assistance for Optional Strategies (e)(9)and (e)(10)

Refer to the compliance assistance section for the Erosion and Sedimentation Control requirements (page 18 of this document). A copy of the 2002 Guidelines for Soil Erosion and Sediment Control can be purchased from the Connecticut DEP Inland Water Resources Div. For current information on availability please call (860) 424-3706.

Consider using pervious paving materials to reduce storm water runoff.

Section 16a-38k-4(e)(11): Reduce heat island effect at the site by utilizing any combination of the use of native shade species, paving materials with a solar reflectance index of at least twenty-nine, and/or an open grid pavement system for 50 percent or more of the site parking, sidewalk and road areas; or place at least 50 percent of parking spaces under a covering, such as the a deck, a roof, underground or the building itself. Any roof used to cover parking spaces must have a solar reflectance index of at least twenty-nine.

Section 16a-38k-4(e)(12): Reduce heat island effect through roofing selection by either installing native vegetation on at least 50 percent of the roof area or by using a roofing material that has a Solar Reflectance Index equal to or greater than the values in the following table on at least 75 percent of the roof surface:

Roof Type	Slope	Solar Reflectance Index
Low-Sloped Roof	**≤ 2:12**	**78**
Steep-Sloped Roof	**> 2:12**	**29**

Compliance Assistance for Optional Strategies (e)(11)and (e)(12)

Materials with dark surfaces (pavement, roofing, etc.) absorb heat and radiate it back to surrounding areas. Studies have demonstrated that where there are many heat absorbing surfaces, temperatures may be boosted by 10˚F or more. The heat island effect increases the need for air conditioning (and therefore electricity consumption) and is detrimental to site plantings, local wildlife, and maintaining comfortable temperatures. The Cool Roof Rating Council can provide information on roofing materials, while the U.S. EPA provides information, including study results, on the heat island effects. See the resource section for links.

Section 16a-38k-4(e)(13): Reduce light pollution from the site. In addition to requirements mandated in Section 4b-16 of the Connecticut General Statutes,

automatic controls to turn off lights during non-business hours shall be installed on all non-emergency interior lighting. Manual override capability may be provided for after hours use. Exterior lighting shall be provided only in areas where lighting is required for safety and comfort. Light fixtures shall not be installed where the main purpose is to light building facades or landscape features. Exterior building-mounted lighting fixtures that are only needed during building operation shall be controlled by a time-clock with an easily accessible manual control. Lighting of flags, signs, and monuments shall be limited to fifty watts per fixture and shall incorporate shielding devices to minimize light pollution. No more than two fixtures may be used for each flag, sign or monument.

Compliance Assistance for Optional Strategy (e)(13)

Section 4b-16 of the Connecticut General Statutes governs outdoor lighting for public facilities, reducing light pollution by controlling the amount and distribution of outdoor lighting. The measures listed above will further assure that the project does not unnecessarily contribute to light pollution. The International Dark-Sky Association is the recognized authority on outdoor light pollution. There is a link in the resources section.

Section 16a-38k-4(e)(14): Building orientation shall be such that the east/west glazing exposure is minimized. South windows shall have an external overhang to entirely shade adjacent windows during the summer solstice or shall utilize glazing with a solar heat gain coefficient of less than or equal to 0.4. Shading mechanisms or glazing with a solar heat gain coefficient less than or equal to 0.4 shall be installed at eastern and western exposure windows to minimize solar heat gain early and late in the day respectively.

Compliance Assistance for Optional Strategy (e)(14)

Orienting a building such that the east/west exposure is minimized and the north/south exposure is maximized provides for optimized daylighting opportunities. Excess glare and heat gain can be controlled by incorporating glazing with a low Solar Heat Gain Coefficient and/or by providing proper shading. South side external overhangs as an architectural feature can be used to shade windows from glare and heat gain. For east and west exposure windows, internal shades can be used to reduce glare and heat gain during the morning and afternoon portions of the day.

Section 16a-38-4(e)(15) Buildings, roads, parking areas, sidewalks, or other impervious surfaces shall not be built in any area that is inconsistent with the state plan of conservation and development.

Compliance Assistance for Optional Strategy (e)(15)

The intent of this option is to address human resource needs and development; balance economic growth with environmental protection and resource conservation concerns; and coordinate the functional planning activities of state

agencies to accomplish long-term effectiveness and economies in the expenditure of public funds. The policies contained in the C&D Plan text provide the context and direction for state agencies to implement their plans and actions in a manner consistent with the following six Growth Management Principles:

1) Redevelop and Revitalize Regional Centers and Areas with Existing or Currently Planned Physical Infrastructure

2) Expand Housing Opportunities and Design Choices to Accommodate a Variety of Household Types and Needs

3) Concentrate Development Around Transportation Nodes and Along Major Transportation Corridors to Support the Viability of Transportation Options

4) Conserve and Restore the Natural Environment, Cultural and Historical Resources, and Traditional Rural Lands

5) Protect and Ensure the Integrity of Environmental Assets Critical to Public Health and Safety

6) Promote Integrated Planning Across all Levels of Government to Address Issues on a Statewide, Regional and Local Basis

Demonstrate within the agency's Environmental Impact Evaluation (EIE) that the project development is consistent with the state plan of conservation and development. The appropriate section of the EIE should be included with the report that is required to be submitted upon design development completion.

Resources

- *CHPS Best Practices Manual*, vol. 2, Guideline GC4, http://www.chps.net/
- *LEED Reference Guide*, Site Prerequisites, http://www.usgbc.org/
- Information on cool roofs is available from the Cool Roof Rating Council website: www.coolroofs.org.
- Information on light pollution:
- Illuminating Engineering Society of North America, http://www.iesna.org/
- *CHPS Best Practices Manual*, vol. 2, EL11: Outdoor Lighting, http://www.chps.net/
- *LEED Reference Guide*, Site Credit 8: Light Pollution Reduction, http://www.usgbc.org/
- The International Dark Sky Association, http://www.darksky.org
- The Connecticut Brownfields Redevelopment Authority: http://www.ctbrownfields.com/
- The Connecticut Dept. of Transportation's Public Transportation Division: http://www.ctrides.com/
- The University of Connecticut Cooperative Extension Service: http://www.extension.uconn.edu/
- Cool Roof Rating Council website: www.coolroofs.org.
- U.S. EPA Heat Island Effect information: http://www.epa.gov/heatisland/

- The International Dark-Sky Association: http://www.darksky.org/
- The Lighting Research Center at RPI Daylighting Program: http://www.lrc.rpi.edu/programs/daylightdividends/
- The National Institute of Building Sciences Daylighting Program: http://www.wbdg.org/design/daylighting.php
- The Daylighting Collaborative: http://www.daylighting.org/
- Daylighting Studies Concerning Productivity: http://www.h-m-g.com/projects/daylighting/projects-PIER.htm
- The state plan for conservation and development is available at http://www.ct.gov/opm/cwp/view.asp?a=2990&q=383182&opmNav_GID=1807
- Connecticut Department of Environmental Protection main site: www.ct.gov/dep
- Center for Land Use Education and Research (CLEAR) and Nonpoint Education for Municipal Officials (NEMO), "Reducing Runoff Through Better Site Design" http://nemo.uconn.edu/tools/stormwater
- Maps of 100-year floodplain elevations are available from FEMA http://www.msc.fema.gov, or call 877-336-2627.
- The Connecticut Locational Guide Map provides information on preserved lands: http://www.ct.gov/opm/cwp/view.asp?a=29908&q=385462&opmNav_GID=1807

Information on stormwater issues:

- U.S. Environmental Protection Agency Stormwater Management for Construction Activities, http://cfpub.epa.gov/npdes/stormwater/swppp.cfm
- U.S. Environmental Protection Agency Construction General Permits, http://cfpub1.epa.gov/npdes/stormwater/cgp.cfm

Building Standard Optional Strategies- State Facilities

Operations and Procedures/Innovation

The following three strategies are available for improving operations or incorporating innovation into the building design. There is no minimum requirement in this category.

Building Standard Optional Strategy

Section 16a-38k-4(f)(1): Do not install fire suppression systems that contain chlorofluorocarbons (CFCs), hydrochlorofluorocarbon (HCFCs), or halons. Select refrigerants and heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems that minimize or eliminate compounds contributing to ozone layer depletion and global warming. If refrigerants are used, the mechanical room shall have leak detection equipment installed.

Compliance Assistance for Optional Strategy (f)(1)

Fire Extinguishers - CFC-free dry chemical type fire extinguishers utilize sodium bicarbonate and monammonium phosphate instead of refrigerants and halons.

HVAC&R – This option expands the mandatory requirement of eliminating CFCs to require that alternative refrigerants-HCFCs or HFCs-meet or exceed the criteria set forth in *LEED for Schools First Edition updated November 2007* under Credit EA 4 Enhanced Refrigeration Management, using the formula under Option 2. Whenever refrigerants are used, mechanical rooms must have leak detection equipment installed. (see also page 23 of this document).

Resources

- The United States Environmental Protection Agency (EPA) has information regarding the benefits of CFC phase out: http://www.epa.gov/ozone/geninfo/benefits.html . An additional EPA resource regarding refrigerants can be found at http://www.epa.gov/ozone/snap/refrigerants/qa.html#middle
- The Global Monitoring Division of the National Oceanic and Atmospheric Administration (NOAA) provides extensive information on ozone depletion and refrigerants: http://www.esrl.noaa.gov/gmd/
- This excellent Princeton University website provides information on ozone depletion and extensive information of CFC alternatives: http://www.princeton.edu/~chm333/2002/spring/Ozone/
- The Alternative Fluorocarbons Environmental Acceptability Study provides information on CFC and HCFC alternatives: http://www.afeas.org/atmospheric_chlorine.html
- In addition to the resources listed above, the EPA maintains information concerning fire extinguisher alternatives at: http://www.epa.gov/ozone/snap/fire/index.html
- The U. S. Green Building Council *LEED for Schools First Edition updated November 2007* can be accessed at http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1586

Section 16a-38k-4 (f)(2): Utilize innovative high performance features or technologies that greatly exceed any existing mandatory requirement as specified in Section 16a-38k-3 or optional measure within Section 16a-38k-4.

Compliance Assistance for Optional Strategy (f)(2)

The purpose of this option is to acknowledge design teams and building owners who adopt innovative high performance features and technologies that greatly exceed existing mandatory measures required under regulation or non-mandatory options within the scope of the regulation. This option recognizes that there are new technologies and new ideas not covered by other options that need to be supported and encouraged.

To achieve credit for achieving this innovation option, submit with the list of measures you intend to implement under the regulation (as required in section 16a-38k-8) a narrative that (1) defines the technology or feature to be utilized and (2) describe how the technology or feature enhances superior performance in the operation of the building.

For the purposes of this option, Combined Heat & Power (CHP) and Geothermal Heat Pump systems are considered advanced technologies that are eligible for credit.

Section 16a-38k-4 (f)(3): In settings where a central plant provides energy to multiple buildings or in cases where multiple buildings are fed from the same fuel source, new construction or renovation shall include metering and other such equipment necessary to evaluate energy and water consumption.

Compliance Assistance for Optional Strategy (f)(3)

When multiple buildings are supplied with electricity from a central meter or receive fuel, steam, or hot water from a central plant, it is impossible to monitor energy consumption for each building. The purpose of this measure is to isolate the consumption of the building so that its performance can be monitored and evaluated. In order to meet this requirement, one of the following strategies should be utilized:

1. **Electric Metering** – Each building should be metered individually. This is a code requirement for new construction. For existing buildings, primary meters can usually be easily installed for each building, or a sub-metering system can be installed. The electric supplier and/or an electrical contractor should be consulted.
2. **Fuel and Steam Metering** – If the building is fed steam or fuel from a central plant, a recording flow meter must be installed that will allow the monitoring of consumption. The fuel supplier and/or a plumbing and heating contractor should be consulted.
3. **Water Metering** – Each building must have a water meter that allows the monitoring of water consumption. The local water district or a plumbing contractor can provide guidance.

Acoustical Standards

Mandatory Requirement for Schools

Mandatory Requirement Section 16a-38k-5(a)	All classrooms, including art rooms, music rooms, science rooms, computer rooms, and special needs, remedial and library space shall meet the acoustical standards as required under section 10-285g of the Connecticut General Statutes.

Purpose

Excessive noise from outside sources, adjacent rooms, or noisy HVAC systems reduces the effectiveness of the learning environment. In extreme cases, it can make it impossible for teachers and students to effectively communicate. This measure ensures that the classroom is an effective learning space.

Compliance Assistance for Mandatory Requirement

Section 10-285g of the Connecticut General Statutes requires school buildings to be constructed or altered in accordance with the American National Standard Institute: Acoustic Performance Criteria, ANSI S12.60-2002, Design Requirements and Guidelines for Schools.

Resources

- ❑ American National Standards Institute (ANSI): http://www.ansi.org/
- ❑ Acoustical Society of America: http://asa.aip.org/
- ❑ Connecticut General Statutes: http://www.cga.ct.gov/

Properly Locate Outside Air Intakes

Mandatory Requirement for Schools

Mandatory Requirement Section 16a-38k-5(b)	Outside air intakes shall be located a minimum of twenty-five feet from any hazard or noxious contaminants such as vents, chimneys, plumbing vents, exhaust fans, cooling towers, street alleys, parking lots, loading docks, dumpster areas, bus loops, or any area where vehicle idling occurs. If locating an air intake within twenty-five feet of a contaminant source is unavoidable, the intake must be located a minimum of ten feet horizontal distance and two feet lower than the contaminant source.

Purpose

Particulates tracked into school buildings are one of the sources of moisture and contaminants in schools. Pesticides, dust, and heavy metals are among the unwanted materials that can be tracked into a building. Poorly placed intake vents are another source of potentially hazardous pollutants into a building.

Compliance Assistance for Mandatory Requirement

Install a permanent architectural entryway system, including a 15 foot walk-off mat, to minimize the transport of dirt, particulates, and moisture into the building.

Locate all air intakes away from potential sources of air pollutants to ensure that indoor air quality is not compromised. Be particularly careful not to locate air intakes near any area where school buses may be idling. If located facing a street or driveway, the 25 foot measurement shall be taken from the center line of the street.

If an air intake is within 25 feet of pollutant sources, show that it is located at least two feet below the contaminant sources and at least ten feed away horizontally from the nearest edge of the air intake to the nearest edge of the contaminant source.

Resources

- ❑ International Code Council, Building Officials and Code Administration (BOCA): http://www.iccsafe.org/help/redirect-bocai.html

Install Gas Equipment with Electronic Ignition

Mandatory Requirement for Schools

Mandatory Requirement Section 16a-38k-5(c)	Only electronic ignitions shall be specified for gas-fired water heaters, boilers, furnaces, air handling units, and stovetops/ovens.

Purpose

Under certain conditions, carbon monoxide from pilot light combustion can accumulate and can cause potentially dangerous conditions for the building occupants.

Compliance Assistance for Mandatory Requirement

Only install gas equipment listed in the mandatory requirement that utilizes electronic ignition.

Use Low VOC Materials

Mandatory Requirement for Schools

Mandatory Requirement Section 16a-38k-5(d)	The following materials shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*: (1) 50% of adhesives and sealants used in the interior of the building; (2) Acoustic ceiling tiles and wall panels; (3) Interior paints; (4) Wall coverings; (5) Carpet systems and associated adhesives; (6) Composite and solid wood flooring; (7) Resilient flooring and associated adhesives.

Purpose

Volatile Organic Compounds (VOCs) are present to varying degrees in a wide range of common building products. These chemicals can be released into the air and can cause a variety of health problems, from minor irritation to major health issues. Children are typically more susceptible than adults to VOCs

Compliance Assistance for Mandatory Requirement

Purchase and use only products listed that are certified as low-VOC products by one of the following organizations:

- ❑ Scientific Certification Systems - Indoor Advantage-Gold
- ❑ GREENGUARD Certification Program

Resources

- ❑ Scientific Certification Systems: http://www.scscertified.com/ecoproducts/index.html
- ❑ Greenguard Environmental Institute: http://www.greenguard.org/
- ❑ California Indoor Air Quality Program (for download of the *Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers:* http://www.cal-iaq.org/VOC/

Environmental Assessment of Building Site

Mandatory Requirement for Schools

Mandatory Requirement Section 16a-38k-5(e)	The town or regional board of education and the building committee of such town or district, shall provide for a Phase I environmental site assessment in accordance with the American Society for Testing and Materials Standard #1527, Standard Practice for Environmental Site Assessments: Phase I Site Assessment Process, or similar subsequent standards, as required pursuant to Section 10-291 of the Connecticut General Statutes. If a town, regional board of education or the building committee of such town or district suspect contamination, a Phase II Environmental Site Assessment shall be undertaken as described in American Society for Testing and Materials Standard E1903-97 or similar subsequent standards. Any contamination found shall be remedied.

Purpose

To protect children's health, this mandatory measure ensures that the site has been assessed for contamination, and if contamination is suspected, the situation is further investigated and is remedied if necessary.

Compliance Assistance for Mandatory Requirement

Using the Connecticut Department of Environmental Protection's (CT DEP's) Site Characterization Guidance Document (SCGD), conduct a Phase I Environmental Site Assessment (ESA) to determine if contamination exists at the site. As directed in the SCGD, a Phase I ESA must include the following components: site description; site history; file and record reviews of federal, state, and local agencies; review of previous assessments/documentation; the environmental setting; a site reconnaissance survey; and documentation of findings and a preliminary conceptual site model. A variety of information sources may be available to develop the Phase I ESA. These elements are described in detail in the SCGD. A Phase I ESA should be prepared by a CT Licensed Site Professional (LEP). LEPs are licensed by CT DEP to perform investigation and remediation activities on contaminated sites in CT. In addition, towns and/or Boards of Education should receive assistance from the LEP in interpreting the findings, conclusions and recommendations contained in the Phase I ESA.

If the Phase I ESA concludes that any hazardous wastes and/or hazardous substances may be present on the site, a Phase II Environmental Site Assessment must be conducted in accordance with the SCGD. The Phase II ESA should also be performed by an LEP and the LEP should provide the town and/or Board of Education with assistance in interpreting the report's findings, conclusions and recommendations. Any contamination found shall be remedied to meet Connecticut Department of Environmental Protection remediation standard requirements. *Note*

that under the DEP regulation, schools fall into the "residential activity" definition (see Remediation Standard Regulations, definition 53).

Resources

- ❑ Site Characterization Guidance Document: http://www.ct.gov/dep/cwp/view.asp?a=27518&q=335418&depNAV_GID=1626
- ❑ CT Department of Environmental Protection Remediation Standard Regulations: http://www.ct.gov/dep/cwp/view.asp?a=27518&q=325012&depNav_GID=1626
- ❑ CT Department of Environmental Protection Licensed Environmental Professional Program Fact Sheet: http://www.ct.gov/dep/cwp/view.asp?A=2715&Q=324984
- ❑ Roster of Licensed Environmental Professionals in CT: http://www.ct.gov/dep/lib/dep/site_clean_up/lep/LEProster.pdf
- ❑ Environmental Professionals' Organization of Connecticut, Inc.(EPOC) website: http://www.epoc.org/index.php?option=com_wrapper&Itemid=75

HEPA Vacuuming

Mandatory Requirement for Schools

Mandatory Requirement Section 16a-38k-5(f)	Prior to substantial completion of the building, vacuum all carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum. For phased or occupied renovations, HEPA vacuum the carpet daily in occupied areas.

Purpose

This practice minimizes the amount of pollutants that are distributed through the building and retained on surfaces within the building.

Compliance Assistance for Mandatory Requirement

In addition to thorough vacuuming, install carpet and other textile material after all sanding and sawing is complete. If dust producing activities are unavoidable after the installation of carpet/textile material, perform the activities in a contained area and protect all exposed soft surfaces with tape-sealed plastic sheeting.

Building Standard Optional Strategies- Schools

Energy Efficiency and Renewable Energy

The following eleven strategies are available for demonstrating within the energy efficiency and renewable energy category. At least one option in this category must be selected:

Section 16a-38k-6(a)(1): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 3 1/2 percent.

Section 16a-38k-6(a)(2): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 7 percent.

Section 16a-38k-6(a)(3): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 10 1/2 percent.

Section 16a-38k-6(a)(4): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 14 percent.

Section 16a-38k-6(a)(5): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 17 1/2 percent

Section 16a-38k-6(a)(6): Same as in Section 16a-38k-3(c) except that the percentage improvement over base is increased by 21 percent.

Compliance Assistance for Optional Strategies (a)(1) through (a)(6)

The above options use the same compliance methodologies and tools as the requirements outlined in Section 16a-38k-3 (see pages 9 of this document), and they may be used cumulatively. For example, complying with option 3 also puts you in compliance with options 1 and 2 and thus provides 3 (as opposed to just 1) of the 25 total strategies needed for project compliance.

Section 16a-38k-6(a)(7): The installation of on-site renewable energy shall provide at least 3 percent of the building energy needs based upon the U. S. Department of Energy Commercial Buildings Energy Consumption Survey for estimated electricity usage or by using the same modeling software used to demonstrate compliance with the energy efficiency section of this document. Any facility that installs renewable energy systems must retain associated RECs for a period of two years.

Section 16a-38k-6(a)(8): Same as in subsection (a)(7) except at least 7 percent of the building energy needs are met through on-site renewable energy.

Section 16a-38k-6(a)(9): Same as in subsection (a)(7) except at least 10 percent of building energy needs are met through on-site renewable energy.

Compliance Assistance for Optional Strategies (a)(7) through (a)(9)

Renewable energy is classified as:

- ❑ Solar thermal systems
- ❑ Solar electric (photovoltaic systems)
- ❑ Wind power
- ❑ Methane landfill gas

- ❑ Low-impact hydropower (free-flow/no-head, or low-head systems)
- ❑ Biomass from locally available sources
- ❑ Biodiesel
- ❑ Fuel Cells

Geothermal heat pumps are not considered renewable energy systems for the purposes of this option. See "Building Innovations"

Solar thermal systems often offer the best investment in solar energy. Meeting a portion of the building's space heating, domestic water heating, or both loads combined is possible with a variety of system types and configurations. Systems dedicated to domestic water heating needs are often a good choice, as there is a demand for hot water year round.

Photovoltaic systems collect solar energy and directly convert it to electricity. The electricity generated is direct current (DC) and is either used to power DC devices or, more commonly, is converted (inverted) to alternating current (AC) to be used on-site for AC devices and/or supplied to the local electrical grid. Building and ground mounted systems are available.

Wind energy has been rapidly gaining in popularity, and many countries now meet significant portions of their electrical needs with wind generators. Today's slow rpm generators have solved many of the maintenance concerns and have greatly reduced the negative effects on bird life. The siting of wind generators is a long-term process, so planning must begin early. It is not unusual for the available wind to be monitored for at least a one-year period before selecting a site.

Methane landfill gas can be used to directly power boilers or may be used as a fuel source for fuel cells. The gas is corrosive so precautions must be taken to protect system components.

Low-impact hydroelectric power systems take advantage of the natural flow of rivers and streams, rather than utilizing dams to control the flow of water.

Qualifying biomass energy systems use locally grown biomass that is cultivated and harvested in a sustainable manner. Waste wood products and/or wood products from sustainable practices are eligible fuel sources.

Biodiesel is a fuel made from plant materials and/or waste cooking oils. Most commercially available biodiesel is produced from soybeans. Various biodiesel products are available including 100% biodiesel (commonly referred to as B100). Fuel mixes of biodiesel and conventional diesel are also commercially available including B20, B50, and B80 with 20%, 50%, and 80% biodiesel content respectively. In calculating the percentage of renewable energy utilized at the facility, only the actual biodiesel content is to be included. For example, if 10% of the energy is supplied by B50 biodiesel, the renewable contribution to the total energy consumption is 5%.

Resources

- ❑ General information and links to Connecticut Clean Energy Fund: www.ctcleanenergy.com
- ❑ Resources for building modeling software: http://www.eere.energy.gov/buildings/highperformance/simulation_software.html
- ❑ Database of state incentives for renewable energy and efficiency: http://www.dsireusa.org/

- U. S. Department of Energy Commercial Buildings Energy Consumption Surveys: http://www.eia.doe.gov/emeu/consumption/index.html
- CHPS Best Practices Manual, vol. 2: Guideline OS1: http://www.chps.net/
- LEED Reference Guide, Energy and Atmosphere Credit 2: Renewable Energy: http://www.usgbc.org/
- Advanced Buildings Reference Guide: Renewable Energy: http://www.poweryourdesign.com/refguide.htm

Renewable Energy Credit (REC) Options

Section 16a-38k-6(a)(10): The facility shall have a two-year contract to purchase at least 35 percent of the building's annual electricity consumption from a Class I renewable energy source. Alternately, the purchase may be in the form of New England Power Pool Generation Information System (NEPOOL-GIS) renewable energy credits (RECs); if procuring RECs outside of the NEPOOL-GIS, the RECs shall be equivalent to Class I renewable energy source and certified by a nationally recognized certification organization as identified in the *Connecticut State Facilities Building Standard Guidelines Compliance Manual for High Performance Buildings*; or the purchase may be through the CTCleanEnergyOptions™ program . Baseline electric usage can be determined using either the U. S. Department of Energy Commercial Buildings Energy Consumption survey for estimated electricity usage or by using building modeling software that is identified in the *Connecticut State Facilities Building Standard Guidelines Compliance Manual for High Performance Buildings.* RECs purchased to comply with this section cannot be purchased from a facility that has installed renewable energy systems for credit under 16a-38k-4(a)(7 through 9).

Compliance Assistance for Optional Strategy (a)(10)

Determine the energy needs of the building and comply with one of the following three methodologies:

1. Sign a two-year contract with a clean energy provider to purchase renewable energy credits representing at least 35% of the building's annual electricity consumption from a Class 1 renewable energy source. Connecticut Light and Power (CL&P) and United Illuminating (UI) both offer clean energy contracts. See the resources section for more information.

Class I renewable energy source is defined as energy derived from:

- Solar power
- Wind power
- Fuel cells
- Methane gas from landfills
- Ocean thermal power
- Wave or tidal power
- Low emission advanced renewable energy conversion technologies

- ❑ Waste heat recovery systems installed on or after July 1, 2006, that produce electrical or thermal energy by capturing preexisting waste heat or pressure from industrial or commercial processes
- ❑ Run-of-the-river hydropower facilities with generating capacities of not more than five megawatts, do not cause an appreciable change in the river flow, and began operation after July 1, 2003
- ❑ Biomass facilities, including, but not limited to, biomass gasification plants that utilize land clearing debris, tree stumps, or other biomass that regenerates and/or will not result in a depletion of resources, provided such biomass is cultivated and harvested in a sustainable manner and the average emission rate for such facility is equal to or less than .075 pounds of nitrogen oxide per million Btu of heat input for the previous calendar quarter, except that energy derived from a biomass facility with a capacity of less than five hundred kilowatts that began construction before July 1, 2003, may be considered a Class I renewable energy source, provided such biomass is cultivated and harvested in a sustainable manner. (NOTE: Sustainable biomass does not mean construction and demolition waste, finished biomass products from sawmills, paper mills or stud mills, organic refuse derived separately from municipal solid waste, or biomass from old growth timer stands.)

2. Purchase Class 1 renewable energy credits through the New England Power Pool Generation Information System (NEPOOL-GIS) equal to at least 35% of the building's annual electricity consumption. The credits are offered through brokers. See the resources section for a link to NEPOOL certificate brokers.

3. Purchase renewable energy credits through an independent source. The credits must be equivalent to Class I renewable resources and certified by a nationally recognized certification organization such as the Green-e Program offered by the Center for Resource Solutions. See the resources section for a link to the Green-e certificate program.

Renewable Energy Credits

Renewable Energy Credits (RECs) also known as Tradable Renewable Certificates (TRCs) allow a user of electricity to purchase credits for the production of renewable energy that offsets the generation of electricity by conventional means. This allows purchasers to participate in the renewable energy marketplace when locally produced renewable energy is not available. The purchase of RECs allows renewable energy generating facilities to be built where they are most cost-effective, while allowing customers anywhere to participate.

RECs may have monetary value and can be traded on the open market. Participants purchasing RECs to meet the requirements of this regulation may not sell the RECs unless meeting the renewable energy requirement through an alternative method.

Resources

- ❑ Renewable energy credit (REC) New England Power Pool (NEPOOL) program: http://www.nepoolgis.com/
- ❑ Renewable energy credit (REC) Certificate Brokers NEPOOL program: http://www.nepoolgis.com/newsRoom/update02.asp

- ❑ Green-e renewable energy credit (REC) purchasing and certification program: http://www.green-e.org/base/re_products?cust=b
- ❑ The following article describes the NEPOOL REC system as it applies to the State of Connecticut: http://www.evomarkets.com/assets/evobriefs/nw_1062599800.pdf
- ❑ Details of the CT Clean Choice™ clean energy program offered by the DPUC-for customers of CL&P and UI can be found at: http://www.sterlingplanet.com/bizBuyCT.php
- ❑ Details of the Community Energy clean energy program offered by the DPUC-for customers of CL&P and UI can be found at: http://www.newwindenergy.com/
- ❑ CL&P's clean energy program information is available at: http://www.cl-p.com/community/environment/clean.asp
- ❑ Information on UI's clean energy program can be found at: http://www.uinet.com/index.asp

Energy Resource Management: The following strategy is available for renewable and non-renewable energy consumption.

Section 16a-38k-6(a)(11): Develop a measurement and verification plan for energy usage, to cover a period of at least one year after occupancy.

Compliance Assistance for Optional Strategy (a)(11)

This point can be obtained by instituting a plan to monitor and record energy usage for at least one year. A variety of data logging equipment and services are available for the measurement and verification (M&V) of the energy consumption of various systems throughout the building. Contact your electric and gas suppliers for assistance with establishing an M&V process for your facility.

Resources

- ❑ Electronic version of the Connecticut State Building Code – Connecticut Supplement is available from the Office of State Building Inspector Web page that can be accessed through the State of Connecticut, Department of Public Safety website: http://www.ct.gov/dps/
- ❑ Paper and electronic versions of the Connecticut Building Code (International Building Code Portion of the State Building Code, State of Connecticut) and the International Energy Conservation Code are available from the International Code Council on their website http://www.iccsafe.org under ICC Store and State/Local Codes.
- ❑ Main page: http://www.iccsafe.org/

Building Standard Optional Strategies- Schools

Indoor Environment

The following twelve strategies are available for improving indoor environment. At least two options in this category must be selected:

Section 16a-38k-6(b)(1): Install permanent indoor air monitoring systems to provide performance feedback on ventilation systems. Such monitoring systems, at minimum, shall include devices to measure temperature, relative humidity, carbon dioxide, and dew point. Carbon dioxide measurement sensors shall measure both interior and exterior levels of CO2.

Compliance Assistance for Optional Strategy (b)(1)

Air monitoring is an indicator of potential problems within a building. Continuous air sampling allows the building operator to identify potentially unhealthy conditions so that adjustments can be made to resolve the conditions.

According to the LEED New Construction Rating System, carbon dioxide should be monitored in mechanically ventilated spaces with design occupant densities greater than or equal to 25 people per 1000 square feet. For naturally ventilated spaces, CO_2 concentrations should be monitored within all spaces. CO_2 monitoring shall be located within the room between 3 feet and 6 feet above the floor. One CO_2 sensor may be used to represent multiple spaces if the natural ventilation design uses passive stack(s) or other means to induce airflow through those spaces equally and simultaneously without intervention by building occupants.

Measurement of temperature, relative humidity, and dew point can help identify conditions that can lead to condensation and potential mold problems within the building shell.

Calibration of all monitoring system equipment is critically important, and should be done at least as often as the manufacturer recommends.

Section 16a-38k-6 (b)(2): Provide increased outdoor ventilation by designing mechanical ventilation systems to exceed the minimum rates required by the current Connecticut State Building Code or the most recent version of the ASHRAE Standard 62.1 , whichever is more stringent, by thirty percent.

Compliance Assistance for Optional Strategy (b)(2)

If appropriate, use heat recovery equipment to minimize the additional energy consumption associated with higher ventilation rates in mechanical systems.

Section 16a-38k-6 (b)(3): After construction ends and with all interior finishes installed but prior to building occupancy, flush the building continuously for at least ten days with outside air while maintaining an internal temperature between 60°F and 78°F and relative humidity no

higher than 60%. Do not "bake out" the building by increasing the temperature of the space. Alternatively, use the following strategy: Flush out each space separately until 3,500 cubic feet of outside air per square foot of floor space has been delivered to that space. The space shall then be ventilated at the rate of 0.3 cubic feet per minute per square foot of floor space or the design minimum outside air rate, whichever is greater. This shall be performed for a minimum of three hours prior to occupancy and then during occupancy until a total of 14,000 cubic feet of outside air per square foot of floor area has been delivered to that space.

Compliance Assistance for Optional Strategy (b)(3)

Perform a building flush-out by supplying outside air continuously for ten days while maintaining an internal temperature of at least 60˚F but no warmer than 78°Fand relative humidity no higher than 60%.

OR

Alternative Compliance Pathway for Optional Strategy (b)(3)

Flush out each space separately with outside air until 3,500 cubic feet of outside air has been delivered for each square foot of floor area. Then ventilate the area at the rate of 0.3 cubic feet of outside air per square foot of floor space or the design outside air rate, whichever is greater, at least three hours prior to occupancy. Maintain that ventilation rate until a total of 14,000 cubic feet of outside air per square foot of floor areas has been delivered to the space.

Section 16a-38k-6(b)(4): All composite wood and agrifiber products used within the shell of the building shall meet the testing and product requirements of the California Department of Health Services *Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers,* including 2004 Addenda.

Compliance Assistance for Optional Strategy (b)(4)

The State of California has a downloadable version of the *Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers,* including 2004 Addenda at http://www.cal-iaq.org/VOC/

Section 16a-38k-6(b)(5): For administrative offices and other regularly occupied spaces, allow for individual lighting control for ninety percent or more of the building occupants in workspaces to allow for adjustments to suit individual tasks and preferences. For classroom and core learning spaces, with the exception of chemistry laboratories, art and music rooms, shops, and gyms, install two modes of illumination: general illumination and audio visual illumination. General illumination mode shall achieve desk level illumination of 30-50 footcandles; audio visual mode shall achieve a desk level illumination of 10 to 20 footcandles while limiting vertical illumination at a projection screen of no more than seven footcandles. All lighting fixtures shall include glare control features.

Compliance Assistance for Optional Strategy (b)(5)

This option can be met by specifying the installation of lighting controls for at least 90% of the administrative work spaces. Lighting in all classrooms and learning spaces, with the exception of spaces noted in the regulation, shall have a minimum of two illumination modes: general illumination mode and audio visual mode.

Section 16a-38k-6(b)(6): Using conditions for thermal comfort described in the current version of the ASHRAE Standard 55, allow for individual thermal comfort control for fifty percent or more of the building occupants to allow for adjustments to suit individual tasks and preferences and provide thermal system comfort controllability for all shared multi-occupant spaces to enable adjustment that meets group needs and preferences.

Compliance Assistance for Optional Strategy (b)(6)

Installing adjustable thermostats in each classroom and workspace will comply with this option. Programmable thermostats should be considered for all thermostat installations.

Section 16a-38k-6(b)(7): Building facility personnel, under direction of the building owner, shall administer an anonymous survey for building occupants within the first twelve months after initial occupancy to assess occupant satisfaction and implement corrective actions for recurrent issues. At minimum, the survey shall cover thermal building comfort, lighting, security issues, indoor air quality, functionality of space, and acoustics. If greater than 20% of the respondents express dissatisfaction with any specific issue, the building owner shall prepare a plan for remedial action.

Section 16a-38k-6(b)(8): Demonstrate through computer software simulations or through recording of indoor light measurements that a minimum illumination level of twenty-five footcandles has been achieved from daylight in at least 75% of all regularly occupied areas.

Compliance Assistance for Optional Strategy (b)(8)

Most lighting design firms and many electrical engineering firms utilize simulation software to predict daylight levels. Lighting design firms and energy efficiency consulting firms will be able to assist with recording light meters to measure daylight contribution.

Section 16a-38k-6(b)(9): There shall be a direct line of sight to the outdoor environment via window glazing between 2 1/2 and 7 1/2 feet above the finished floor for 70% of all regularly occupied areas.

Compliance Assistance for Optional Strategy (b)(9)

Installing windows at normal window heights in 75% of regularly occupied areas will meet this requirement. Rooms without an exterior wall may be excluded from this calculation.

Section 16a-38k-6(b)(10): To prevent mold, heating, ventilating and air conditioning systems (HVAC) shall be designed to limit space relative humidity to 60% or less during load conditions whether the building is occupied or non-occupied; an ongoing indoor air quality management plan shall be implemented as required under section 10-220 of the Connecticut General Statutes,

using the U. S. Environmental Protection Agency's (EPA) Indoor Air Quality *Tools for Schools* Program; and the criteria of sections 16a-38k-6(b)(6) and 16a-38k-6(b)(7) of the Regulations of Connecticut State Agencies shall be met.

Compliance Assistance for Optional Strategy (b)(10)

Resources

- ❑ Connecticut General Statutes: http://www.cga.ct.gov/
- ❑ Tools for Schools: http://www.epa.gov/iaq/schools/

Section 16a-38k-6(b)(11): Student and teacher classroom chairs, desks, and tables manufactured, refurbished or refinished within one year prior to building occupancy and used within the building interior shall be certified for low chemical emissions by the certifying organization listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*.

Compliance Assistance for Optional Strategy (b)(11)

Use the following certification organization for to identify low VOC furniture:

- ❑ Greenguard Environmental Institute: http://www.greenguard.org/

Section 16a-38k-6(b)(12): Where chemical use occurs, including housekeeping areas, chemical storage and mixing areas, and copy/print rooms, use dedicated exhaust to ventilate the space at a minimum of 0.5 cubic feet per minute per square foot with adequate make-up air. No recirculation is permitted and such spaces shall have a negative air pressure of at least five pascal (.02 inches of water gauge) to a minimum of one pascal (0.004 inches of water gauge) when the doors are closed.

Compliance Assistance for Optional Strategy (b)(12)

Physically isolate activities and storage areas that are associated with emissions of hazardous or potentially hazardous contaminants. Design chemical storage and mixing areas and copy rooms with dedicated exhaust ventilation systems.

Section 16a-38k-6(b)(13): Building design shall control entry of pollutants and excess moisture into buildings and later cross-contamination of regularly occupied areas at all high volume entryways and those adjacent to playing fields and locker rooms through the use of three-part walk-off systems and the proper placement of outside air intakes. Walk-off systems shall include a grate or grill outside the entryway for removing dirt and snow, a drop through mat system within the vestibule, and a fifteen foot interior walk-off mat.

Compliance Assistance for Optional Strategy (b)(13)

One of the major sources of particulate contamination in school buildings are particles tracked into schools on shoes. Contaminants include pesticides, heavy metals, and dust. The best way to minimize this unwanted contamination from entering the building is the

use of a permanents walk-off entryway system at all entrances in which people normally enter and exit the building . Specifications should include entryway walk-off systems and walk-off mats.

Additional Indoor Environment Considerations

The following practice is not specifically addressed in the above sections, but nevertheless will result in creating better indoor air quality in a facility.

- ❑ Do not use fossil-fuel-powered, mobile, machinery inside the building. This is to prevent accumulation of exhaust inside the building from equipment such as floor polishers and burnishers.

Building Standard Optional Strategies- Schools

Water Efficiency

The following four strategies are available for improving water efficiency; at least one option in this category must be selected:

Section 16a-38k-6(c)(1): Same as in Section 16a-38k-3(g), except that the conserving strategies use 30 percent less water in aggregate.

Section 16a-38k-6(c)(2): Reduce by 50 percent the amount of water required for landscaping from a mid-summer baseline usage case. Reductions may be attributed to the use of captured rainwater, recycled waste (grey) water, efficiency of irrigation strategies, and use of drought resistant plant species. This strategy only applies to renovation projects.

Section 16a-38k-6(c)(3): Use landscaping that does not require a permanent irrigation system or uses non-potable water for irrigation. Any system installed for irrigation using potable water shall only be utilized for plant establishment and be removed prior to one year of building occupancy.

Section 16a-38k-6(c)(4): Reduce potable water use by half through water conserving fixtures and/or use of non-potable water using methodologies stated in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*. This strategy only applies to renovation projects.

Compliance Assistance for Optional Strategies (c)(1) and (c)(4)

Develop a water-use baseline using the same methodology described for the mandatory requirement 16a-38k-3(f) (see page 15 of his document). Careful selection of water-conserving plumbing fixtures, dry fixtures and efficient control technologies will be needed to meet these more stringent water reduction targets. Composting toilet systems, non-water using urinals, and occupant sensors will all help to reduce the potable water demand. Consider reuse of stormwater and greywater for non-potable applications such as toilet and urinal flushing and custodial uses. Check all local and state codes before proceeding with a greywater or stormwater reuse system.

Compliance Assistance for Optional Strategies (c)(2) and (c)(3)

The use of potable water for irrigation can be minimized or eliminated by specifying drought resistive plants and grasses, collecting and using rainwater for irrigation, and/or using highly water-efficient irrigation systems. When specifying water conservative plants, determine soil composition and ensure that existing soils will support the plants to be specified. Consider all operating and maintenance costs of any irrigation equipment specified. If irrigation is necessary, make arrangements to irrigate during morning hours to maximize irrigation benefits and minimize evaporation.

In order to reduce water demand for sewage conveyance and irrigation, rainwater catchment systems with cisterns or underground storage tanks could be used. These supplementary systems can significantly decrease water demand by drawing on stored water instead of municipal water supplies or drinking water wells.

Rainwater catchment systems should be designed with a water storage capacity for sewage conveyance and/or irrigation in typical years under average conditions. In other words, oversizing water storage to meet drought conditions may be costly and could increase maintenance requirements. On the other hand, undersizing storage may simply result in a system that is too small to significantly offset potable water consumption. Rainwater collection and storage systems should be designed to avoid mold growth, bacterial accumulation, and stagnation.

Resources

- US Environmental Protection Agency: http://www.epa.gov/oaintrnt/water/index.htm
- State of Connecticut Department of Environmental Protection: http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325520&depNav_GID=1654&depNav=|
- State of Connecticut Department of Public Health : http://www.dph.state.ct.us/
- LEED Reference Guide, Water Credit 2: Innovative Waste Water Technologies and Water Credit 1: Water Efficient Landscaping: http://www.usgbc.org/
- American Water Works Association: http://www.awwa.org/waterwiser/links/index.cfm?LinkCategoryID=6
- California Urban Water Conservation council: http://www.h2ouse.org/
- CHPS Best Practices Manual, vol. 2, Guideline SP6: Drought Tolerant and Pest-Resistant Plants, Guideline SP10: Water-Efficient Irrigation Systems, Guideline SP12: Reclaimed Water for Irrigation: http://www.chps.net/
- The Irrigation Association: http://www.irrigation.org/

Building Standard Optional Strategies- Schools

Recycling, Reuse, and Sustainability

The following thirteen strategies are available for improving recycling, reuse, and sustainability. At least two options within this category must be selected:

Section 16a-38k-6(d)(1): Retain at least 75 percent, by surface area, of an existing building structure, including structural floor and roof decking, exterior framing, and envelope surface, but excluding window assemblies and non-structural roofing material. This strategy only applies to renovation projects.

Section 16a-38k-6(d)(2): Same as subsection (d)(1) above, except that a total of 95 percent of the building structure is retained. This strategy only applies to renovation projects.

Section 16a-38k-6(d)(3): Use existing non-structural elements such as interior walls, doors, floor coverings and ceiling systems in at least half (by square footage) of the completed building. This strategy only applies to renovation projects.

Compliance Assistance for Optional Strategies (d)(1) through (d)(3)

Consider reusing existing, previously occupied buildings, including structure, envelope, and elements. Remove any elements that pose a contamination risk to building occupants and upgrade the components that would improve energy and water efficiency such as windows, mechanical systems, and plumbing fixtures

Section 16a-38k-6(d)(4): Recycle or salvage at least half of non-hazardous construction and demolition debris.

Section 16a-38k-6(d)(5): Same as subsection (d)(4) above, except that a total of 75 percent of non-hazardous construction and demolition debris is recycled or salvaged.

Compliance Assistance for Optional Strategies (d)(4) and (d)(5)

Establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals. Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet, and insulation. Designate a specific area(s) on the construction site for segregated collection of recyclable materials and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

Section 16a-38k-6(d)(6): Use 5 percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project. Only permanently installed materials can be used in calculations.

Section 16a-38k-6(d)(7): Same as subsection (d)(6) above, except that a total of 10 percent of refurbished, salvaged, or reused materials, based on cost of the total value of materials on the project shall be used.

Compliance Assistance for Optional Strategies (d)(6) and (d)(7)

Identify opportunities to incorporate salvaged materials into building design and research potential material suppliers. Consider salvaged materials such as beams and posts,

flooring, paneling, doors and frames, cabinetry and furniture, brick and decorative items. Note that mechanical, electrical, and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project

Section 16a-38k-6(d)(8): Use materials where the weighted average of recycled materials content is 10 percent, based on cost, of the total value of the materials in the project. Recycled content value of a material assembly shall be determined by weight. The weighted average shall be determined using the following formula:

Weighted average of recycled materials= % post consumer content + 1/2(% of pre-consumer content).

Section 16a-38k-6(d)(9): Same as subsection (d)(8) above, except that the weighted average of recycled materials must constitute at least 20 percent, based on cost, of the total value of the materials in the project.

Compliance Assistance for Optional Strategies (d)(8) and (d)(9)

Identify the project goal for recycled content materials and identify material suppliers that can achieve this goal. During construction, ensure that the specified recycled content materials are installed. Consider a range of environmental, economic, and performance attributes when selecting products and materials.

Post-consumer material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.

Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

Section 16a-38k-6(d)(10): Use a minimum of 10 percent of building materials extracted or manufactured within a five-hundred mile radius of the building site.

Section 16a-38k-6(d)(11): Same as (d)(10) above, except that a minimum of 20 percent of building materials extracted or manufactured within a five-hundred mile radius of the building site shall be used.

Compliance Assistance for Optional Strategies (d)(10) and (d)(11)

Establish a project goal for locally sourced materials and identify materials and material suppliers that can achieve this goal. During construction, ensure that the specified local materials are installed and quantify the total percentage of local materials installed. Consider a range of environmental, economic, and performance attributes when selecting products and materials. Note that if only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value. Mechanical, electrical, and plumbing components and specialty items such as elevators and equipment shall not be included in this calculation. Only include materials permanently installed in the project.

Section 16a-38k-6(d)(12): Use building materials and products that are made from plants harvested in a ten-year or shorter cycle. Two and one-half percent of the total value of building materials and products, based on costs, must be used in the project.

Compliance Assistance for Optional Strategy (d)(12)

Establish a project goal for rapidly renewable materials and identify products and suppliers that can support achievement of this goal. Consider materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheatboard, strawboard, and cork. During construction, ensure that the specified renewable materials are installed.

Section 16a-38k-6(d)(13): At least half of permanently installed wood and wood-based products shall be certified in accordance with the current Forest Stewardship Council (FSC) principles and criteria.

Compliance Assistance for Optional Strategy (d)(13)

Establish a project goal for FSC-certified wood products and identify suppliers that can achieve this goal. During construction, ensure that the FSC-certified wood products are installed and quantify the total percentage of FSC-certified wood products installed. Note that these components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. Only include materials permanently installed in the project

Resources

- ❑ LEED for Schools Green Building Rating System for New Construction and Major Renovation, First Edition, November, 2007. http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1586
- ❑ Contact the Connecticut DEP for materials and resources reduce/reuse/recycle issues: http://www.ct.gov/dep/cwp/view.asp?a=2714&q=324882&depNav_GID=1645&depNav=|
- ❑ DEP main site: http://www.ct.gov/dep
- ❑ Regulation relating to recycling in State of Connecticut http://www.cga.ct.gov/2005/pub/Chap446d.htm

Building Standard Optional Strategies- Schools

Site Selection and Development

The following fourteen strategies are available for improving the site selection process. A minimum of two options within this category must be selected:

Section 16a-38k-6(e)(1): Construct or renovate the building on a previously developed site and within one-half mile of a residential zone/neighborhood with an average density of ten units per acre net and within one half mile of a minimum of ten basic services as described in the *State Facilities Building Standard Guidelines Compliance Manual for High Performance Buildings* (this document) and with pedestrian access between the building and the services.

Compliance Assistance for Optional Strategy (e)(1)

Building on a previously developed site or renovating an existing building saves valuable open space. Building within ½ mile of a densely populated area will reduce bus and car traffic. Build within ½ mile of 10 of the following basic services:

1. Community Center
2. Post Office
3. Bank
4. Pharmacy
5. Supermarket
6. Convenience Store
7. Public Library
8. Day Care Center
9. Health Care Facility
10. Laundromat or Dry Cleaner
11. Hardware Store
12. Fitness Center
13. Public Park
14. Government Service Building
15. Senior Center
16. Hair Salon/Barber Shop
17. Museum

Section 16a-38k-6(e)(2): Select a site that has access to public transportation. Public transportation is considered accessible if the site is located within one-third of a mile to an existing commuter rail station or located within one quarter mile of a public commuter bus line.

Compliance Assistance for Optional Strategy (e)(2)

The Connecticut Dept. of Transportation's Public Transportation Division can provide information on train and bus services, and ride sharing programs for teachers and staff. A link is listed in the resources section.

Section 16a-38k-6(e)(3) Encourage bicycle transportation by providing secure bicycle racks or storage within five-hundred feet of a building entrance for a minimum of 5 percent of building users at peak times and shower and changing facilities must be provided in the building or within five-hundred feet of the building.

Compliance Assistance for Optional Strategy (e)(3)

Many companies manufacture heavy duty bike racks designed for schools and commercial buildings. A web-search using the words "bicycle racks parking" will reveal numerous sources. Local bicycle shops may also be able to supply heavy duty racks.

Section 16a-38k-6(e)(4): Encourage the use of low-emitting and fuel efficient vehicles by providing preferred parking for low-emitting and fuel efficient vehicles for 5 percent of the total parking capacity at the site.

Compliance Assistance for Optional Strategy (e)(4)

To comply provide parking close to the building entrance that represents at least 5% of the total parking capacity, assigning these areas for low emission and fuel efficient vehicles only. Low-emitting, fuel-efficient vehicles include: electric, hybrids and vehicles using bio-diesel, compressed natural gas, or other low-emitting fuel or technology. Simply assigning parking spaces for compact cars does not satisfy the criteria.

Section 16a-38k-6(e)(5): Reduce pollution from single occupancy vehicle use by sizing parking capacity to meet, but not exceed minimum local zoning requirements; provide designated preferred parking for carpools or vanpools for 5 percent of the total provided parking spaces; and provide infrastructure and support programs to facilitate shared vehicle usage such as ride sharing bulletin boards and shuttle services to mass transit.

Compliance Assistance for Optional Strategy (e)(5)

The Connecticut Dept. of Transportation's Public Transportation Division can provide information on van pooling and ride sharing programs available to teachers and administrative staff. A link is listed in the resources section.

Section 16a-38k-6(e)(6): Protect existing natural areas or restore damaged areas to promote biodiversity. Any site disturbances shall be limited to no more than forty feet beyond the building perimeter; ten feet beyond surface walkways, patios, surface parking and utilities less than twelve inches in diameter; fifteen feet beyond primary roadway curbs and main utility branch trenches; and twenty-five feet beyond constructed areas with permeable surfaces, such as playing fields, that require additional staging areas in order to limit compaction in the constructed area. For previously developed or graded sites, restore or protect to a minimum of 50 percent of the site area, excluding the building footprint, to plant species indigenous to the locality or to cultivars of native plants adapted to the local climate conditions and not considered invasive species or noxious weeds. Except for playing fields and picnic areas, minimize lawn areas to less than 10 percent of the building site landscape.

Compliance Assistance for Optional Strategy (e)(6)

The University of Connecticut Cooperative Extension System can assist with the protection of natural areas, the availability/suitability of native plants, water conserving grasses and a wealth of related information on sustainable site design. A link is located in the resource section. Keep lawn areas to less than ten percent of the building site landscape to reduce fuel usage related to mowing.

Section 16a-38k-6(e)(7): Maximize open space at the site. Provide vegetated open space within the project boundary to exceed the local zoning's open space requirement by 25 percent; where there is no local zoning requirement, provide vegetated open space adjacent to the building that, at minimum, is equal to the building footprint.

Compliance Assistance for Optional Strategy (e)(7)

Vegetated open space refers to areas of natural vegetation with native plants. Lawns are not considered "vegetated open space." As with Strategy 6, the University of Connecticut Cooperative Extension System can assist with this strategy.

Section 16a-38k-6(e)(8): Design the site to minimize storm water runoff. Implement a storm water management plan that results in a 25 percent reduction in peak run-off rate for a two year, twenty-four hour design storm from pre-construction to developed conditions; and implement a storm water management plan that results in a 25 percent decrease in run-off volume of storm water runoff from the one hundred-year, twenty-four hour design storm from existing to developed conditions.

Section 16a-38k-6(e)(9): Design the site to minimize pollutants in storm water runoff by implementing a storm water management plan that reduces impervious cover, promotes infiltration, redirects water to pervious areas or storage reservoirs that treats storm water runoff from 90 percent of the average annual rainfall.

Compliance Assistance for Optional Strategies (e)(8)and (e)(9)

Refer to the compliance assistance section for the Erosion and Sedimentation Control requirements (page 18 in this document). A copy of the 2002 Guidelines for Soil Erosion and Sediment Control can be purchased from the Connecticut DEP Inland Water Resources Div. For current information on availability please call (860) 424-3706.

Consider using pervious paving materials to reduce storm water runoff.

Section 16a-38k-6(e)(10): Reduce heat island effect at the site by utilizing any combination of the use of native shade species, paving materials with a solar reflectance index of at least twenty-nine, and/or an open grid pavement system for 50 percent or more of the site parking, sidewalk and road areas; or place at least 50 percent of parking spaces under a covering, such as the a deck, a roof, underground or the building itself. Any roof used to cover parking spaces must have a solar reflectance index of at least twenty-nine.

Section 16a-38k-6(e)(11): Reduce heat island effect through roofing selection by either installing native vegetation on at least 50 percent of the roof area or by using a roofing material that has a Solar Reflectance Index equal to or greater than the values in the following table on at least 75 percent of the roof surface:

Roof Type	Slope	Solar Reflectance Index
Low-Sloped Roof	**≤ 2:12**	**78**
Steep-Sloped Roof	**> 2:12**	**29**

Compliance Assistance for Optional Strategies (e)(10)and (e)(11)

Materials with dark surfaces (pavement, roofing, etc.) absorb heat and radiate it back to surrounding areas. Studies have demonstrated that where there are many heat absorbing surfaces, temperatures may be boosted by 10˚F or more. The heat island effect increases the need for air conditioning (and therefore electricity consumption) and is detrimental to site plantings, local wildlife, and maintaining comfortable temperatures. The Cool Roof Rating Council can provide information on roofing materials, while the U.S. EPA provides information, including study results, on the heat island effects. See the resource section for links.

Section 16a-38k-6(e)(12): Reduce light pollution from the site. In addition to requirements mandated in Section 4b-16 of the Connecticut General Statutes, automatic controls to turn off lights during non-business hours shall be installed on all non-emergency interior lighting. Manual override capability may be provided for after hours use. Exterior lighting shall be provided only in areas where lighting is required for safety and comfort. Light fixtures shall not be installed where the main purpose is to light building facades or landscape features. Exterior building-mounted lighting fixtures that are only needed during building operation shall be controlled by a time-clock with an easily accessible manual control. Lighting of flags, signs, and monuments shall be limited to fifty watts per fixture and shall incorporate shielding devices to minimize light pollution. No more than two fixtures may be used for each flag, sign or monument.

Compliance Assistance for Optional Strategy (e)(12)

Section 4b-16 of the Connecticut General Statutes governs outdoor lighting for public facilities, reducing light pollution by controlling the amount and distribution of outdoor lighting. The measures listed above will further assure that the project does not unnecessarily contribute to light pollution. The International Dark-Sky Association is the recognized authority on outdoor light pollution. There is a link in the resources section.

Section 16a-38k-6(e)(13): Building orientation shall be such that the east/west glazing exposure is minimized. South windows shall have an external overhang to entirely shade adjacent windows during the summer solstice or shall utilize glazing with a solar heat gain coefficient of less than or equal to 0.4. Shading mechanisms or glazing with a solar heat gain coefficient less than or equal to 0.4 shall be installed at eastern and western exposure windows to minimize solar heat gain early and late in the day respectively.

Compliance Assistance for Optional Strategy (e)(13)

Orienting a building such that the east/west exposure is minimized and the north/south exposure is maximized provides for optimized daylighting opportunities. Excess glare and heat gain can be controlled by incorporating glazing with a low Solar Heat Gain Coefficient and/or by providing proper shading. South side external overhangs as an architectural feature can be used to shade windows from glare and heat gain. For east and west exposure windows, internal shades can be used to reduce glare and heat gain during the morning and afternoon portions of the day.

Section 16a-38-6(e)(14) Buildings shall not be constructed on land that is lower than five feet above the elevation of the 100 year flood as defined by the Federal Emergency Management Agency or its successor agency; and buildings, roads, parking areas, sidewalks, or other impervious surfaces shall not be built in any area that is inconsistent with the applicable municipal plan of conservation and development prepared in accordance with section 8-23 of the Connecticut General Statutes

Compliance Assistance for Optional Strategy (e)(14)

Building on land that is prone to flooding is not only damaging to the environment, but can create moisture problems in a building. Problems can be as severe as periodic flooding or as subtle as moisture migration into the building. Unwanted moisture can result in deterioration of building materials and mold formation. Not developing land on floodplains achieves two important results:

- Decreases in building damage and liability
- Restoration of floodplain land to absorb flood waters and minimize impacts to downstream communities.

This option addresses human resource needs and development and balances economic growth with environmental protection and resource conservation concerns in the expenditure of public funds.

To document compliance, provide the appropriate FEMA map demonstrating that the building is not located in the floodplain, and provide a copy of the municipal plan of conservation and development is available at the office of the town clerk and if the municipality has a website, it is required to be posted on that site.

Section 16a-38-6(e)(15) The school building shall be sited on land away from sources of unreasonable excess noise, such as highways, airport flight paths, and areas that are subject to unreasonable noise from agricultural or industrial equipment use.

Compliance Assistance for Optional Strategy (e)(15)

Avoid building on sites that are subject to excessive exterior noise.

Resources

- *CHPS Best Practices Manual*, vol. 2, Guideline GC4, http://www.chps.net/
- *LEED Reference Guide*, Site Prerequisites, http://www.usgbc.org/
- Information on cool roofs is available from the Cool Roof Rating Council website: www.coolroofs.org.
- Information on light pollution:
- Illuminating Engineering Society of North America, http://www.iesna.org/
- *CHPS Best Practices Manual*, vol. 2, EL11: Outdoor Lighting, http://www.chps.net/
- *LEED Reference Guide*, Site Credit 8: Light Pollution Reduction, http://www.usgbc.org/
- The International Dark Sky Association, http://www.darksky.org
- The Connecticut Dept. of Transportation's Public Transportation Division: http://www.ctrides.com/
- The University of Connecticut Cooperative Extension Service: http://www.extension.uconn.edu/
- Cool Roof Rating Council website: www.coolroofs.org.
- U.S. EPA Heat Island Effect information: http://www.epa.gov/heatisland/
- The International Dark-Sky Association: http://www.darksky.org/
- The Lighting Research Center at RPI Daylighting Program: http://www.lrc.rpi.edu/programs/daylightdividends/
- The National Institute of Building Sciences Daylighting Program: http://www.wbdg.org/design/daylighting.php
- The Daylighting Collaborative: http://www.daylighting.org/
- Daylighting Studies Concerning Productivity: http://www.h-m-g.com/projects/daylighting/projects-PIER.htm
- Connecticut Department of Environmental Protection main site: www.ct.gov/dep
- Center for Land Use Education and Research (CLEAR) and Nonpoint Education for Municipal Officials (NEMO), "Reducing Runoff Through Better Site Design" http://nemo.uconn.edu/tools/stormwater
- Maps of 100-year floodplain elevations are available from FEMA http://www.msc.fema.gov

Information on stormwater issues:

- U.S. Environmental Protection Agency Stormwater Management for Construction Activities, http://cfpub.epa.gov/npdes/stormwater/swppp.cfm
- U.S. Environmental Protection Agency Construction General Permits, http://cfpub1.epa.gov/npdes/stormwater/cgp.cfm
- Municipal websites can be found using the "Quick Links" button at: http://www.ct.gov/
- FEMA maps and Flood Insurance Studies (which contain flood and coastal profiles) are available at: http://www.msc.fema.gov/

Building Standard Optional Strategies- Schools

Operations and Procedures/Innovation

The following three strategies are available for improving operations or incorporating innovation into the building design. There is no minimum requirement in this category.

Building Standard Optional Strategy

Section 16a-38k-6(f)(1): Do not install fire suppression systems that contain chlorofluorocarbons (CFCs), hydrochlorofluorocarbon (HCFCs), or halons. Select refrigerants and heating, ventilating, air conditioning, and refrigeration (HVAC&R) systems that minimize or eliminate compounds contributing to ozone layer depletion and global warming. If refrigerants are used, the mechanical room shall have leak detection equipment installed.

Compliance Assistance for Optional Strategy (f)(1)

Fire Extinguishers - CFC-free dry chemical type fire extinguishers utilize sodium bicarbonate and monammonium phosphate instead of refrigerants and halons.

HVAC&R – This option expands the mandatory requirement of eliminating CFCs to require that alternative refrigerants-HCFCs or HFCs-meet or exceed the criteria set forth in *LEED for Schools First Edition updated November 2007* under Credit EA 4 Enhanced Refrigeration Management, using the formula under Option 2. Whenever refrigerants are used, mechanical rooms must have leak detection equipment installed.

Section 16a-38k-6 (f)(2): Utilize innovative high performance features or technologies that greatly exceed any existing mandatory requirements as specified in sections 16a-38k-3 and 16a-38k-5 or optional measures within Section 16a-38k-6.

Compliance Assistance for Optional Strategy (f)(2)

The purpose of this option is to acknowledge design teams and building owners who adopt innovative high performance features and technologies that greatly exceed existing mandatory measures required under regulation or non-mandatory options within the scope of the regulation. This option recognizes that there are new technologies and new ideas not covered by other options that need to be supported and encouraged.

To achieve credit for achieving this innovation option, submit with the list of measures you intend to implement under the regulation (as required in section 16a-38k-8) a narrative that (1) defines the technology or feature to be utilized and (2) describe how the technology or feature enhances superior performance in the operation of the building.

For the purposes of this option, Combined Heat & Power (CHP) and Geothermal Heat Pump systems are considered advanced technologies that are eligible for credit.

Section 16a-38k-6 (f)(3): Integrate the sustainable features of the school building into the educational curriculum within the first full year of school operation.

Compliance Assistance for Optional Strategy (f)(3)

The design team should coordinate with and educate the school administration and faculty on the high performance features of the school. A curriculum should describe those features and explore the relationships between humans, the building, and the natural environment. The curriculum must include at least ten hours of classroom instruction per year per full-time student, meet state standards and be approved by the school administrators

Resources

- ❑ The United States Environmental Protection Agency (EPA) has information regarding the benefits of CFC phase out: http://www.epa.gov/ozone/geninfo/benefits.html . An additional EPA resource regarding refrigerants can be found at http://www.epa.gov/ozone/snap/refrigerants/qa.html#middle
- ❑ The Global Monitoring Division of the National Oceanic and Atmospheric Administration (NOAA) provides extensive information on ozone depletion and refrigerants: http://www.esrl.noaa.gov/gmd/
- ❑ This excellent Princeton University website provides information on ozone depletion and extensive information of CFC alternatives: http://www.princeton.edu/~chm333/2002/spring/Ozone/
- ❑ The Alternative Fluorocarbons Environmental Acceptability Study provides information on CFC and HCFC alternatives: http://www.afeas.org/atmospheric_chlorine.html
- ❑ In addition to the resources listed above, the EPA maintains information concerning fire extinguisher alternatives at: http://www.epa.gov/ozone/snap/fire/index.html
- ❑ The U. S. Green Building Council *LEED for Schools First Edition* updated November 2007 can be accessed at http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1586
- ❑ Information on curriculum from the Connecticut State Department of Education can be accessed at http://www.sde.ct.gov/sde/cwp/view.asp?a=26188Q=320954&sdenav_gid=1757
- ❑ The following sites have a variety of curriculum and energy education resources available:
    - National Energy Education Development Project (NEED) http://www.need.org/curriculum.php
    - Alliance to Save Energy http://www.ase.org/section/_audience/educators
    - National Energy Foundation http://www.nef1.org/educators.html
    - Energy Information Agency http://www.eia.doe.gov/kids/onlineresources.html

Regulation Compliance Alternative for Building Standard Options

Section 16a-35k-7 Alternative Option

Section 16a-38k-7:Alternative Options to section 16a-38k-4 or section 16a-36k-6	Section 16a-38k-7 Alternative strategies to Section 16a-38k-4 of the Regulations of Connecticut State Agencies or Section 16a-38k-6 of the Regulations of Connecticut State Agencies. (a) As an alternate to meeting the criteria in section 16a-38k-4 of the Regulations of Connecticut State Agencies, a project as defined by sections 16a-38k-2(a) and 16a-38k-2(b) of the Regulations of Connecticut State Agencies-may meet the requirements under section 16a-38k-4 of the Regulations of Connecticut State Agencies by receiving a Leadership in Energy and Environmental Design (LEED) Silver level certification from the United States Green Building Council, or by receiving a Two-Globe rating from the Green Globe system self certification program, providing that the project includes all mandatory requirements within sections 16a-38k-3 and 16a-38k-8 of the Regulations of Connecticut State Agencies. (b) As an alternate to meeting the criteria in section 16a-38k-6 of the Regulations of Connecticut State Agencies, a project as defined by sections 16a-38k-2(c) and 16a-38k-2(d) of the Regulations of Connecticut State Agencies by receiving a Leadership in Energy and Environmental Design (LEED) Silver level certification from the United States Green Building Council, or by meeting the criteria set forth in the Northeast Collaborative for High Performance School Protocol, also known as NE-CHPS, providing that the project includes all mandatory requirements within sections 16a-38k-3, 16a-38k-5, and 16a-38k-8 of the Regulations of Connecticut State Agencies.

Purpose

This alternative compliance approach recognizes the effort required to obtain LEED or Green Globes rating and seeks to avoid duplication of those efforts.

Compliance Assistance for Alternative Option

This alternative approach is available for both new construction and major renovation projects.

In order to utilize this compliance alternative for State Facilities, all of the “mandatory” requirements section 16a-38k-3(a) through (l) must be met. LEED Silver or Green Globes Two-Globe rating may be used only to replace the 26 Building Standard Options required for compliance.

In order to utilize this compliance alternative for schools, all of the "mandatory" requirements of sections 16a-38k-3(a) through (l) and 16a-38k-5(a) through (f) must be met. LEED Silver or Green Globes Two-Globe rating may be used only to replace the 28 Building Standard Options required for compliance.

LEED rating – The U. S. Green Building Council maintains the LEED program which includes a rating system for new and existing commercial buildings. Obtaining a Silver, Gold, or Platinum Certification under the LEED program may be used to demonstrate compliance. LEED "Registration" for the project does not satisfy this requirement, as the project must be officially "Certified" under the LEED program.

Green Globes system – The Green Globes Environmental Assessment and Rating System was adapted from the Canadian Go Green Plus program and is operated by the Green Buildings Initiative. The Green Globes system is a self-certification program that is questionnaire driven, but includes third-party verification. A construction documents questionnaire is the basis for the rating system and covers issues similar to those covered by the LEED rating system. Third party verification follows the self-certification process and is arranged by the Green Buildings Initiative.

Northeast Collaborative for High Performance School Protocol (NE-CHPS) is a is a set of building and design standards that was developed specifically for schools. It is based on California's pioneering Collaborative for High Performance Schools guide, but has been tailored specifically for state code requirements, the New England climate, and the environmental priorities of the region.

Resources

- For information on the LEED rating system, visit the U.S. Green Building Council website: http://www.usgbc.org/
- For information on the Green Globes program, visit the Green Buildings Initiative website: http://www.thegbi.org/home.asp
- For information on the Northeast Collaborative for High Performance Schools, visit the Northeast Energy Efficiency Partnership website: http://www.neep.org/HPSE/ne_chps.html

Compliance Checklist-State Facilities

In order to demonstrate compliance, the reporting requirements detailed in Section 16a-38k-8 must be completed. The following checklist may be used to catalog compliance progress.

Mandatory Requirements

X	Section	Summary Description
	16a-38k-3(a)	Building Commissioning
	16a-38k-3(b)	Integrated Design Process
	16a-38k-3(c)	Base Energy Performance 21% Better Than Code
	16a-38k-3(d)	ENERGY STAR Products
	16a-38k-3(e)	Indoor Air Quality Management Plan
	16a-38k-3(f)	Water Efficiency
	16a-38k-3(g)	Recycling of Materials
	16a-38k-3(h)	Erosion and Sedimentation Control
	16a-38k-3(i)	No Smoking Policy
	16a-38k-3(j)	Integrated Pest Management Plan
	16a-38k-3(k)	CFC Refrigerant Ban or Phase-out Plan
	16a-38k-3(l)	Minimum Ventilation

Building Standard Options

(A minimum of 26 of the following strategies must be implemented.)

X	Section	Summary Description
		At least one measure in subsection (a) must be selected
	16a-38k-4(a)(1)	Energy Performance 24.5% Better Than Code
	16a-38k-4(a)(2)	Energy Performance 28% Better Than Code
	16a-38k-4(a)(3)	Energy Performance 31.5% Better Than Code
	16a-38k-4(a)(4)	Energy Performance 35% Better Than Code
	16a-38k-4(a)(5)	Energy Performance 38.5% Better Than Code
	16a-38k-4(a)(6)	Energy Performance 42% Better Than Code
	16a-38k-4(a)(7)	On-Site Renewable Energy – 3%
	16a-38k-4(a)(8)	On-Site Renewable Energy – 7%
	16a-38k-4(a)(9)	On-Site Renewable Energy – 10%
	16a-38k-4(a)(10)	Purchase Renewable Energy
	16a-38k-4(a)(11)	Energy Measurement and Verification Plan
		At least two measures in subsection (b) must be selected
	16a-38k-4(b)(1)	Install Permanent Indoor Air Monitoring Systems
	16a-38k-4(b)(2)	Provide Increased Outdoor Ventilation
	16a-38k-4(b)(3)	Building Flushout
	16a-38k-4(b)(4)	Low VOC Adhesives and Sealants
	16a-38k-4(b)(5)	Low VOC Paints and Coatings
	16a-38k-4(b)(6)	Low VOC Carpet and Carpet Cushion
	16a-38k-4(b)(7)	Composite Wood and Agrifiber Products

X	Section	Summary Description
	16a-38k-4(b)(8)	Building Design to Control Entry of Pollutants
	16a-38k-4(b)(9)	Individual Lighting Control
	16a-38k-4(b)(10)	Individual Thermal Comfort Control
	16a-38k-4(b)(11)	Building Occupant Survey
	16a-38k-4(b)(12)	Daylight Contribution
	16a-38k-4(b)(13)	Visual Gazing – Views to the Outdoor Environment
	16a-38k-4(b)(14)	Isolation of Chemical Use Areas
		At least one measure in subsection (c) must be selected
	16a-38k-4(c)(1)	Reduce Total Potable Water Usage by 30%
	16a-38k-4(c)(2)	Reduce Water Consumption for Landscaping 50%
	16a-38k-4(c)(3)	Eliminate Potable Water Usage for Landscaping
	16a-38k-4(c)(4)	Reduce Total Potable Water Usage by 50%
		At least two measures in subsection (d) must be selected
	16a-38k-4(d)(1)	Maintain 75% of an Existing Building Structure
	16a-38k-4(d)(2)	Maintain 95% of an Existing Building Structure
	16a-38k-4(d)(3)	Re-use Existing Non-Structural Building Elements
	16a-38k-4(d)(4)	Recycle or Salvage 50% of Construction and Demolition Debris
	16a-38k-4(d)(5)	Recycle or Salvage 75% of Construction and Demolition Debris
	16a-38k-4(d)(6)	Use 5% Refurbished, Salvaged, or Reused materials
	16a-38k-4(d)(7)	Use 10% Refurbished, Salvaged, or Reused materials
	16a-38k-4(d)(8)	Use 10% Recycled Content Materials
	16a-38k-4(d)(9)	Use 20% Recycled Content Materials
	16a-38k-4(d)(10)	Use 10% Local Materials
	16a-38k-4(d)(11)	Use 20% Local Materials
	16a-38k-4(d)(12)	Use Building Materials Made from Short Harvest Cycle Plants
	16a-38k-4(d)(13)	Use Forest Stewardship Council (FSC) Certified Wood Products
		At least two measures in subsection (e) must be selected
	16a-38k-4(e)(1)	Re-develop a Local Site
	16a-38k-4(e)(2)	Develop a Brownfield Site
	16a-38k-4(e)(3)	Select a Site with Public Transportation Access
	16a-38k-4(e)(4)	Encourage Bicycle Transportation
	16a-38k-4(e)(5)	Encourage Low-Emission Vehicle Use with Preferred Parking
	16a-38k-4(e)(6)	Encourage Car and Van-pooling
	16a-38k-4(e)(7)	Protect Natural Areas at the Construction Site
	16a-38k-4(e)(8)	Maximize Open Space
	16a-38k-4(e)(9)	Implement a Stormwater Management Plan Reducing Run-off by 25%
	16a-38k-4(e)(10)	Implement a Stormwater Management Plan that Treats 90% of Annual Rainfall
	16a-38k-4(e)(11)	Reduce Heat Island Effect Through Landscaping Strategies
	16a-38k-4(e)(12)	Select Roofing Materials to Reduce Heat Island Effect
	16a-38k-4(e)(13)	Reduce Outdoor Light Pollution
	16a-38k-4(e)(14)	Orient Building for Daylighting and Energy Performance
	16a-38k-4(e)(15)	Sustainable Site Development

X	Section	Summary Description
		No minimum requirement for measures in subsection (f)
	16a-38k-4(f)(1)	Eliminate the use of CFCs, HCFCs and Halons
	16a-38k-4(f)(2)	Building Innovation
	16a-38k-4(f)(3)	Metering of Buildings
	Total Building Standard Optional Strategies (26 Needed for Compliance)	

Compliance Checklist-Schools

In order to demonstrate compliance, the reporting requirements detailed in Section 16a-38k-8 must be completed. The following checklist may be used to catalog compliance progress.

Mandatory Requirements

X	Section	Summary Description
	16a-38k-3(a)	Building Commissioning
	16a-38k-3(b)	Integrated Design Process
	16a-38k-3(c)	Base Energy Performance 21% Better Than Code
	16a-38k-3(d)	ENERGY STAR Products
	16a-38k-3(e)	Indoor Air Quality Management Plan
	16a-38k-3(f)	Water Efficiency
	16a-38k-3(g)	Recycling of Materials
	16a-38k-3(h)	Erosion and Sedimentation Control
	16a-38k-3(i)	No Smoking Policy
	16a-38k-3(j)	Integrated Pest Management Plan
	16a-38k-3(k)	CFC Refrigerant Ban or Phase-out Plan
	16a-38k-3(l)	Minimum Ventilation
	16a-38k-5(a)	Acoustical Standards
	16a-38k-5(b)	Properly Locate Outside Air Intakes
	16a-38k-5(c)	Electronic Ignition on Natural Gas Equipment
	16a-38k-5(d)	Use of Low VOC Products
	16a-38k-5(e)	Environmental Site Assessment
	16a-38k-5(f)	HEPA Vacuuming

Building Standard Options

(A minimum of 28 of the following strategies must be implemented.)

X	Section	Summary Description
		At least one measure in subsection (a) must be selected
	16a-38k-6(a)(1)	Energy Performance 24.5% Better Than Code
	16a-38k-6(a)(2)	Energy Performance 28% Better Than Code
	16a-38k-6(a)(3)	Energy Performance 31.5% Better Than Code
	16a-38k-6(a)(4)	Energy Performance 35% Better Than Code
	16a-38k-6(a)(5)	Energy Performance 38.5% Better Than Code
	16a-38k-6(a)(6)	Energy Performance 42% Better Than Code
	16a-38k-6(a)(7)	On-Site Renewable Energy – 3%
	16a-38k-6(a)(8)	On-Site Renewable Energy – 7%
	16a-38k-6(a)(9)	On-Site Renewable Energy – 10%
	16a-38k-6(a)(10)	Purchase Renewable Energy
	16a-38k-6(a)(11)	Energy Measurement and Verification Plan
		At least two measures in subsection (b) must be selected
	16a-38k-6(b)(1)	Install Permanent Indoor Air Monitoring Systems

X	Section	Summary Description
	16a-38k-6(b)(2)	Provide Increased Outdoor Ventilation
	16a-38k-6(b)(3)	Building Flushout
	16a-38k-6(b)(4)	Composite Wood and Agrifiber Products
	16a-38k-6(b)(5)	Individual Lighting Control
	16a-38k-6(b)(6)	Individual Thermal Comfort Control
	16a-38k-6(b)(7)	Building Occupant Survey
	16a-38k-6(b)(8)	Daylight Contribution
	16a-38k-6(b)(9)	Visual Gazing – Views to the Outdoor Environment
	16a-38k-6(b)(10)	Mold Prevention
	16a-38k-6(b)(11)	Low VOC Furniture
	16a-38k-6(b)(12)	Isolation of Chemical Use Areas
	16a-38k-6(b)(13)	Control of Particulates at Pedestrian Entryways
		At least one measure in subsection (c) must be selected
	16a-38k-6(c)(1)	Reduce Total Potable Water Usage by 30%
	16a-38k-6(c)(2)	Reduce Water Consumption for Landscaping 50%
	16a-38k-6(c)(3)	Eliminate Potable Water Usage for Landscaping
	16a-38k-6(c)(4)	Reduce Total Potable Water Usage by 50%
		At least two measures in subsection (d) must be selected
	16a-38k-6(d)(1)	Maintain 75% of an Existing Building Structure
	16a-38k-6(d)(2)	Maintain 95% of an Existing Building Structure
	16a-38k-6(d)(3)	Re-use Existing Non-Structural Building Elements
	16a-38k-6(d)(4)	Recycle or Salvage 50% of Construction and Demolition Debris
	16a-38k-6(d)(5)	Recycle or Salvage 75% of Construction and Demolition Debris
	16a-38k-6(d)(6)	Use 5% Refurbished, Salvaged, or Reused materials
	16a-38k-6(d)(7)	Use 10% Refurbished, Salvaged, or Reused materials
	16a-38k-6(d)(8)	Use 10% Recycled Content Materials
	16a-38k-6(d)(9)	Use 20% Recycled Content Materials
	16a-38k-6(d)(10)	Use 10% Local Materials
	16a-38k-6(d)(11)	Use 20% Local Materials
	16a-38k-6(d)(12)	Use Building Materials Made from Short Harvest Cycle Plants
	16a-38k-6(d)(13)	Use Forest Stewardship Council (FSC) Certified Wood Products
		At least two measures in subsection (e) must be selected
	16a-38k-6(e)(1)	Re-develop a Local Site
	16a-38k-6(e)(2)	Select a Site with Public Transportation Access
	16a-38k-6(e)(3)	Encourage Bicycle Transportation
	16a-38k-6(e)(4)	Encourage Low-Emission Vehicle Use with Preferred Parking
	16a-38k-6(e)(5)	Encourage Car and Van-pooling
	16a-38k-6(e)(6)	Protect Natural Areas at the Construction Site
	16a-38k-6(e)(7)	Maximize Open Space
	16a-38k-6(e)(8)	Implement a Stormwater Management Plan Reducing Run-off by 25%
	16a-38k-6(e)(9)	Implement a Stormwater Management Plan that Treats 90% of Annual Rainfall
	16a-38k-6(e)(10)	Reduce Heat Island Effect Through Landscaping Strategies

X	Section	Summary Description
	16a-38k-6(e)(11)	Select Roofing Materials to Reduce Heat Island Effect
	16a-38k-6(e)(12)	Reduce Outdoor Light Pollution
	16a-38k-6(e)(13)	Orient Building for Daylighting and Energy Performance
	16a-38k-6(e)(14)	No Building in Floodplain and Sustainable Site Development
	16a-38k-6(e)(15)	Site Building away from External Sources of Excessive Noise
		No minimum requirement for measures in subsection (f)
	16a-38k-6(f)(1)	Eliminate the use of CFCs, HCFCs and Halons
	16a-38k-6(f)(2)	Building Innovation
	16a-38k-6(f)(3)	Curriculum on Sustainable Building Features
	Total Building Standard Optional Strategies (27 Needed for Compliance)	

High Performance Buildings Glossary

The following are terms that may be encountered in this document and/or in the process of designing and constructing high performance buildings.

ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

ASTM – American Society for Testing and Materials.

biodiesel – A domestic, renewable fuel for diesel engines derived from natural oils like soybean oil, which meets the specifications of American Society for Testing and Materials D 6751. Biodiesel is not the same thing as raw vegetable oil. It is produced by a chemical process that removes the glycerin from the oil.

biogas – Gas, rich in methane, which is produced by the fermentation of animal dung, human sewage, or crop residues in an air-tight container. It is used as a fuel to heat stoves and lamps, run small machines, and generate electricity. The residues of biogas production can be used as a low-grade organic fertilizer.

bio-oil – A liquid created from biomass (see below) found in forestry and agricultural residues. The biomass is thermochemically converted to bio-oil by using processes called direct liquefaction or fast pyrolysis. The high water and oxygen content of bio-oils reduces their heating value to less than half the value of petroleum. However, bio-oils are low in viscosity and have been successfully burned in boilers, kilns, turbines, and diesel engines.

biomass – Any biological material that can be used as fuel. Biomass fuel is burned or converted in systems that produce heat, electricity, or both. In this document, biomass-fired systems refer to systems that are fueled by clean wood chips from forestry or saw mill operations.

brownfields – Industrial or commercial property that is abandoned or underused, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

CSI – Construction Specifications Institute.

COMcheck –Software developed by the U.S. DOE to help commercial projects demonstrate compliance with all commercial energy code requirements for envelope, lighting, and mechanical systems.

commissioning – A systematic process of ensuring that all building systems perform interactively according to the contract documents, the design intent, and the building's operational needs. Commissioning involves three phases: pre-design, construction, and warranty.

commissioning plan – A plan that includes a list of all equipment to be commissioned, delineation of roles for each of the primary commissioning participants, and details on the scope, timeline, and deliverables throughout the commissioning process.

cool roof – A roof that reflects most of the sun's energy instead of absorbing it into the interior spaces below.

daylighting –The practice of placing windows and reflective surfaces so that the natural light of day provides effective internal illumination. Optimize the daylighting design to minimize glare

and eliminate direct-beam light in the classroom and use daylighting controls designed to dim or turn off electric lights when sufficient daylight is available.

Design-Build – A construction-project delivery process in which a single entity assumes the obligation of furnishing the design, supervision, and construction services required to complete a project.

DOE-2 – Software that was developed by the U.S. DOE to predict the fuel consumption (both electric and fossil fuel) of a building based on its design. Later iterations include DOE 2.2, a more advanced form of the original software.

DOE-2.1E – An updated version of DOE-2 software.

eQUEST – (**QU**ick **E**nergy **S**imulation **T**ool) – Sophisticated software that allows for detailed energy analysis of a designed building. It also allows users to build 2-D and 3-D displays of the building geometry.

ENERGY STAR – A program that maintains a database of compliant manufactures and products. Partial list of products include computers, monitors, copy machines, water coolers, printers, scanners, refrigerators, and washing machines.

gray water system – Water that has been used in showers, sinks, and laundry machines that may be reused for other purposes, especially landscape irrigation. Toilet water is not used in this system.

Greenfields – Parcels of land not previously developed beyond that of agriculture or forestry use. The opposite of brownfield.

heat island – An effect caused when exterior surfaces absorb the sun's energy and heat the air near the ground. On a building site, rising temperatures make the air conditioning work harder, increasing energy cost.

HEPA filters – High Efficiency Particulate Air filters

integrated pest management (IPM) – A sustainable approach to managing pests that minimizes economic, health, and environmental risks.

integrated design – The consideration and design of all building systems and components. It brings together the various disciplines involved in designing a building and reviews their recommendations as a whole. It also recognizes that each discipline's recommendation has an impact on other aspects of the building project.

life cycle costing – A means of calculating and comparing different designs, equipment, and products to identity the best investment.

operations and maintenance manual – Provides detailed operations and maintenance information for all equipment and products used in the building.

operations and maintenance training – Provides a short introduction on operations and maintenance of equipment and products for all building staff and then features hands-on workshops for facility personnel.

recycled content – Materials that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer) or after consumer use (post consumer).

Stormwater Management Report

Edgewood Pre-K Academy

325 and 345 Mix Street, Bristol, CT

Prepared For:

City of Bristol
111 North Main Street
Bristol, CT 06010

Prepared By:

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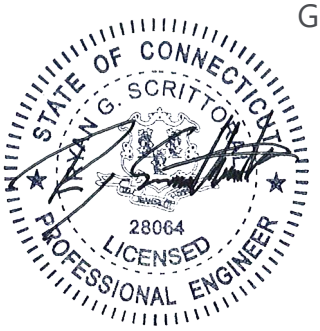

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Edgewood Pre-K Academy

(Site Rendering – Provided by Benesch)

325 and 345 Mix Street

Bristol, CT 06010

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1 INTRODUCTION

1.1 General Information

The subject parcels addressed 325 and 345 Mix Street, Bristol, CT, are located between Mix Street and Willow Brook Road. They are situated in the R-15 (Single Family Residential) Zone and the subject parcel and directly neighboring parcels are denoted and characterized as (per Bristol GIS):

- 325 Mix Street – Vol 1347 / Page 370 – Dennis Malone Aquatics Center (project site)
- 345 Mix Street – Vol 347 & 343 / Page 184 & 70 – Edgewood Pre-k Academy (project site)
- North – Residential Properties on Revere Drive
- East – A Wooded Area
- South – Giamatti Little League Center
- West – Residential Properties on Willow Brook and Edrow Road

The project proposes ADA upgrades to bring the site into compliance with current ADA regulations, updating site features to ensure a 20-year lifespan, new drainage and utility structures, and removal/replacement of existing bituminous pavement and curbing. Renovations and improvements of the existing Edgewood Pre-K Academy, including site improvements and amenities, will consist of the following:

- New Bituminous Pavement and Concrete Curbing
- New Fenced Play Zones
- Updated Utilities and Storm Drainage System
- Updated Concrete Walks
- Updated ADA Accessibility Parking and Pedestrian Routing
- Revised Site Landscaping and Plantings
- New Electric Vehicle Charging Stations

The existing site is comprised of the existing Edgewood Pre-K Academy to remain, bituminous parking areas, sheds, playgrounds, baseball field, and a bio-retention basin. The existing site is approximately half pervious and half impervious; the site enhancements will decrease impervious cover by approximately 0.35 acres.

Site Location Map

The project was designed utilizing the City of Bristol Regulations, the 2000 Connecticut Department of Transportation (ConnDOT) Drainage Manual (as amended), the latest Connecticut Guidelines for Soil Erosion and Sediment Control (as amended), and the latest Connecticut Department of Energy and Environmental Protection (CT DEEP) Water Quality Manual (as amended).

1.2 Project Summary

This project proposes to:

- Rehabilitate existing bituminous parking areas, drive aisles, curbing, and concrete walks.
- Provide new utility connections.
- Improve water quality with updated site drainage.
- Provide ADA accessibility to the existing Edgewood Pre-K Academy.

The project will disturb approximately 4.27 acres, including approximately 0 acres of ROW improvements. The entirety of site work will consist of ADA compliance upgrades, the rehabilitation of the parking lots and sidewalks, and drainage retrofits, while in conformance with city regulations for site layout.

1.3 Existing Site Conditions

1.3.1 Topography

The project site has the existing building acting as a high point with flows being conveyed to the south wetlands and north wetlands. Flows into the south wetlands are conveyed into either Polkville Ave Brook or neighboring properties to the south and flows into the north wetlands (an existing bio-retention basin) eventually end up into the Mix Street drainage system and new Britain watershed property. The existing site elevations (NAVD 88) range from approximately 253 ft at the southern edge of the site to 270 ft located at the northwest corner of the site.

1.3.2 Soils

NRCS soils mapping indicates three (3) soil types located within the project limits; defined as:

- 27A – Sudbury Sandy Loam [Hydrologic Soil Group D]
- 306 – Udorthents-Urban Land Complex [Hydrologic Soil Group B]
- 308 – Udorthents, Smoothed [Hydrologic Soil Group B]

1.3.3 On-site and Adjacent Waterbody Information

There is a small waterbody / watercourse (Polkville Ave Brook) that passes though the southern portion of the project site where a portion of wetlands were delineated Martin Brogie. There is also an existing above ground bio-retention basin in the northern corner of the site where additional wetlands were located. The waterbody / watercourse will not be disturbed during the course of the project, and no work is to be performed within either of the wetlands located on site.

1.3.4 Additional Site Considerations

- The site is not located within a Coastal Management Area, as the City of Bristol is not located within the Coastal NPS Program Management Area, per CT DEEP.
- The site is located within an Aquifer Protection Area, per map titled, "Aquifer Protection Areas – Bristol, Connecticut", dated December 2021. (CT ECO Map Catalog)
- The site is located within a FEMA Flood Zone, per map titled, "Q3 Flood Zone Data – Bristol, CT", dated September 2010. (CT ECO Map Catalog)
- The site is not located within a Natural Diversity Database Area, per map titled, "Natural Diversity Data Base Areas – Bristol, CT", dated December 2025. (CT ECO Map Catalog)

2 HYDROLOGY

2.1 Methodology

The analysis to determine peak flows generated from the site was prepared using TR-55 procedures for calculating peak rates of runoff resulting from precipitation events and procedures for developing runoff hydrographs. HydroCAD software was utilized to perform hydrologic computations. Rainfall frequency estimates for precipitation, based on National Oceanic and Atmospheric Administration (NOAA) data from 345 Mix Street, Bristol, CT, were utilized to generate the flows.

The following 24-hour, precipitation estimates were utilized:

2-Year	3.48 inches
10-Year	5.56 inches
25-Year	6.87 inches
50-Year	7.82 inches
100-Year	8.87 inches

Design Storm Type: NOAA, 24-hour Type D

Project Type: Rehabilitation

2.2 Existing Conditions

2.2.1 Watershed Boundaries and Design Points.

Drainage from the existing site is contained within two (2) watersheds for analysis.

- **Watershed E1 (Flow to South Wetlands):** This watershed consists of overland and piped flow from the western/southern portion of the 325 and 345 Mix Street parcels. All flow from this watershed will be conveyed to the south wetlands, where it either infiltrates or flows overland to Polkville Ave Brook and neighboring properties. The cover characteristics of this watershed include existing grass areas, concrete walks, a baseball field, wetlands, bituminous driveway and drop off loop, playscapes, shed, and play areas. Watershed E1 consists mostly of Hydraulic Soil Group (HSG) B, with small portions of HSG D along its southern extents.
- **Watershed E2 (Flow to North Wetlands):** This watershed consists of overland and pipes flow from the eastern/northern portion of the 325 and 345 Mix Street parcels. All flow from this watershed will be conveyed to the northern wetlands (existing bio-retention basin), where it either infiltrates or is discharged out into the municipal drainage system in Mix Street. The cover characteristics of this watershed include existing grass areas, concrete walks, Edgewood Pre-K

Academy, wetlands, bituminous driveways and parking lots, Dennis Malone Aquatics Center, and the existing detention pond. Watershed E2 consists only of Hydraulic Soil Group (HSG) B.

Existing Watershed Data (Existing Cover Characteristics, Existing Watershed Area Map, and Hydrologic Computations) have been included in Appendix A.

2.3 Proposed Conditions

2.3.1 Watershed Boundaries and Design Points

This project proposes to provide water quality through the use of 4 hydrodynamic separators on site, ensuring all flows that exit the site through the drainage system area treated. Peak flow reduction is achieved by reducing impervious surfaces from the existing conditions to the proposed conditions. Drainage from the proposed site consists of two (2) watersheds for analysis.

- **Watershed P1 (Flow to South Wetlands):** This watershed consists of overland and piped flow from the western/southern portion of the 325 and 345 Mix Street parcels. All flow from this watershed will be conveyed to the south wetlands, where it either infiltrates or flows overland to Polkville Ave Brook and neighboring properties. The cover characteristics of this watershed include existing grass areas, rehabilitated concrete walks, a baseball field, wetlands, rehabilitated bituminous driveway and drop off loop, playscapes, shed, and updated play areas. Watershed P1 consists mostly of Hydraulic Soil Group (HSG) B, with small portions of HSG D along its southern extents.
- **Watershed P2 (Flow to North Wetlands):** This watershed consists of overland and pipes flow from the eastern/northern portion of the 325 and 345 Mix Street parcels. All flow from this watershed will be conveyed to the northern wetlands (existing detention pond), where it either infiltrates or is discharged out into the municipal drainage system in Mix Street. The cover characteristics of this watershed include existing grass areas, rehabilitated concrete walks, Edgewood Pre-K Academy, wetlands, rehabilitated bituminous driveways and parking lots, Dennis Malone Aquatics Center, and the existing detention pond. Watershed P2 consists only of Hydraulic Soil Group (HSG) B.

  Proposed Watershed Data (Proposed Cover Characteristics, Proposed Watershed Area Map, and Hydrologic Computations) have been included in Appendix B.

2.4 Compliance with Performance Criteria

2.4.1 Compliance with Local Criteria

This project has been designed per the City of Bristol's Regulations, as amended.

2.4.2 Compliance with Connecticut Stormwater Quality Manual

The Connecticut Department of Energy and Environmental Protection Stormwater Quality Manual, as amended.

2.4.2.1 Standard 1 – Runoff Volume Reduction

The method of analysis for this stormwater management system is providing site specific peak runoff volume reduction for the 2, 10, 25, 50, or 100-year Type NOAA, 24-hr Type D storm.

Low impact development practices have been implemented throughout this stormwater management design utilizing treatment practices to remove temporarily suspended solids and other pollutants from the discharge locations. The proposed site will greatly reduce or remove the possibility of the watercourse impairment being generated by this property due to existing debris and pollution. Low Impact Development (LID) and Best Management Practices (BMP) that are being used on this site to improve the quality of discharged stormwater include:

- Bio-Retention Basin – These BMPs are designed to treat the inflow of stormwater and reduce stormwater contamination of TSS and vehicular pollutants in the form or filtration and retention.
- Water Quality Unit / Hydrodynamic Separator (HydroStorm Unit) – This structure is designed to treat low and high flows by capturing oils, temporarily suspended solids, and debris. It will be utilized as a form of pre-treatment.

Peak Flow Comparison

Peak flows at the analysis point are as follows:

Watershed	Storm Event (NOAA Type D)	Discharge Existing (cfs)	Discharge Proposed (cfs)	Δ (%)
Wetlands South (E1 & P1)	2-year	6.61	5.82	-12%
	10-year	14.16	13.69	-3%
	25-year	19.54	19.01	-3%
	50-Year	23.51	22.96	-2%
	100-year	27.93	27.36	-2%
Wetlands North / Mix Street (E2 & P2)	2-year	10.69	10.24	-4%
	10-year	21.87	21.33	-2%
	25-year	29.09	28.55	-2%
	50-Year	34.35	33.82	-2%
	100-year	40.16	39.63	-1%
Total Site	2-year	16.68	15.90	-5%
	10-year	35.67	34.67	-3%
	25-year	48.20	47.13	-2%
	50-Year	57.35	56.27	-2%
	100-year	67.49	66.40	-2%

- Peak flow rates have been reduced for each of the analyzed storm events.

2.4.2.2 Standard 2 – Stormwater Runoff Quantity Control

See table in the above section.

3 HYDRAULICS

The intent of the hydraulic analysis is to ensure that proposed on-site drainage facilities are designed to accommodate and safely convey runoff produced up to and including the 10-year storm event. However, since this project is a replace in kind and the existing site has not had any drainage issues it is our assumption that the current drainage facilities are sized to adequately/safely convey site runoff.

3.1 Compliance with Performance Criteria

The existing site has been designed with a series of drainage facilities, including thirteen (13) type C catch basins, six (6) of which will have new type C tops, one (1) of which will have a new type CL top, and two (2) of which will be completely new structures. There are two (2) existing type CL catch basins to remain, and three (3) manholes, one (1) of which will remain, one (1) of which is proposed, and one (1) of which is being replaced with a proposed water quality unit. This drainage system has been

designed to remove stormwater from impervious surfaces and divert it through the water quality units and the above ground detention pond. Minimal flow from grass and landscaped areas will be diverted directly overland to the wetlands or neighboring properties. The existing drainage system was designed to safely convey flows up with sufficient capacity to maintain the hydraulic grade line sufficiently below existing grade.

3.1.1 Compliance with Local Criteria

The proposed storm sewer system has been designed in compliance with City of Bristol's Regulations, as amended.

3.1.2 Compliance with State Criteria

The proposed storm sewer system has been designed in compliance with the State of Connecticut's Drainage Regulations per the 2000 ConnDOT Drainage Manual. (latest revisions)

Computations for the hydraulic analysis can be viewed in Appendix C.

4 WATER QUALITY

4.1 Methodology

The project has been designed to address both short-term and long-term stormwater quality. Short term (during construction) water quality has been provided in the form of erosion control measures, and long-term (post construction) water quality has been provided through the use of primary and secondary treatment practices. Erosion control has been designed per the latest Connecticut Erosion Control Guidelines and long-term stormwater quality has been designed per the latest CT DEEP Stormwater Quality Manual.

4.2 Compliance with Performance Criteria

4.2.1 Compliance with Local Criteria

This project has been designed in coordination with the City of Bristol's Regulations, as amended.

See appendix D, for water quality volume and flow calculations.

4.2.2 Compliance with Connecticut Stormwater Quality Manual

4.2.2.1 Standard 1 – Pollutant Reduction

Long Term Stormwater Quality

The project was designed with guidance from the latest Connecticut Stormwater Quality Manual. The intent of the design is to provide a "stormwater treatment train," where stormwater quality is

achieved through a series of treatment measures. Harmful pollutants, such as sediment, pathogens, organic material, hydrocarbons, metals, synthetic organic chemicals, and/or deicing compounds are typically carried by the low-flow storms. Since pollutants typically attach themselves to solid particles, treatment practices are designed to remove suspended solids.

The treatment for this site includes:

- Source Control and Pollution Prevention
- Grass Filtration
- Storm Drainage System Maintenance
- Above Ground Stormwater Retention Facilities

Primary Treatment Practices

- Bio-Retention Basin – These BMPs are designed to treat the inflow of stormwater and reduce stormwater contamination of TSS and vehicular pollutants in the form or filtration and retention.
- Water Quality Unit / Hydrodynamic Separator (HydroStrom Unit) – This structure is designed to treat low and high flows by capturing oils, temporarily suspended solids, and debris. It will be utilized as a form of pre-treatment.

Computations for Water Quality can be viewed in Appendix D.

5 SOIL EROSION AND SEDIMENT CONTROL

5.1 Methodology

The proposed soil erosion and sediment controls have been designed in accordance with local regulations, the Connecticut Guidelines for Soil Erosion and Sediment Control, and the requirements of the CTDEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, as applicable. The proposed design considers the specific site characteristics of the site and anticipated construction activities. See the plan set for location and design of proposed short term soil erosion and sediment control measures to be used throughout construction.

Short Term Erosion Control

The proposed erosion and sedimentation controls consider the specific characteristics of the site and the anticipated construction activities. They have been designed in accordance with the latest CT DEEP Guidelines for Soil Erosion and Sediment Control.

Construction Entrances

Construction entrances will be utilized to remove sediment from construction vehicle tires and prevent it from being tracked onto adjoining paved roadway areas.

Erosion Control Barriers

Prior to any construction activity, hay bales, silt fence, or combination hay bale/silt fence barriers will be placed at the downgradient limits of construction. Throughout construction, additional barriers will be installed as necessary at the toe of slopes equal to or in excess of 15 feet. These barriers will be inspected once every seven calendar days and within 24 hours after every rainfall generating a discharge and replaced as necessary. Collected silt will be removed when one-half the barrier height is reached.

Temporary Seeding

Temporary Seeding will be utilized on portions where the phasing and sequencing require an initial disturbance followed by an extended period of inactivity that is greater than 30 days but less than 1 year. Temporary seeding will be conducted within 7 days after the suspension of grading work in disturbed areas where the suspension of work is expected to be more than 30 days but less than 1 year.

Soil Stabilization- Mulches

Structural (non-living) soil stabilization will be utilized to protect the soil surface on a temporary basis without the intention of promoting plant growth. When grading of the disturbed area will be suspended for a period of 30 or more consecutive days, but less than 5 months, disturbed areas will be stabilized within 7 days of the suspension of grading through the use of mulch, non-bituminous tackifiers, erosion control netting, or other approved materials appropriate for use as a temporary soil protector. For surfaces that are not to be reworked within 5 months but will be reworked within 1 year, use temporary seeding, seeding-type mulch (hay, straw, or cellulose fiber) or when slopes are less than 3:1, wood chips, bark chips or shredded bark.

Temporary Filter Inserts

Temporary Filter Inserts will be placed in each existing catch basin and yard drains prior to the start of construction, and in each new catch basin or yard drain during construction. These devices will be removed upon final site stabilization. Filter inserts will be inspected once every seven (7) calendar days and within 24 hours after every rainfall generating a discharge. Replacement of the inserts will be as often as necessary to maintain function of the drainage structure and prevent excessive ponding due to clogged fabric. Ripped or otherwise damaged inserts will be replaced immediately.

Stockpile Management

The topsoil stockpiles which will be idle for at least 30 days will be stabilized with temporary seed and mulch no later than 7 days from the last use. Small stockpiles may be covered with impervious tarps or erosion control matting in lieu of seeding and mulching. A geotextile silt fence or hay bale barrier will be installed around the stockpile area approximately 10 feet from the proposed toe of the slope.

6 OPERATION AND MAINTENANCE

6.1 Inspection Frequency and Criteria

Maintenance and operation will be provided as follows.

During Construction

- **Dust Control:** Moisten disturbed soil areas with water periodically or use a non-asphaltic soil tackifier to minimize dust.
- **Temporary Soil Protection:** Inspect seeded areas weekly and within 24 hours after a storm generating a discharge.
- **Catch Basin Filter Inserts:** Inspect the fabric at least once a week and within 24 hours after the end of a storm generating a discharge. Check the fabric for structural soundness (i.e. tears), proper anchoring/alignment within the grate and ability to drain runoff (i.e. percent of clogging by sediment). Remove the sediment every week, or sooner if ponding is excessive. Each time the sediment is removed, replace the section of fabric removed with a new section. Do not remove the sediment and reuse the same section of fabric.
- **Hay Bale/ Silt Fence Barrier:** Inspect the barrier at least once a week and within 24 hours after the end of a storm generating a discharge. For dewatering operations, inspect frequently before, during and after pumping operations. Remove the sediment deposits when the depth reaches one half the barrier's height. Repair or replace a barrier within 24 hours of observed failure. Maintain the barrier until the contributing disturbed area is stabilized.
- **Construction Entrance/Exit Pad:** Maintain the pad in a condition that will prevent tracking and washing of sediment onto paved surfaces. Place additional clean gravel on top of gravel that has become silted, or remove the silted gravel and replace the gravel to the depth removed with clean gravel, as conditions warrant. Remove immediately all sediment spilled, dropped, washed or tracked onto paved surfaces. Roads adjacent to the

construction site shall be cleaned at the end of each day by hand sweeping or sweeper truck.

- **Existing Catch Basins and Sumps:** Inspect the filter baskets as specified above. After final removal of the filter baskets at the end of construction, clean the sump of all silt and debris.
- **New Catch Basins and Sumps:** As new catch basins are constructed, a sediment trap shall be installed in the unit and a sediment barrier installed around the grate. Inspect the trap and barrier weekly and within 24 hours after a storm generating a discharge. After stabilization of the drainage area entering the catch basin, remove the trap and barrier and clean the basin sump of all silt and debris.
- **Temporary Stockpiles:** Inspect temporary stockpiles at the end of each workday to ensure that tarps are in place and secured. Temporary stockpiles that are expected to be inactive for more than 30 days should be temporarily seeded (see above).

After Construction

- **Catch Basins and Sumps:** Maintenance includes removal of trash from the grate and the sump, as well as sediment from the sump. They shall be inspected semi-annually and cleaned when the sump is one half full of sediment. One of the inspections shall be after the snow and ice removal season is over, and prior to the spring rainfall events. If the sumps is filled more than half-filled with sediment at the semi-annual inspections, they shall be inspected quarterly.
- **Landscaped Areas:** Inspect semi-annually for erosion or dying vegetation. Repair and stabilize any bare or eroded areas and replace vegetation as soon as possible.
- **Driveway Sweeping:** At least twice a year, with the first occurring as soon as possible after snowmelt and the second not less than 90 days following the first.
- **Above Ground Detention Pond:** Inspect the basin semi-annually and after major rain events for the first year, then annually after the first year. Trash should be removed as accumulated. Sediment building up should be removed when it's depth is greater than four (4) inches. Grass should be reseeded if the side slope or bottom exhibit erosion. Grass should be mowed once per month (depending on species) and should be cut to leave at least two (2) inches of height. Mowing should not occur when the ground is soft, to avoid rutting.
- **Hydrodynamic Separators:** Maintain proprietary devices in accordance with the manufacturer's guidelines. Perform inspections of proprietary devices a minimum of once

per year. However, 2 times per year – in late Spring after snowmelt and in late Fall after leaf fall and before the first snowfall is recommended to prevent BMP failure. During inspections, examined the device for standing water. If standing water is present in the device, and standing water is not a component of the design, take corrective action and revise the maintenance plan to prevent similar failures in the future. Clean proprietary devices when pollutant removal capacity is reduced by 50% or more, or when the pollutant storage capacity is reduced by 50% or more. Typical maintenance includes removal of accumulated oil and grease, floatables, and sediment using a vacuum truck or other catch basin cleaning equipment. The Operation and Maintenance (O&M) Plan should indicate the maximum allowable level of oil, sediment, and debris accumulation. These levels should be monitored during inspections to ensure that removal of these materials is performed when necessary. Dispose of material removed from the device, in accordance with CT DEEP guidelines and other state and federal requirements, by a properly licensed contractor or the municipality.

APPENDIX A

Existing Watershed Data

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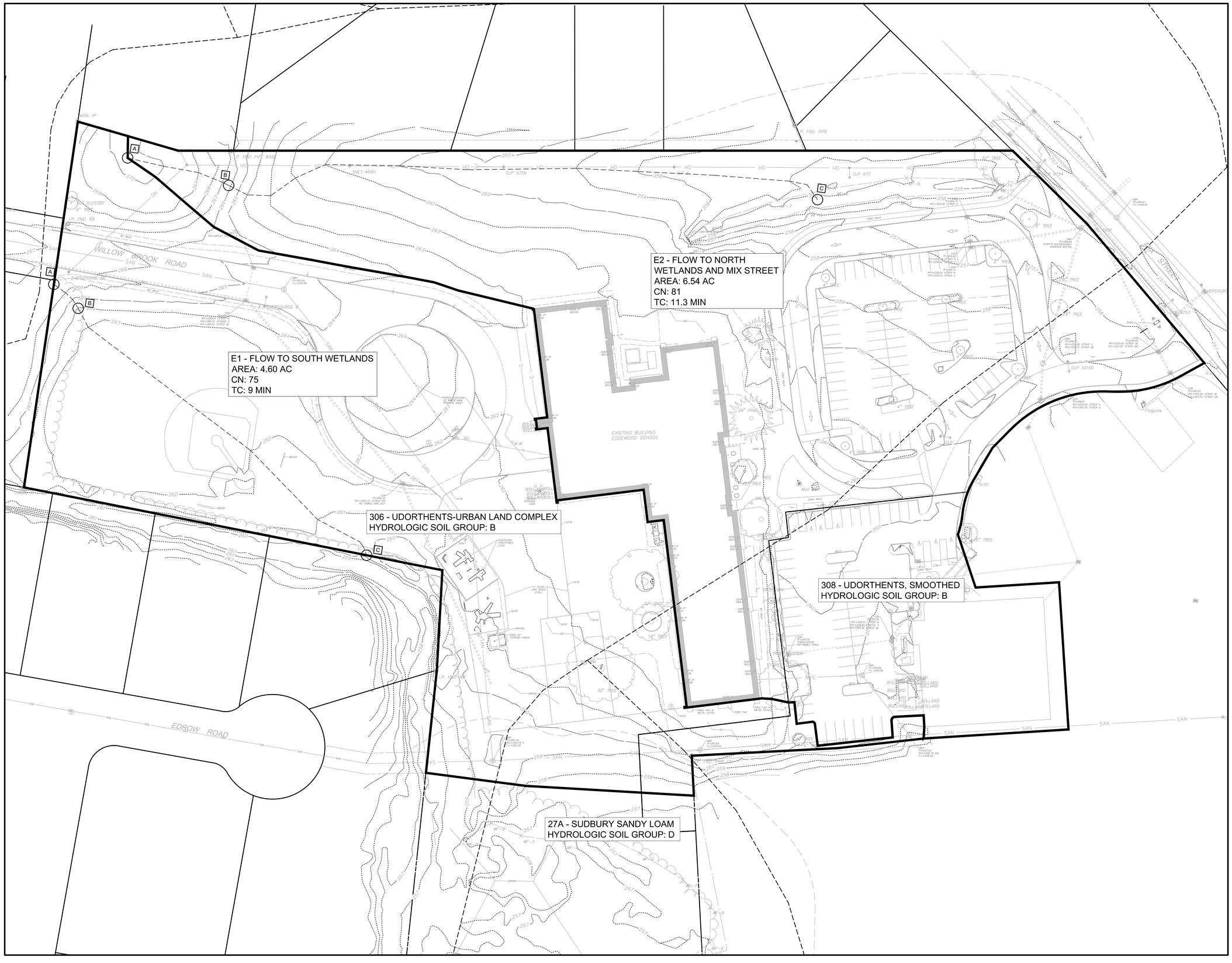

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Project #: 0726-500158.00

NOT FOR CONSTRUCTION
ISSUED FOR REVIEW ONLY

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

BRISTOL, CT 06010

State Project #: 017-0090 RNV

Project #: 25064

Revisions

0 40' 80'
SCALE: 1" = 40'

PHASE 2: DESIGN DEVELOPMENT
MARCH 20, 2026

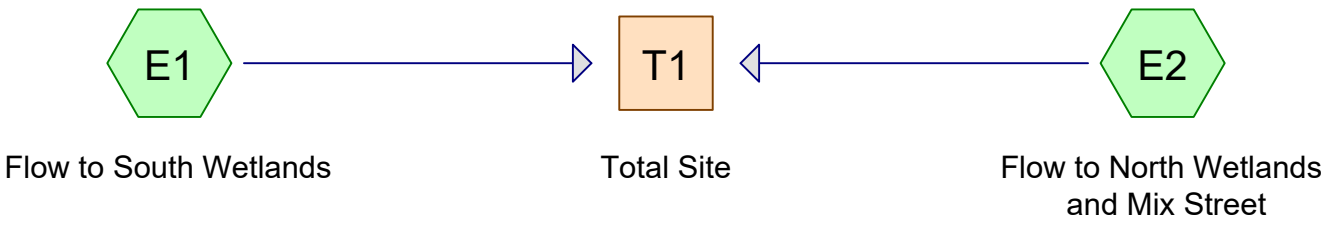
EXISTING WATERSHED AREA MAP

EWAM

Watershed Cover Characteristics
Edgewood Pre-K Academy, Bristol, CT
Project # 0726-500158.00

Existing:

Watershed	Description	Total Area (ac)	Grass B	Grass D	Woods B	Impervious	CN	Tc (min)
E1	Flow to South Wetlands	4.60	2.42	0.35	0.23	1.61	75	9
E2	Flow to North Wetlands and Mix Street	6.54	2.98	0.00	0.00	3.55	81	11.3
TOTAL	Total Site	11.14	5.40	0.35	0.23	5.16	-	-



Subcat Reach Pond Link

Routing Diagram for EWAM
Prepared by Alfred Benesch & Company, Printed 3/18/2026
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	NOAA 24-hr	D	Default	24.00	1	3.48	2
2	10-year	NOAA 24-hr	D	Default	24.00	1	5.56	2
3	25-year	NOAA 24-hr	D	Default	24.00	1	6.87	2
4	50-year	NOAA 24-hr	D	Default	24.00	1	7.82	2
5	100-year	NOAA 24-hr	D	Default	24.00	1	8.87	2

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.160	HSG A	E1, E2
5.630	HSG B	E1, E2
0.000	HSG C	
0.350	HSG D	E1
0.000	Other	
11.140		**TOTAL AREA**

Summary for Subcatchment E1: Flow to South Wetlands

Runoff = 6.16 cfs @ 12.17 hrs, Volume= 0.495 af, Depth= 1.29"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.48"

Area (ac)	CN	Description
2.420	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.610	98	Paved parking, HSG A
4.610	75	Weighted Average
3.000		65.08% Pervious Area
1.610		34.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment E2: Flow to North Wetlands and Mix Street

Runoff = 10.69 cfs @ 12.19 hrs, Volume= 0.921 af, Depth= 1.69"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.48"

Area (ac)	CN	Description
2.980	61	>75% Grass cover, Good, HSG B
3.550	98	Paved parking, HSG A
6.530	81	Weighted Average
2.980		45.64% Pervious Area
3.550		54.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 46.32% Impervious, Inflow Depth = 1.52" for 2-year event
Inflow = 16.68 cfs @ 12.18 hrs, Volume= 1.416 af
Outflow = 16.68 cfs @ 12.18 hrs, Volume= 1.416 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to South Wetlands

Runoff = 14.16 cfs @ 12.16 hrs, Volume= 1.118 af, Depth= 2.91"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.56"

Area (ac)	CN	Description
2.420	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.610	98	Paved parking, HSG A
4.610	75	Weighted Average
3.000		65.08% Pervious Area
1.610		34.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment E2: Flow to North Wetlands and Mix Street

Runoff = 21.87 cfs @ 12.19 hrs, Volume= 1.896 af, Depth= 3.49"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.56"

Area (ac)	CN	Description
2.980	61	>75% Grass cover, Good, HSG B
3.550	98	Paved parking, HSG A
6.530	81	Weighted Average
2.980		45.64% Pervious Area
3.550		54.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 46.32% Impervious, Inflow Depth = 3.25" for 10-year event
Inflow = 35.67 cfs @ 12.18 hrs, Volume= 3.015 af
Outflow = 35.67 cfs @ 12.18 hrs, Volume= 3.015 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to South Wetlands

Runoff = 19.54 cfs @ 12.16 hrs, Volume= 1.550 af, Depth= 4.04"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.87"

Area (ac)	CN	Description
2.420	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.610	98	Paved parking, HSG A
4.610	75	Weighted Average
3.000		65.08% Pervious Area
1.610		34.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment E2: Flow to North Wetlands and Mix Street

Runoff = 29.09 cfs @ 12.19 hrs, Volume= 2.549 af, Depth= 4.68"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.87"

Area (ac)	CN	Description
2.980	61	>75% Grass cover, Good, HSG B
3.550	98	Paved parking, HSG A
6.530	81	Weighted Average
2.980		45.64% Pervious Area
3.550		54.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 46.32% Impervious, Inflow Depth = 4.42" for 25-year event
Inflow = 48.20 cfs @ 12.17 hrs, Volume= 4.099 af
Outflow = 48.20 cfs @ 12.17 hrs, Volume= 4.099 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to South Wetlands

Runoff = 23.51 cfs @ 12.16 hrs, Volume= 1.875 af, Depth= 4.88"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.82"

Area (ac)	CN	Description
2.420	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.610	98	Paved parking, HSG A
4.610	75	Weighted Average
3.000		65.08% Pervious Area
1.610		34.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment E2: Flow to North Wetlands and Mix Street

Runoff = 34.35 cfs @ 12.19 hrs, Volume= 3.032 af, Depth= 5.57"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.82"

Area (ac)	CN	Description
2.980	61	>75% Grass cover, Good, HSG B
3.550	98	Paved parking, HSG A
6.530	81	Weighted Average
2.980		45.64% Pervious Area
3.550		54.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 46.32% Impervious, Inflow Depth = 5.29" for 50-year event
Inflow = 57.35 cfs @ 12.17 hrs, Volume= 4.907 af
Outflow = 57.35 cfs @ 12.17 hrs, Volume= 4.907 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment E1: Flow to South Wetlands

Runoff = 27.93 cfs @ 12.16 hrs, Volume= 2.241 af, Depth= 5.83"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.87"

Area (ac)	CN	Description
2.420	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.610	98	Paved parking, HSG A
4.610	75	Weighted Average
3.000		65.08% Pervious Area
1.610		34.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment E2: Flow to North Wetlands and Mix Street

Runoff = 40.16 cfs @ 12.19 hrs, Volume= 3.574 af, Depth= 6.57"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.87"

Area (ac)	CN	Description
2.980	61	>75% Grass cover, Good, HSG B
3.550	98	Paved parking, HSG A
6.530	81	Weighted Average
2.980		45.64% Pervious Area
3.550		54.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

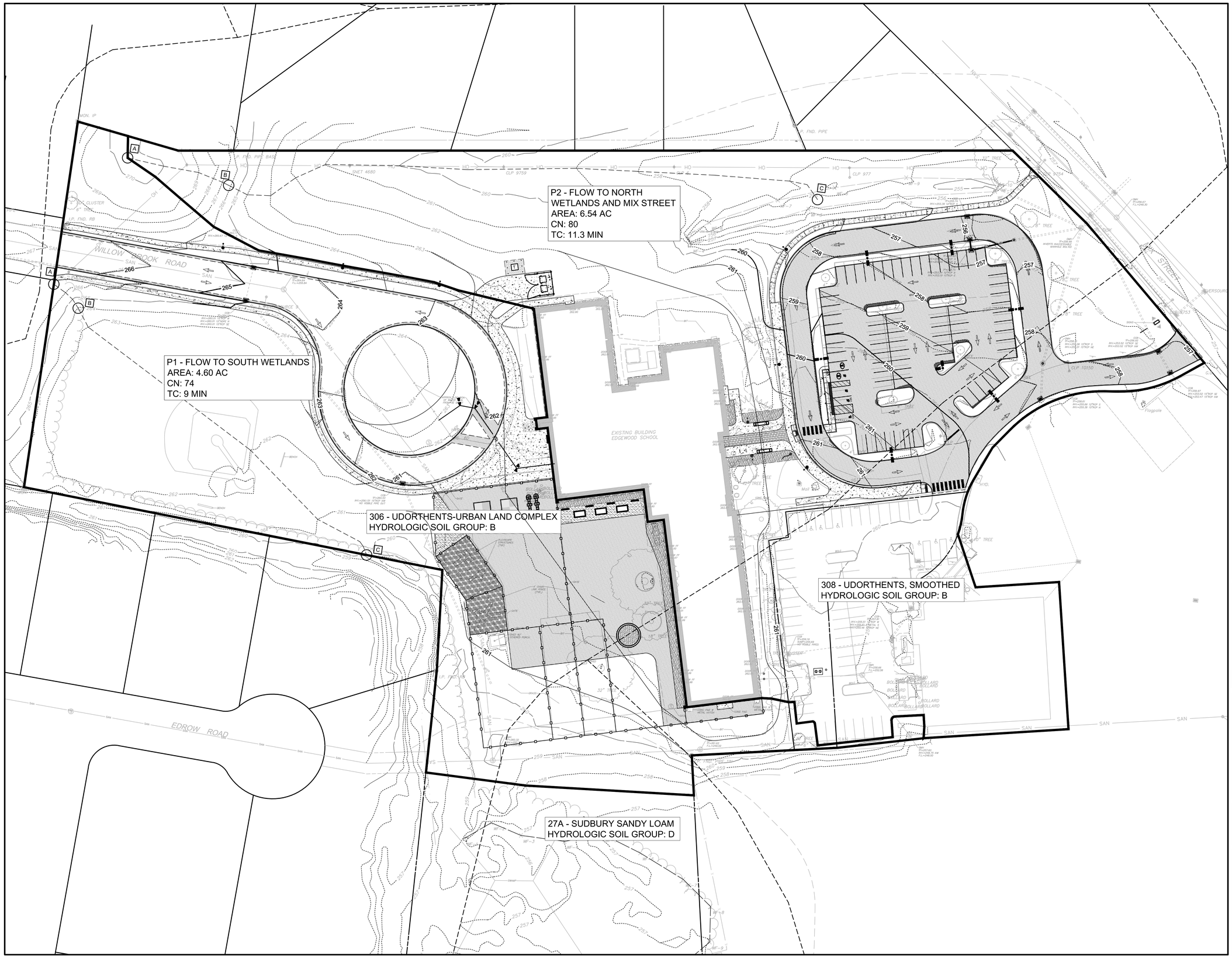
Inflow Area = 11.140 ac, 46.32% Impervious, Inflow Depth = 6.26" for 100-year event
Inflow = 67.49 cfs @ 12.17 hrs, Volume= 5.815 af
Outflow = 67.49 cfs @ 12.17 hrs, Volume= 5.815 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX B

Proposed Watershed Data

benesch



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Project #: 0726-500158.00

NOT FOR CONSTRUCTION
ISSUED FOR REVIEW ONLY

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 25064

Revisions

0 40' 80'
SCALE: 1" = 40'

PHASE 2: DESIGN DEVELOPMENT
MARCH 20, 2026

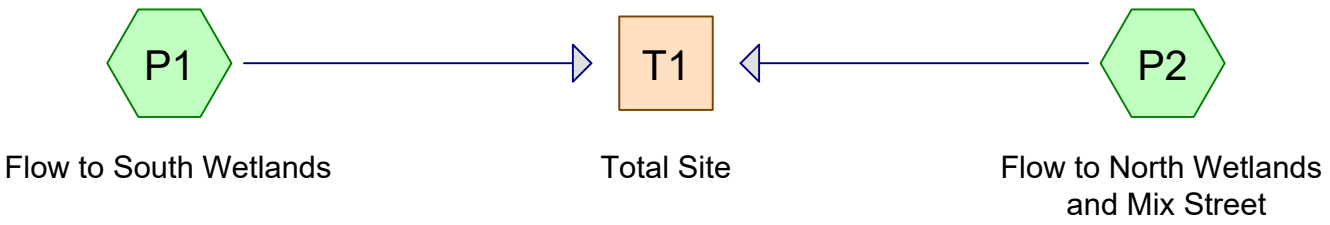
PROPOSED WATERSHED AREA MAP

PWAM

Watershed Cover Characteristics
Edgewood Pre-K Academy, Bristol, CT
Project # 0726-500158.00

Proposed:

Watershed	Description	Total Area (ac)	Grass B	Grass D	Woods B	Impervious	CN	Tc (min)
P1	Flow to South Wetlands	4.60	2.56	0.35	0.23	1.46	74	9
P2	Flow to North Wetlands and Mix Street	6.54	3.19	0.00	0.00	3.35	80	11.3
TOTAL	Total Site	11.14	5.75	0.35	0.23	4.81	-	-



Subcat Reach Pond Link

Routing Diagram for PWAM
Prepared by Alfred Benesch & Company, Printed 3/18/2026
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	NOAA 24-hr	D	Default	24.00	1	3.48	2
2	10-year	NOAA 24-hr	D	Default	24.00	1	5.56	2
3	25-year	NOAA 24-hr	D	Default	24.00	1	6.87	2
4	50-year	NOAA 24-hr	D	Default	24.00	1	7.82	2
5	100-year	NOAA 24-hr	D	Default	24.00	1	8.87	2

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.810	HSG A	P1, P2
5.980	HSG B	P1, P2
0.000	HSG C	
0.350	HSG D	P1
0.000	Other	
11.140		**TOTAL AREA**

Summary for Subcatchment P1: Flow to South Wetlands

Runoff = 5.82 cfs @ 12.17 hrs, Volume= 0.470 af, Depth= 1.23"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.48"

Area (ac)	CN	Description
2.560	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.460	98	Paved parking, HSG A
4.600	74	Weighted Average
3.140		68.26% Pervious Area
1.460		31.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment P2: Flow to North Wetlands and Mix Street

Runoff = 10.24 cfs @ 12.19 hrs, Volume= 0.883 af, Depth= 1.62"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-year Rainfall=3.48"

Area (ac)	CN	Description
3.190	61	>75% Grass cover, Good, HSG B
3.350	98	Paved parking, HSG A
6.540	80	Weighted Average
3.190		48.78% Pervious Area
3.350		51.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 43.18% Impervious, Inflow Depth = 1.46" for 2-year event
Inflow = 15.90 cfs @ 12.18 hrs, Volume= 1.353 af
Outflow = 15.90 cfs @ 12.18 hrs, Volume= 1.353 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment P1: Flow to South Wetlands

Runoff = 13.69 cfs @ 12.17 hrs, Volume= 1.080 af, Depth= 2.82"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.56"

Area (ac)	CN	Description
2.560	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.460	98	Paved parking, HSG A
4.600	74	Weighted Average
3.140		68.26% Pervious Area
1.460		31.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment P2: Flow to North Wetlands and Mix Street

Runoff = 21.33 cfs @ 12.19 hrs, Volume= 1.846 af, Depth= 3.39"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-year Rainfall=5.56"

Area (ac)	CN	Description
3.190	61	>75% Grass cover, Good, HSG B
3.350	98	Paved parking, HSG A
6.540	80	Weighted Average
3.190		48.78% Pervious Area
3.350		51.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 43.18% Impervious, Inflow Depth = 3.15" for 10-year event
Inflow = 34.67 cfs @ 12.18 hrs, Volume= 2.926 af
Outflow = 34.67 cfs @ 12.18 hrs, Volume= 2.926 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment P1: Flow to South Wetlands

Runoff = 19.01 cfs @ 12.16 hrs, Volume= 1.506 af, Depth= 3.93"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.87"

Area (ac)	CN	Description
2.560	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.460	98	Paved parking, HSG A
4.600	74	Weighted Average
3.140		68.26% Pervious Area
1.460		31.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment P2: Flow to North Wetlands and Mix Street

Runoff = 28.55 cfs @ 12.19 hrs, Volume= 2.493 af, Depth= 4.57"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-year Rainfall=6.87"

Area (ac)	CN	Description
3.190	61	>75% Grass cover, Good, HSG B
3.350	98	Paved parking, HSG A
6.540	80	Weighted Average
3.190		48.78% Pervious Area
3.350		51.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 43.18% Impervious, Inflow Depth = 4.31" for 25-year event
Inflow = 47.13 cfs @ 12.17 hrs, Volume= 3.999 af
Outflow = 47.13 cfs @ 12.17 hrs, Volume= 3.999 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment P1: Flow to South Wetlands

Runoff = 22.96 cfs @ 12.16 hrs, Volume= 1.827 af, Depth= 4.77"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.82"

Area (ac)	CN	Description
2.560	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.460	98	Paved parking, HSG A
4.600	74	Weighted Average
3.140		68.26% Pervious Area
1.460		31.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment P2: Flow to North Wetlands and Mix Street

Runoff = 33.82 cfs @ 12.19 hrs, Volume= 2.974 af, Depth= 5.46"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 50-year Rainfall=7.82"

Area (ac)	CN	Description
3.190	61	>75% Grass cover, Good, HSG B
3.350	98	Paved parking, HSG A
6.540	80	Weighted Average
3.190		48.78% Pervious Area
3.350		51.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

Inflow Area = 11.140 ac, 43.18% Impervious, Inflow Depth = 5.17" for 50-year event
Inflow = 56.27 cfs @ 12.17 hrs, Volume= 4.800 af
Outflow = 56.27 cfs @ 12.17 hrs, Volume= 4.800 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Subcatchment P1: Flow to South Wetlands

Runoff = 27.36 cfs @ 12.16 hrs, Volume= 2.189 af, Depth= 5.71"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.87"

Area (ac)	CN	Description
2.560	61	>75% Grass cover, Good, HSG B
0.350	80	>75% Grass cover, Good, HSG D
0.230	55	Woods, Good, HSG B
1.460	98	Paved parking, HSG A
4.600	74	Weighted Average
3.140		68.26% Pervious Area
1.460		31.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	33	0.0730	0.11		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.48"
3.9	368	0.0095	1.57		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
9.0	401	Total			

Summary for Subcatchment P2: Flow to North Wetlands and Mix Street

Runoff = 39.63 cfs @ 12.19 hrs, Volume= 3.513 af, Depth= 6.44"
Routed to Reach T1 : Total Site

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-year Rainfall=8.87"

Area (ac)	CN	Description
3.190	61	>75% Grass cover, Good, HSG B
3.350	98	Paved parking, HSG A
6.540	80	Weighted Average
3.190		48.78% Pervious Area
3.350		51.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0425	0.24		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.48"
4.4	582	0.0185	2.19		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
11.3	682	Total			

Summary for Reach T1: Total Site

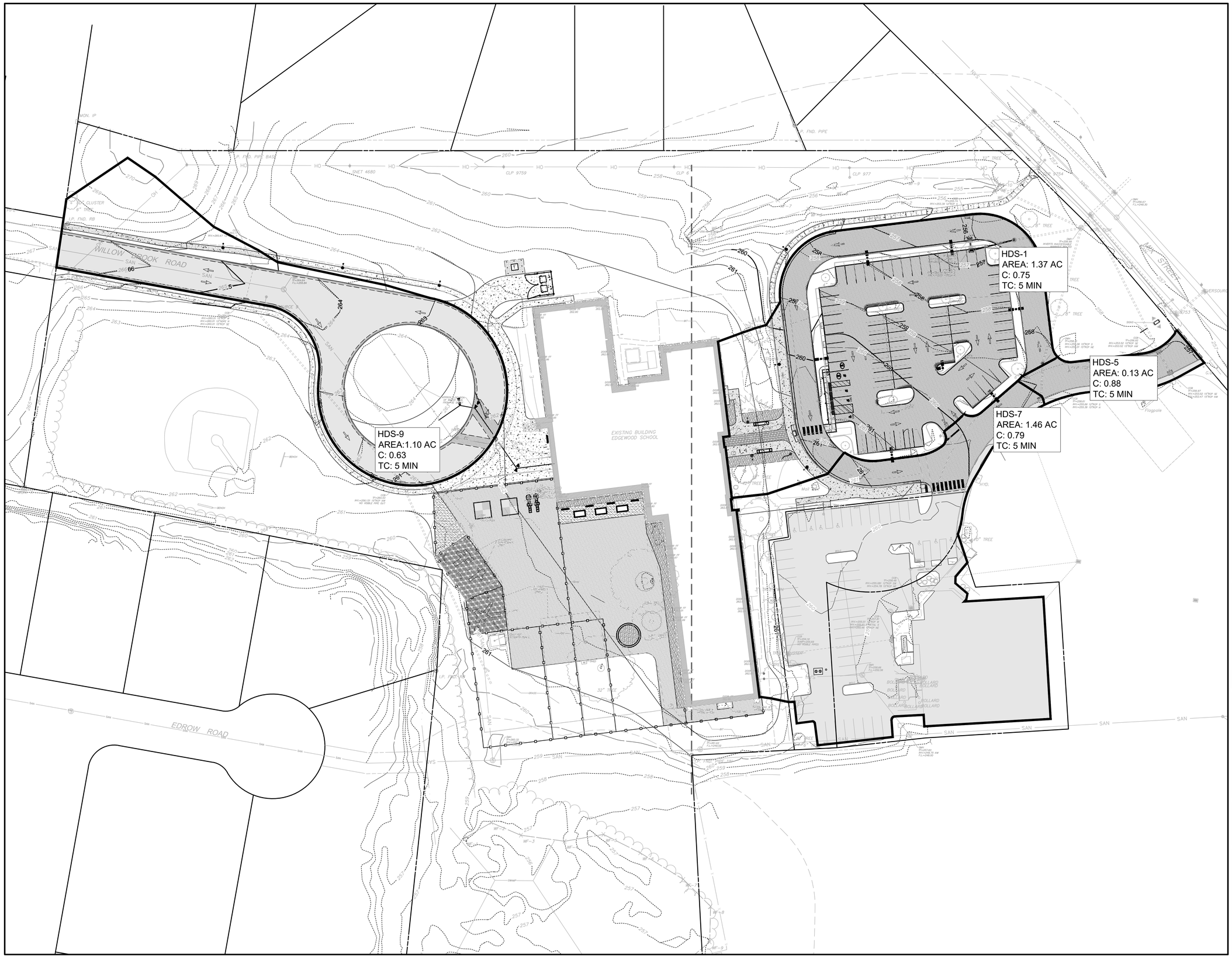
Inflow Area = 11.140 ac, 43.18% Impervious, Inflow Depth = 6.14" for 100-year event
Inflow = 66.40 cfs @ 12.17 hrs, Volume= 5.702 af
Outflow = 66.40 cfs @ 12.17 hrs, Volume= 5.702 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX C

Hydraulic Analysis

benesch



QA+M architecture
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Farmington, CT 06032
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benesch
Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

Project #: 0726-500158.00

NOT FOR CONSTRUCTION
ISSUED FOR REVIEW ONLY

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 25064

Revisions

0 40' 80'
SCALE: 1" = 40'

PHASE 2: DESIGN DEVELOPMENT
MARCH 20, 2026

CATCHMENT
AREA MAP

CAM

C-Values
Edgewood Pre-K Academy
Bristol, CT

3/17/2026

Job Number: 0726-500158.00 RC

Drainage Areas

BASIN	TOTAL (AC.)	IMPERVIOUS (AC.)	PERVIOUS (AC.)	C-Value	Tc (Min.)
HDS-1	1.37	1.03	0.35	0.75	5.00
HDS-5	0.13	0.12	0.00	0.88	5.00
HDS-7	1.46	1.19	0.26	0.79	5.00
HDS-9	1.10	0.61	0.49	0.63	5.00
TOTAL	2.55	1.80	0.75	0.72	5.00

APPENDIX D

Water Quality Volume

benesch

Water Quality Volume Computations
Edgewood Pre-K Academy, Bristol, CT
Project # 0726-500158.00

Designation	Description	Total Area (ac)	Total Impervious Area (ac)	Impervious Coverage, I (%)	Volumetric Runoff Coefficient (R)	WQV (ac-ft, apply 1.3")	Required WQV (cf)	Provided WQV (cf)
					R = 0.05 + 0.009*(I)	WQV = (1.3")*(R)*(A)/12		
1	Total Site	11.14	4.81	43.19	0.44	0.530	23,066	14,134
2	Hydrodynamic Separator HDS-1	1.37	1.03	75.18	0.73	0.108	4,698	HS-5
3	Hydrodynamic Separator HDS-5	0.13	0.12	92.31	0.88	0.012	540	HS-3i
4	Hydrodynamic Separator HDS-7	1.46	1.19	81.51	0.78	0.124	5,399	HS-5
5	Hydrodynamic Separator HDS-9	1.10	0.61	55.45	0.55	0.065	2,850	HS-4i

Water Quality Flow Calculation

Designation	Description	WQV Applied Impervious Area (ac-ft)	Total Drainage Area (ac)	Total Drainage Area (sq. mi)	Watershed Runoff Depth (Q, in)	P (1.3" for water quality storm, in)	NRCS Runoff Curve Number	Ia, (in, Table 4-1, TR-55)	Ia/P	Tc, (hr)	Peak unit discharge, qu, (csm/in, Exhibit 4-III, TR-55	Total WQF (cfs)	Hydroworks Treatment Unit
2	Hydrodynamic Separator HDS-1	0.108	1.37	0.002	0.94	1.3	89	0.247	0.190	0.1	625	1.26	HS-4i
3	Hydrodynamic Separator HDS-5	0.012	0.13	0.000	1.15	1.3	95	0.105	0.081	0.1	660	0.15	HS-4i
4	Hydrodynamic Separator HDS-7	0.124	1.46	0.002	1.02	1.3	91	0.198	0.152	0.1	630	1.46	HS-5i
5	Hydrodynamic Separator HDS-9	0.065	1.10	0.002	0.71	1.3	82	0.439	0.338	0.1	550	0.67	HS-3i

Hydroworks Sizing Summary

EDGEWOOD HDS-1

03-17-2026

Recommended Size: HydroStorm HS 5

Hydroworks Sizing Program Version 5.8.5

A HydroStorm HS 5 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.37 (ac) with an imperviousness of 75 % and Hartford Wso Airport, Connecticut rainfall for the Hydroworks standard particle size distribution.

The recommended HydroStorm HS 5 treats 99 % of the annual runoff and provides 84 % annual TSS removal for the Hartford Wso Airport rainfall records and Hydroworks standard particle size distribution.

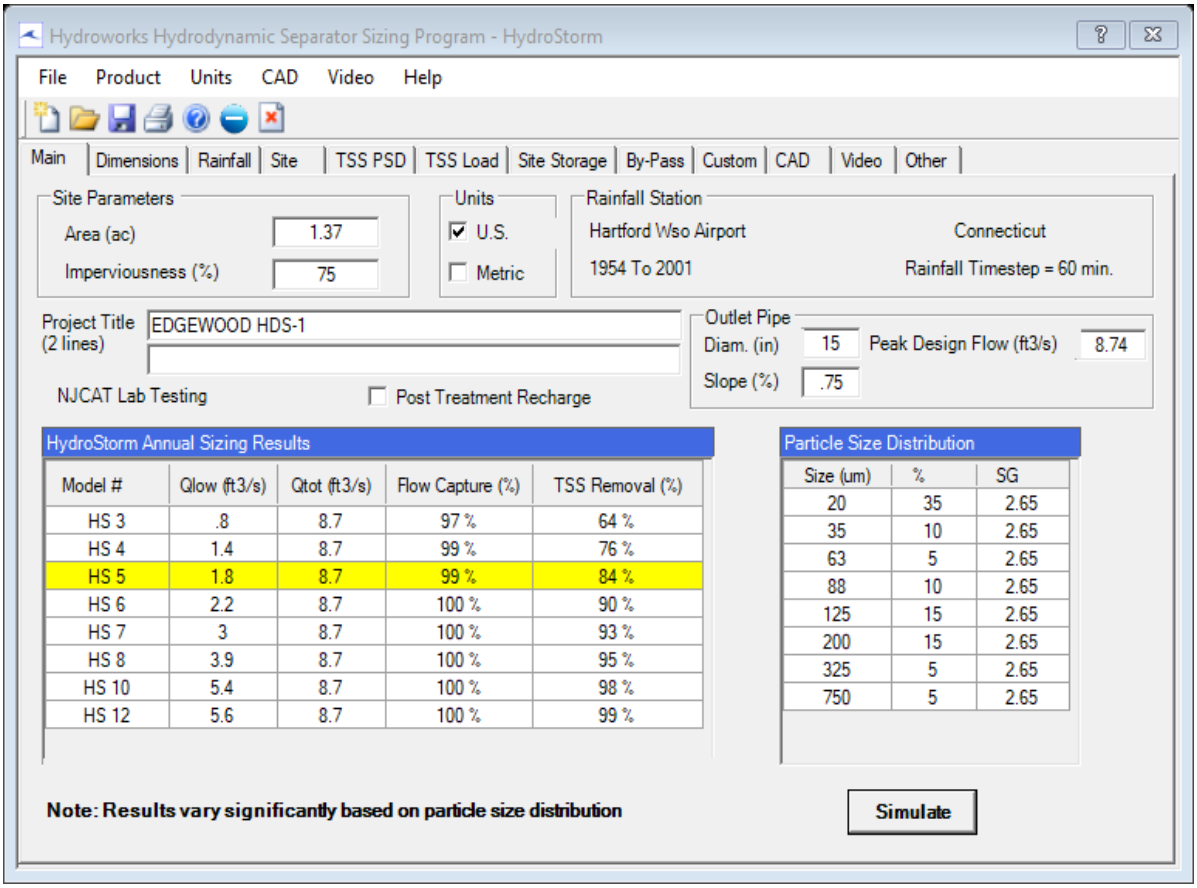
The HydroStorm has a headloss coefficient (K) of 1.04. The given peak flow of 8.74 (ft3/s) Is greater than the full pipe flow of 5.59 (ft3/s) indicating the pipe will be surcharged during the peak flow. Full pipe flow was assumed For the headloss calculations. The pressure head in the pipe was Not evaluated since this would require a hydraulic gradeline analysis. The headloss was calculated to be 10 (in) based on a flow depth of 15 (in) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

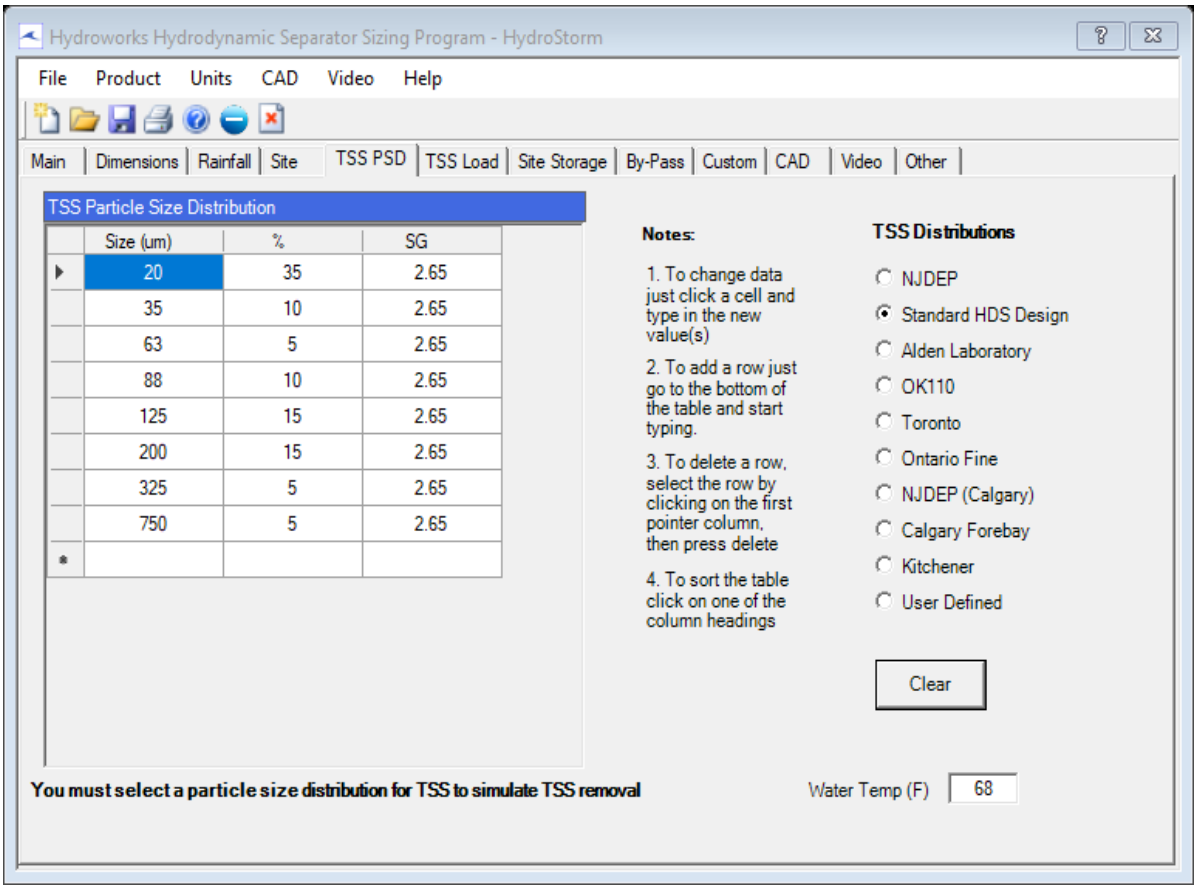
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

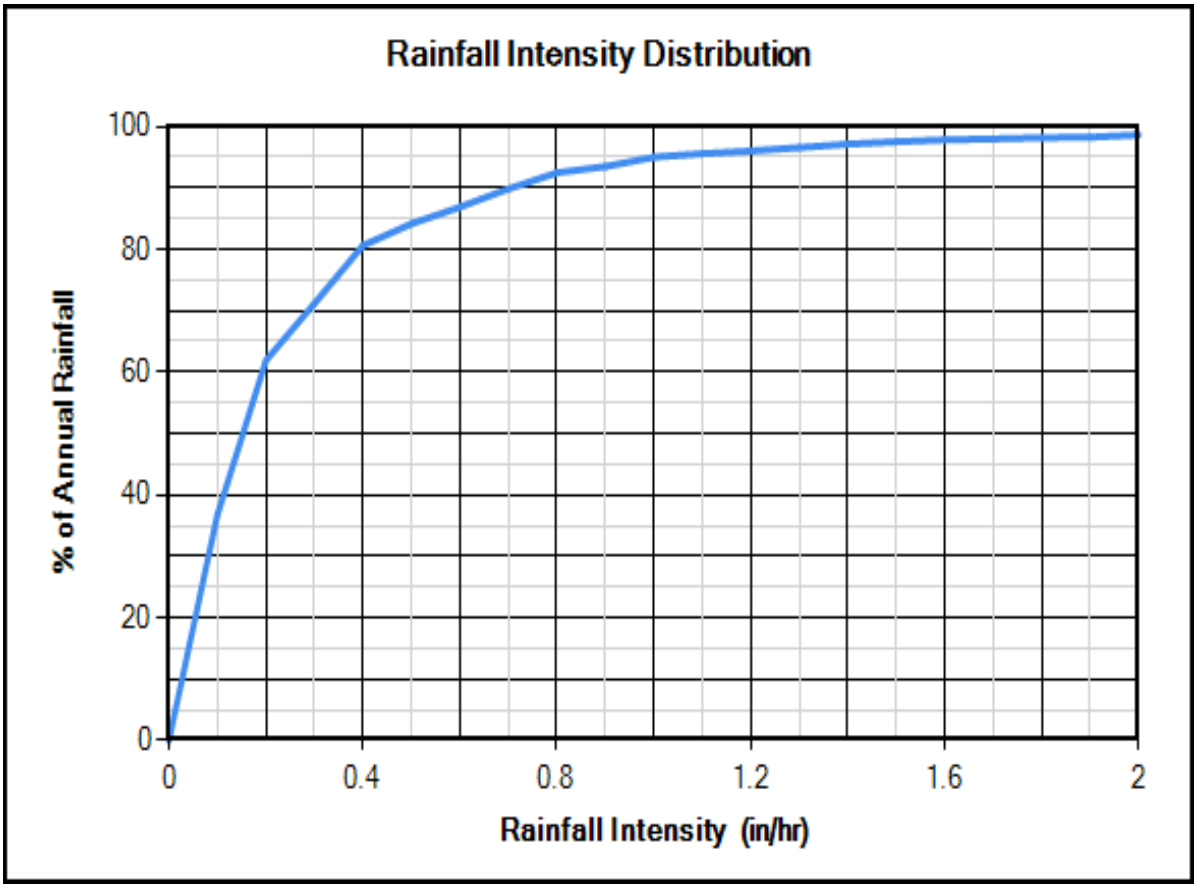
TSS Removal Sizing Summary



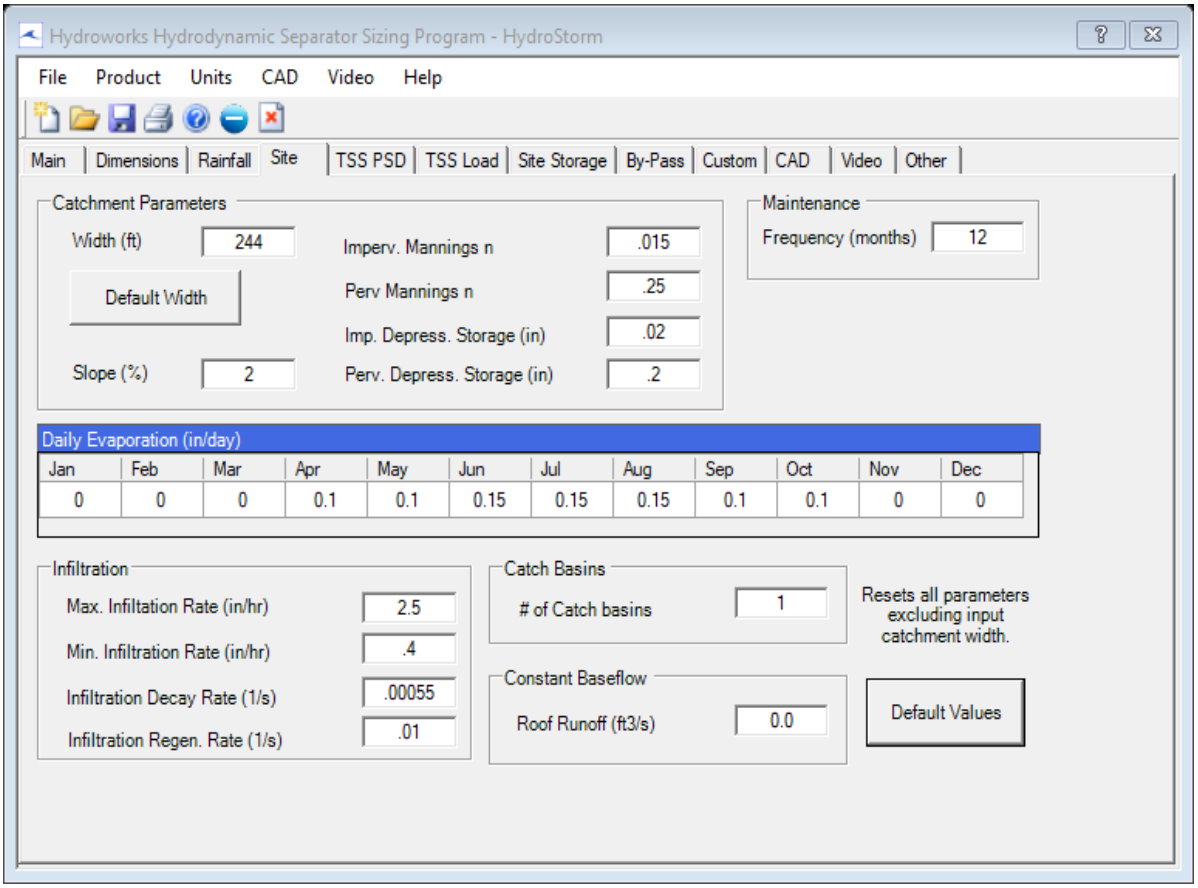
TSS Particle Size Distribution



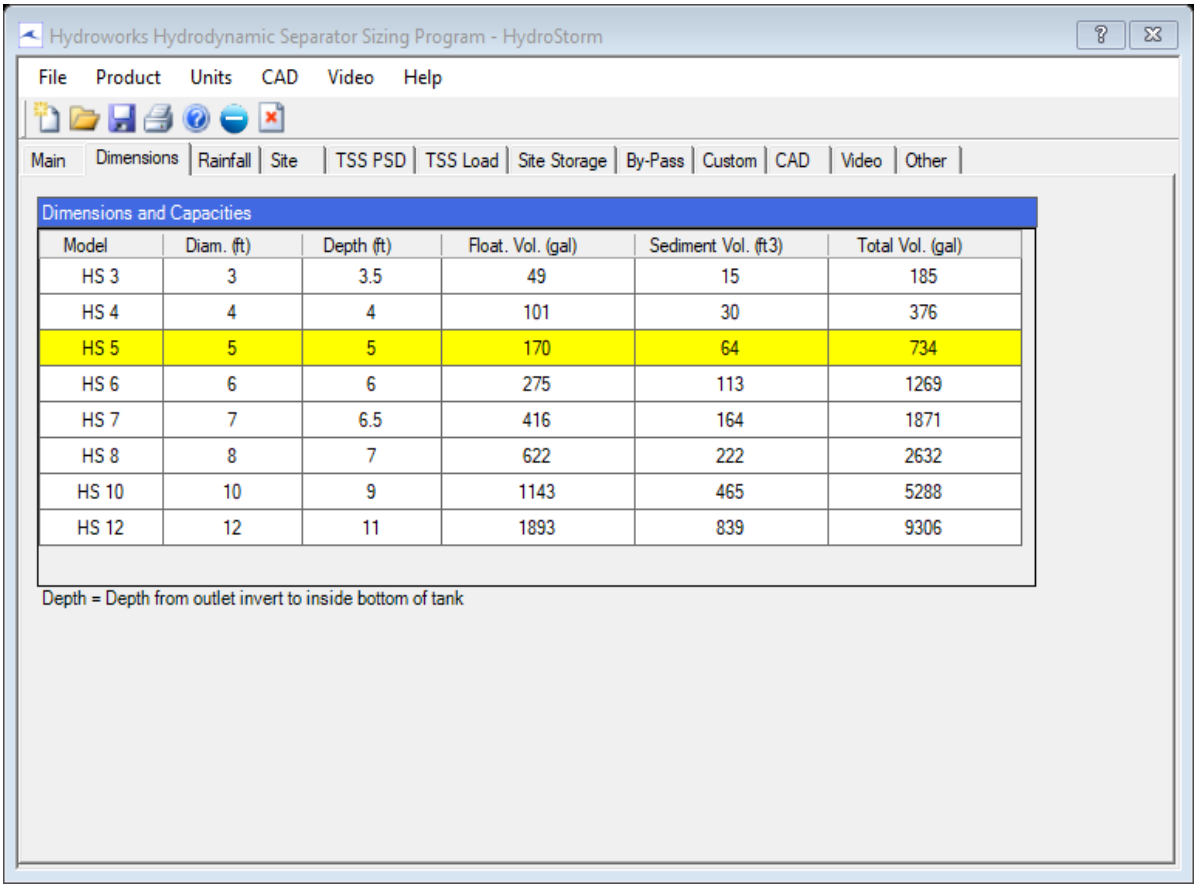
Rainfall Station - Hartford Wso Airport, Connecticut(1954 To 2001)



Site Physical Characteristics



Dimensions And Capacities

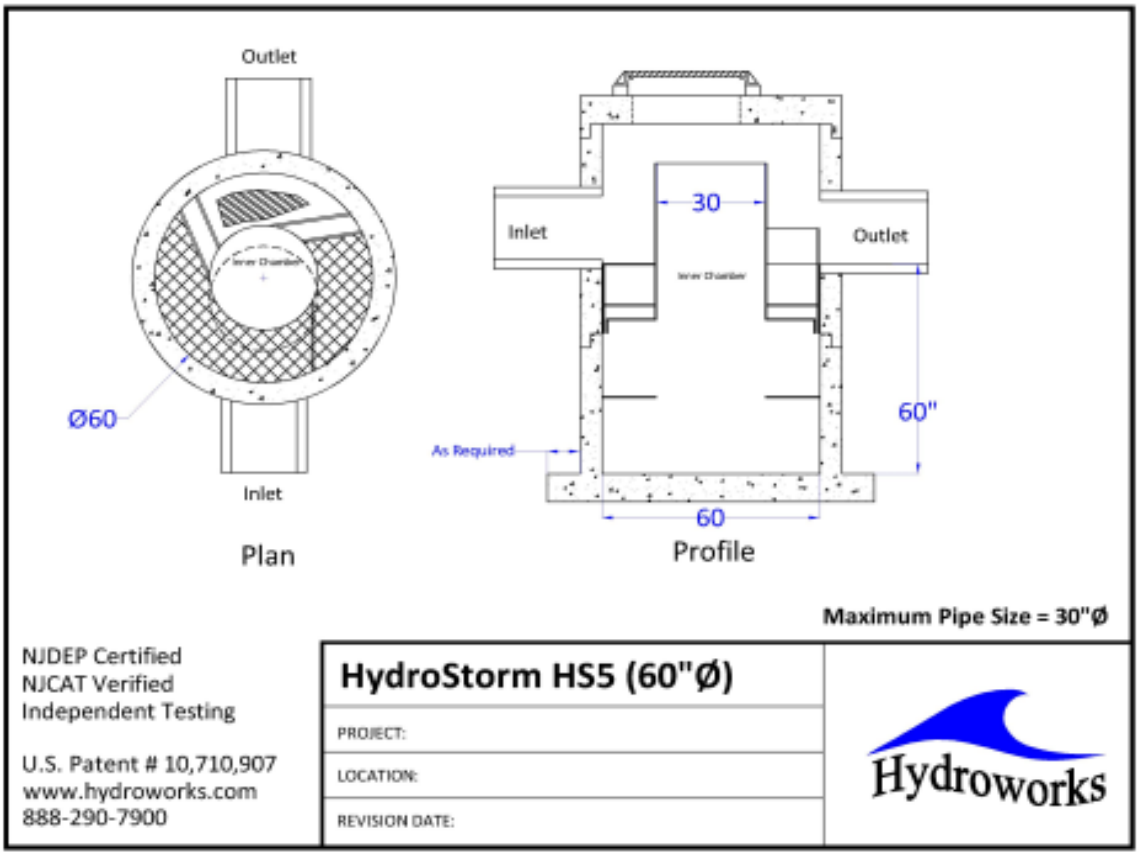


Dimensions and Capacities

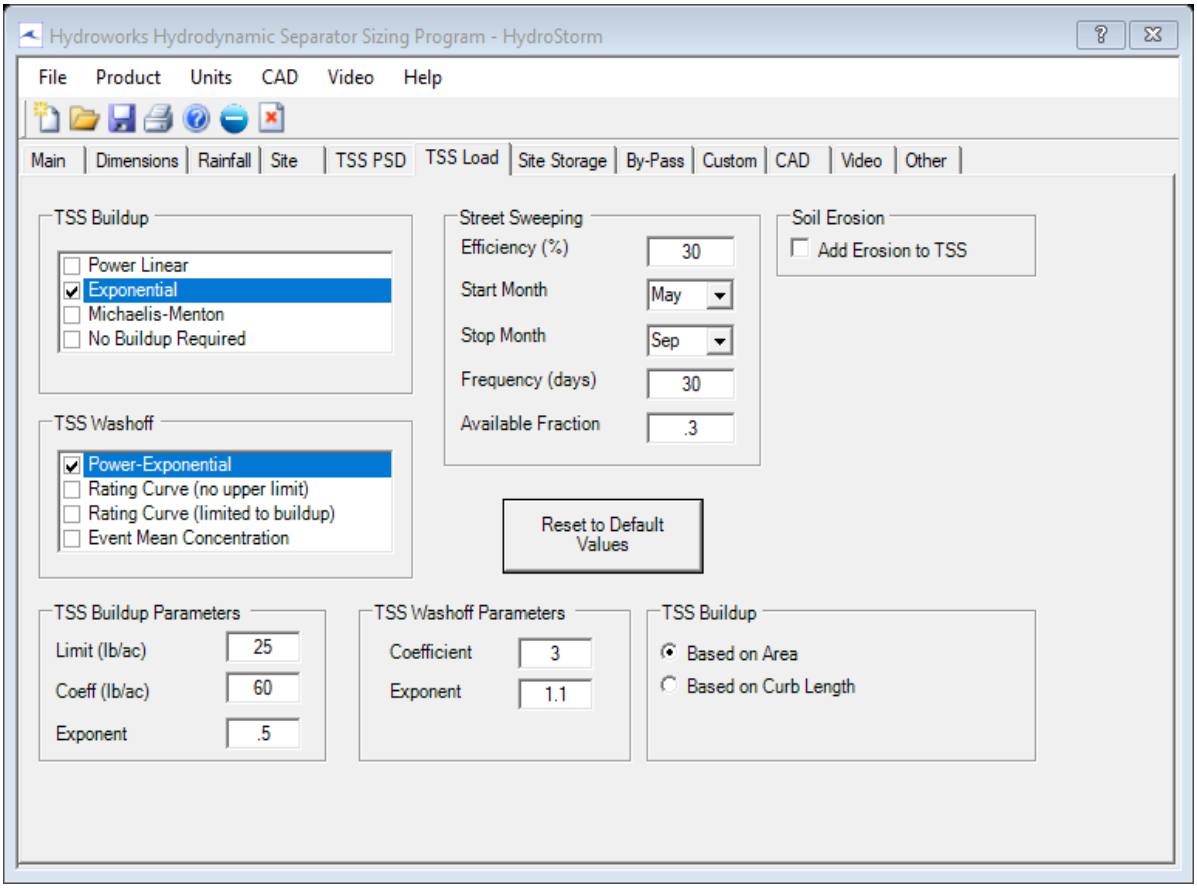
Model	Diam. (ft)	Depth (ft)	Float. Vol. (gal)	Sediment Vol. (ft3)	Total Vol. (gal)
HS 3	3	3.5	49	15	185
HS 4	4	4	101	30	376
HS 5	5	5	170	64	734
HS 6	6	6	275	113	1269
HS 7	7	6.5	416	164	1871
HS 8	8	7	622	222	2632
HS 10	10	9	1143	465	5288
HS 12	12	11	1893	839	9306

Depth = Depth from outlet invert to inside bottom of tank

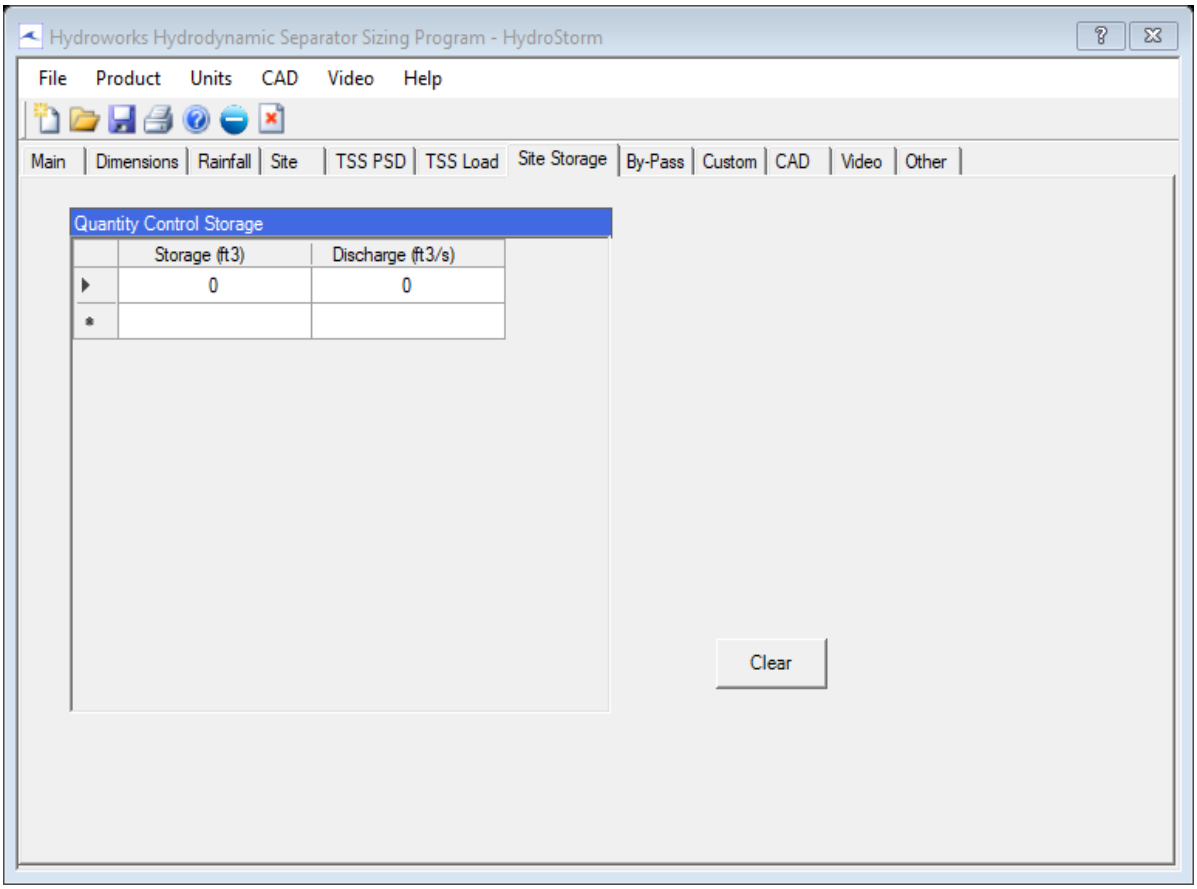
Generic HS 5 CAD Drawing



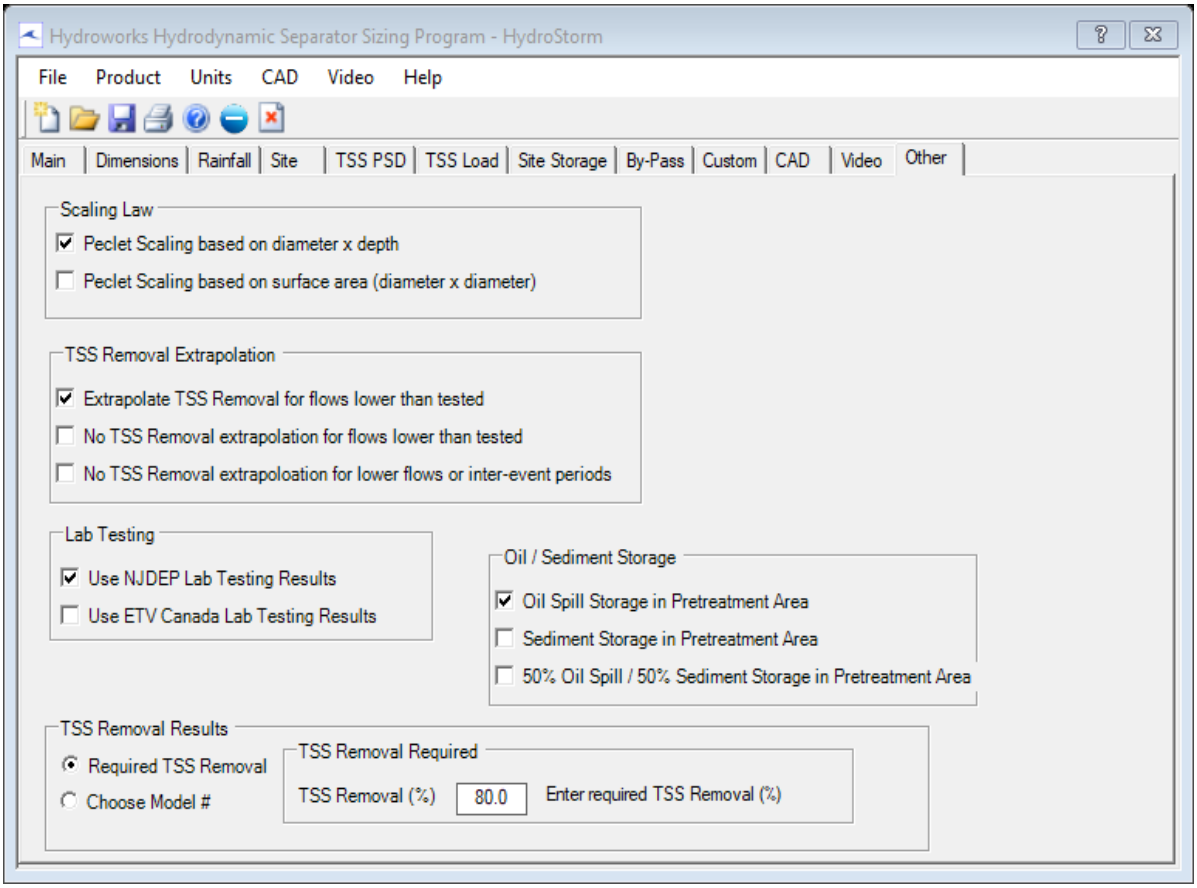
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Flagged Issues

None

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Hydroworks Sizing Summary

EDGEWOOD HDS-5

03-17-2026

Recommended Size: HydroStorm HS 3i

Hydroworks Sizing Program Version 5.8.5

A HydroStorm HS 3i is recommended to provide 80 % annual TSS removal based on a drainage area of .13 (ac) with an imperviousness of 92 % and Hartford Wso Airport, Connecticut rainfall for the Hydroworks standard particle size distribution.

The recommended HydroStorm HS 3i treats 100 % of the annual runoff and provides 97 % annual TSS removal for the Hartford Wso Airport rainfall records and Hydroworks standard particle size distribution.

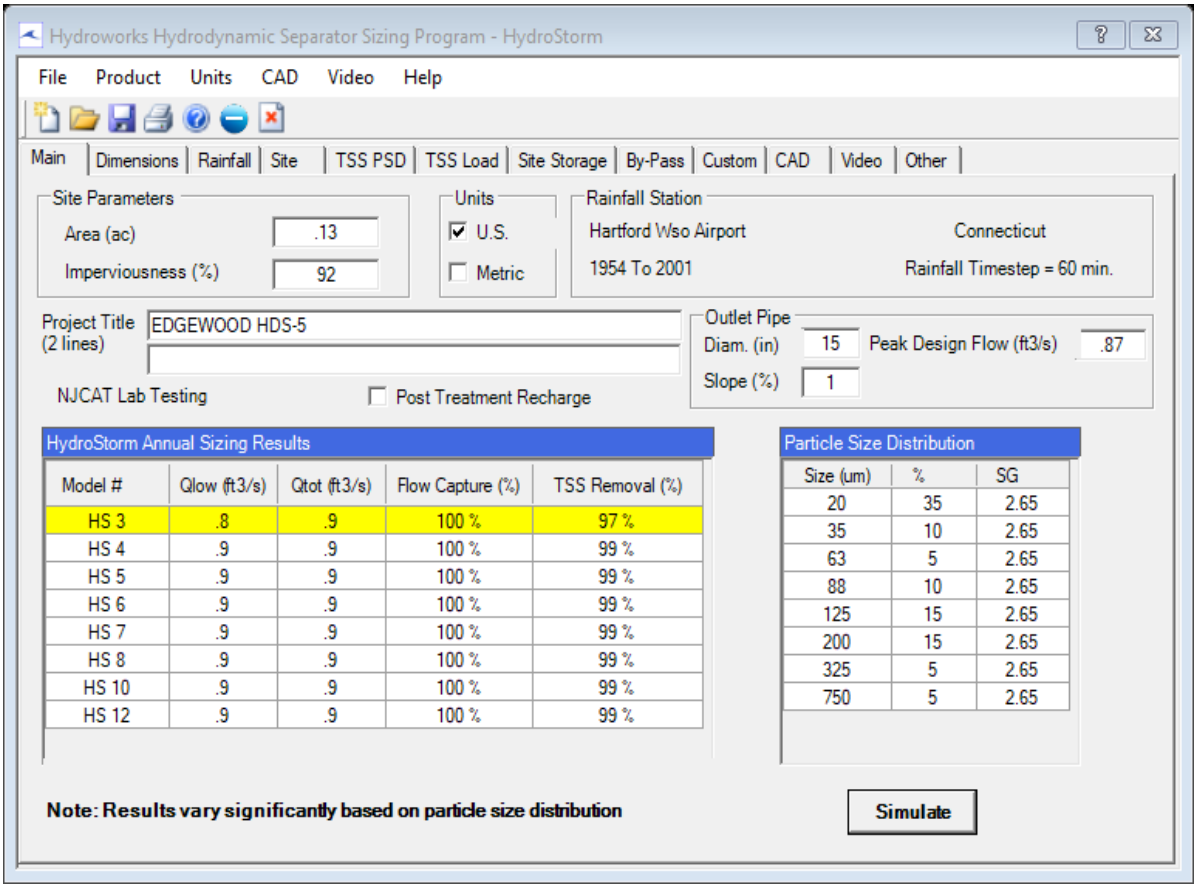
The HydroStorm has a headloss coefficient (K) of 1.04. The given peak flow of .87 (ft3/s) Is less than the full pipe flow of 6.46 (ft3/s) indicating free flow in the pipe during the peak flow assuming no tailwater condition. Partial pipe flow was assumed For the headloss calculations. The critical depth Is greater than the normal depth For the peak flow And 15 (in) pipe diameter And 1 % slope given. Critical depth was assumed For the headloss calculations. The headloss was calculated to be 2 (in) based on a flow depth of 4 (in) .

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

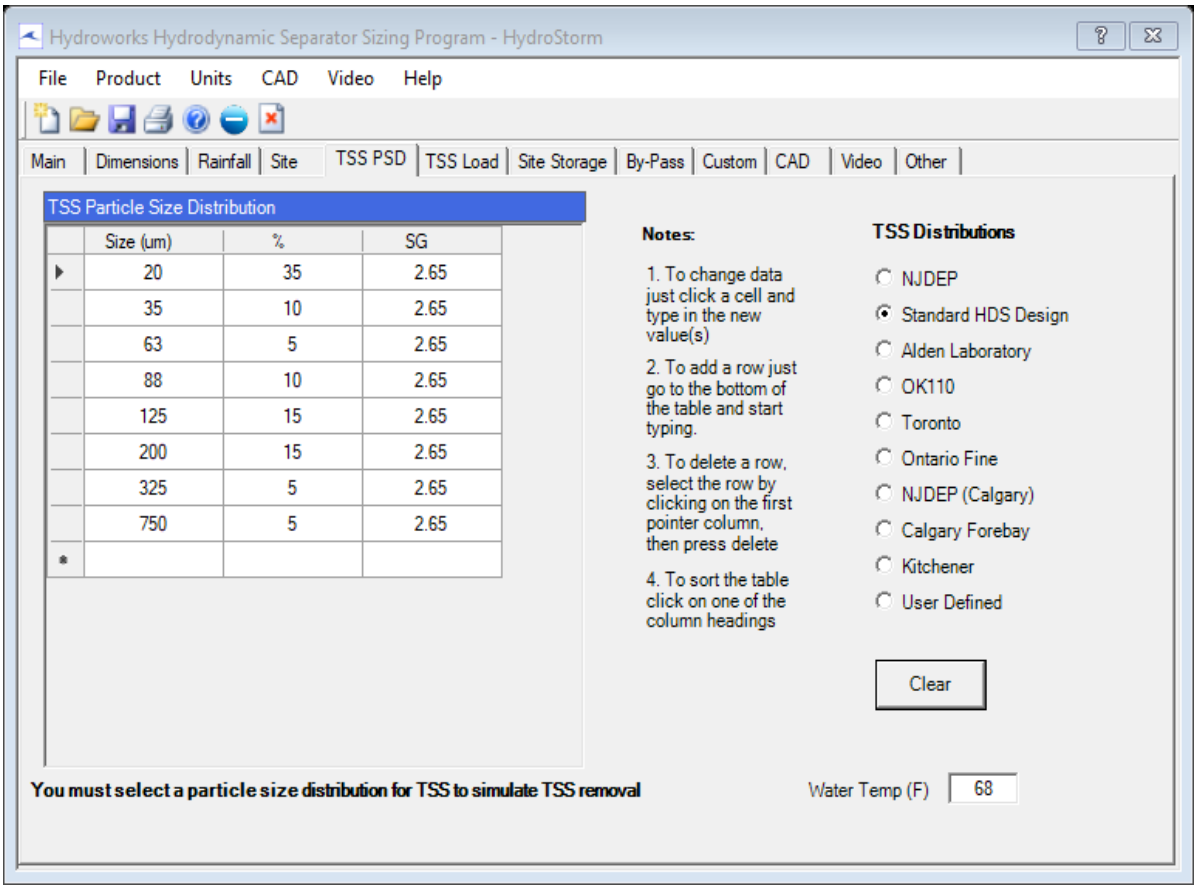
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

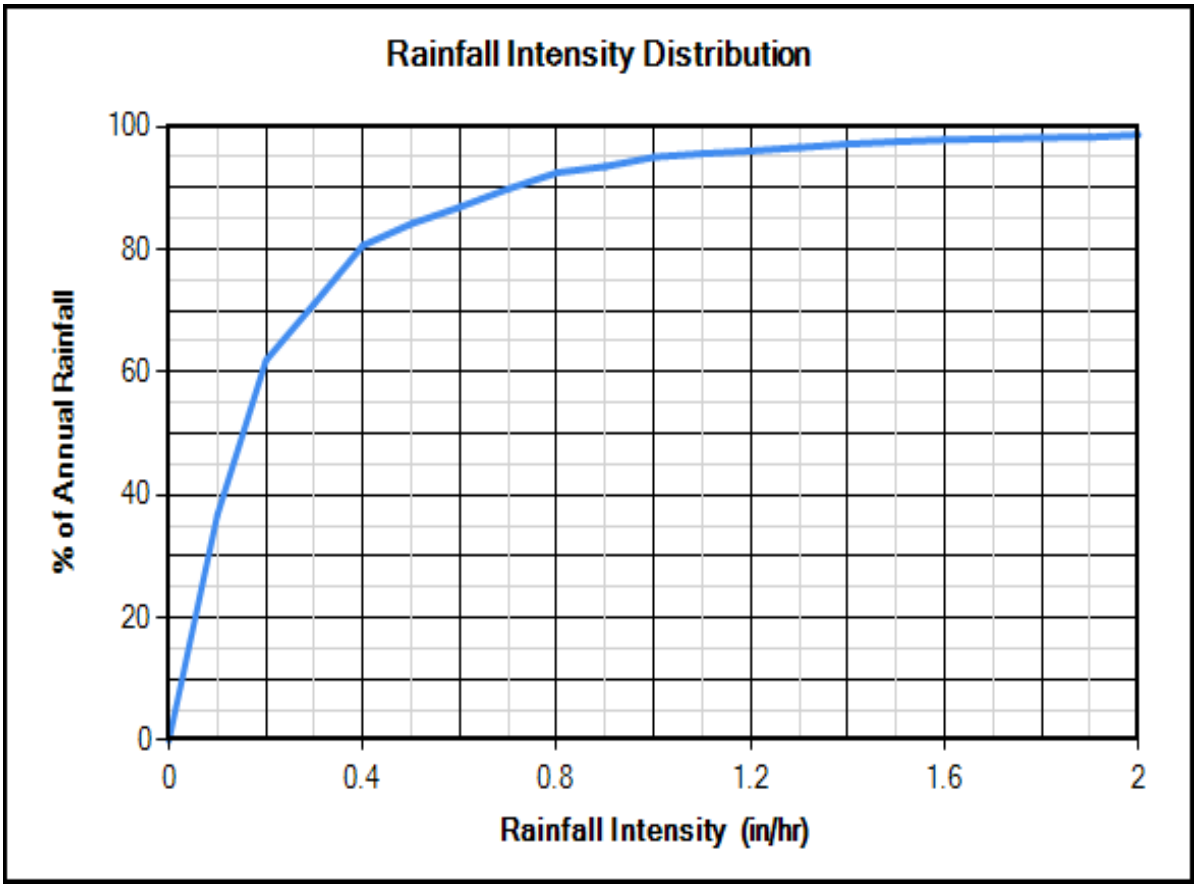
TSS Removal Sizing Summary



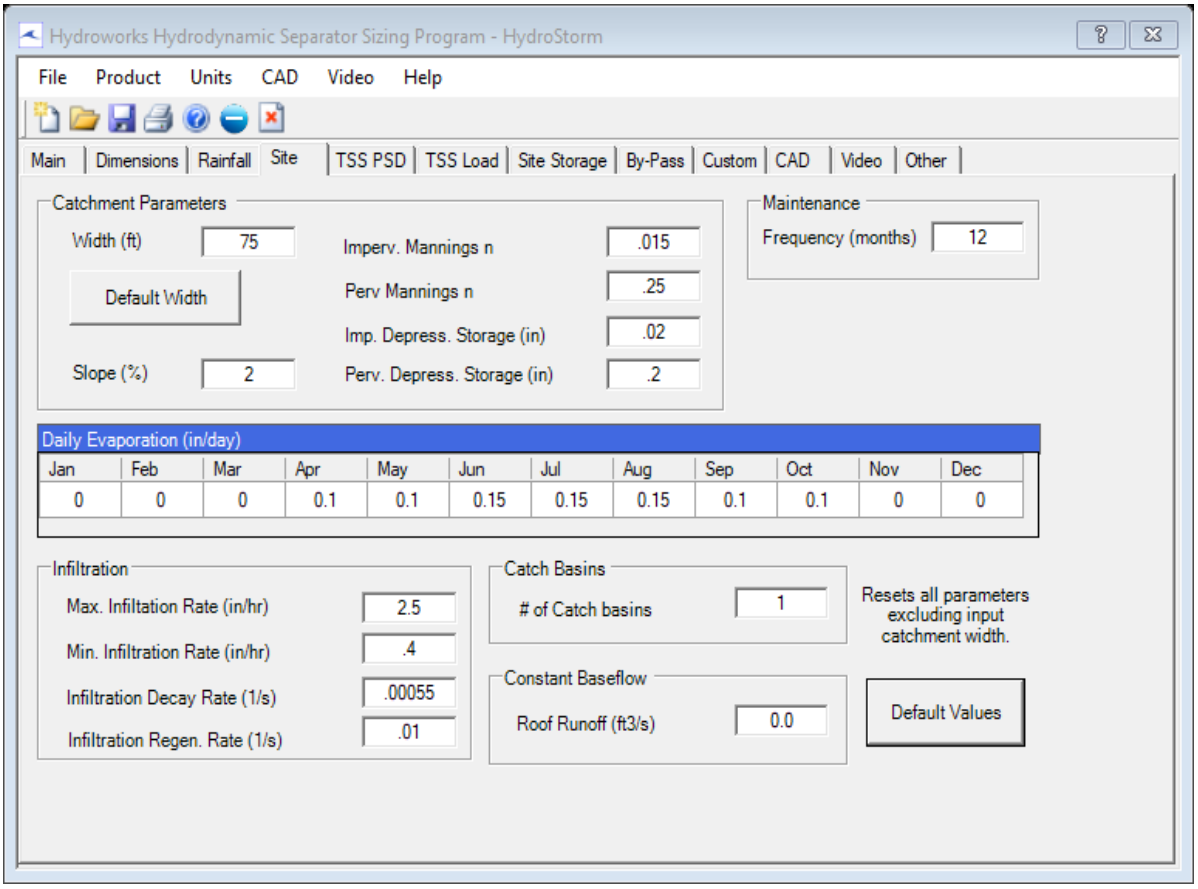
TSS Particle Size Distribution



Rainfall Station - Hartford Wso Airport, Connecticut(1954 To 2001)



Site Physical Characteristics



Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

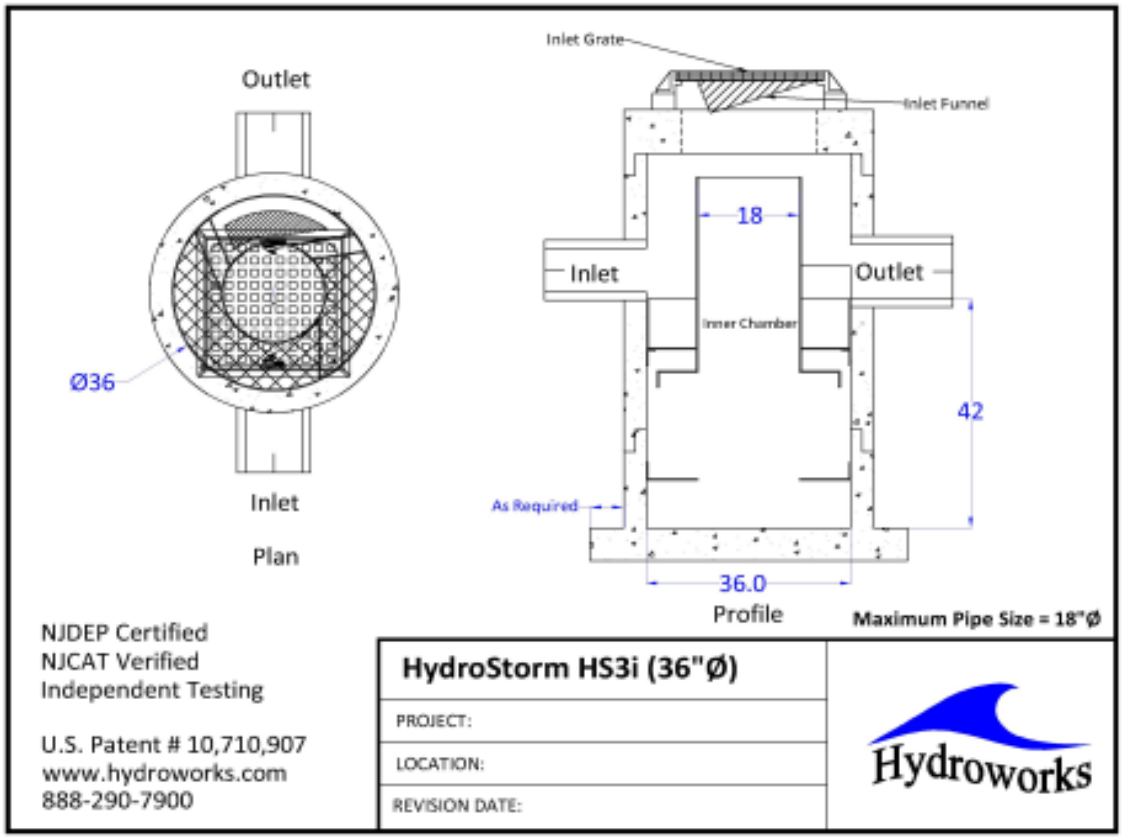
Main | Dimensions | Rainfall | Site | TSS PSD | TSS Load | Site Storage | By-Pass | Custom | CAD | Video | Other

Dimensions and Capacities

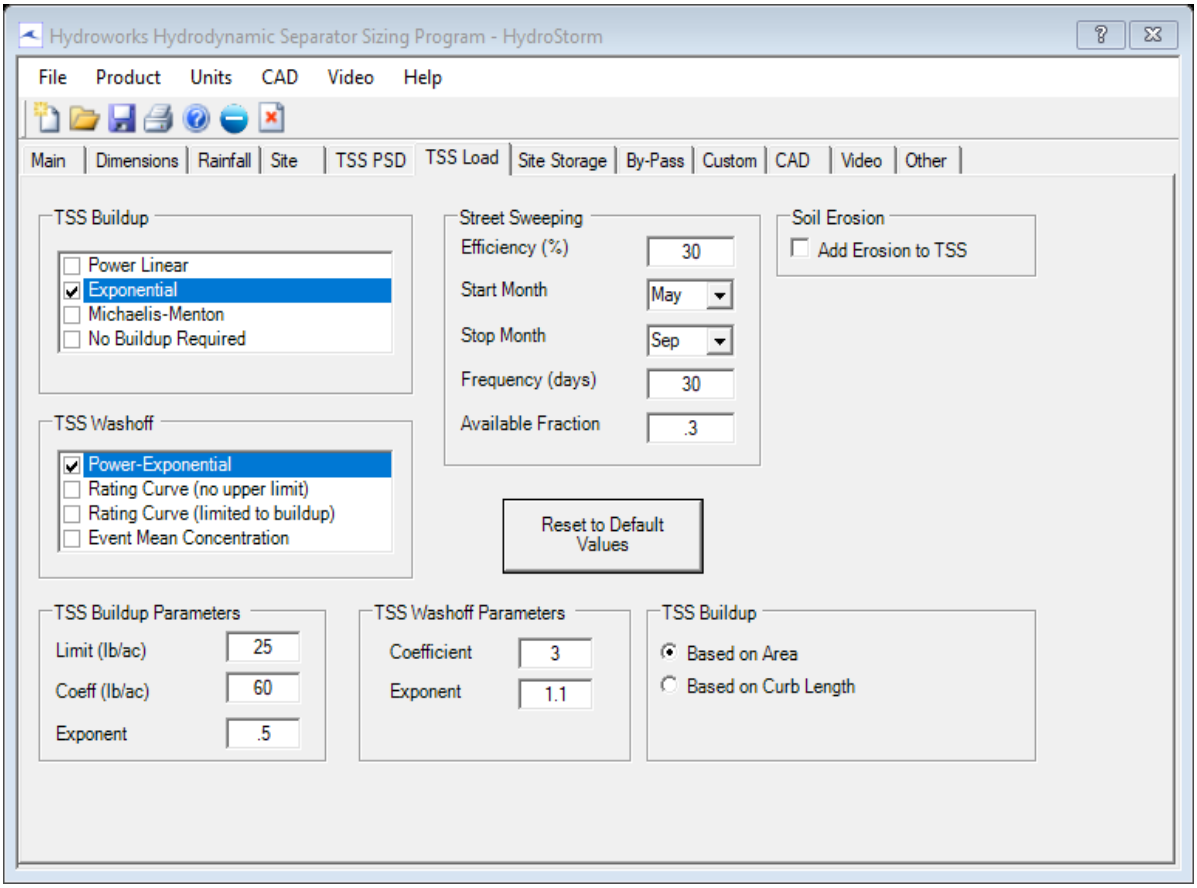
Model	Diam. (ft)	Depth (ft)	Float. Vol. (gal)	Sediment Vol. (ft3)	Total Vol. (gal)
HS 3	3	3.5	49	15	185
HS 4	4	4	101	30	376
HS 5	5	5	170	64	734
HS 6	6	6	275	113	1269
HS 7	7	6.5	416	164	1871
HS 8	8	7	622	222	2632
HS 10	10	9	1143	465	5288
HS 12	12	11	1893	839	9306

Depth = Depth from outlet invert to inside bottom of tank

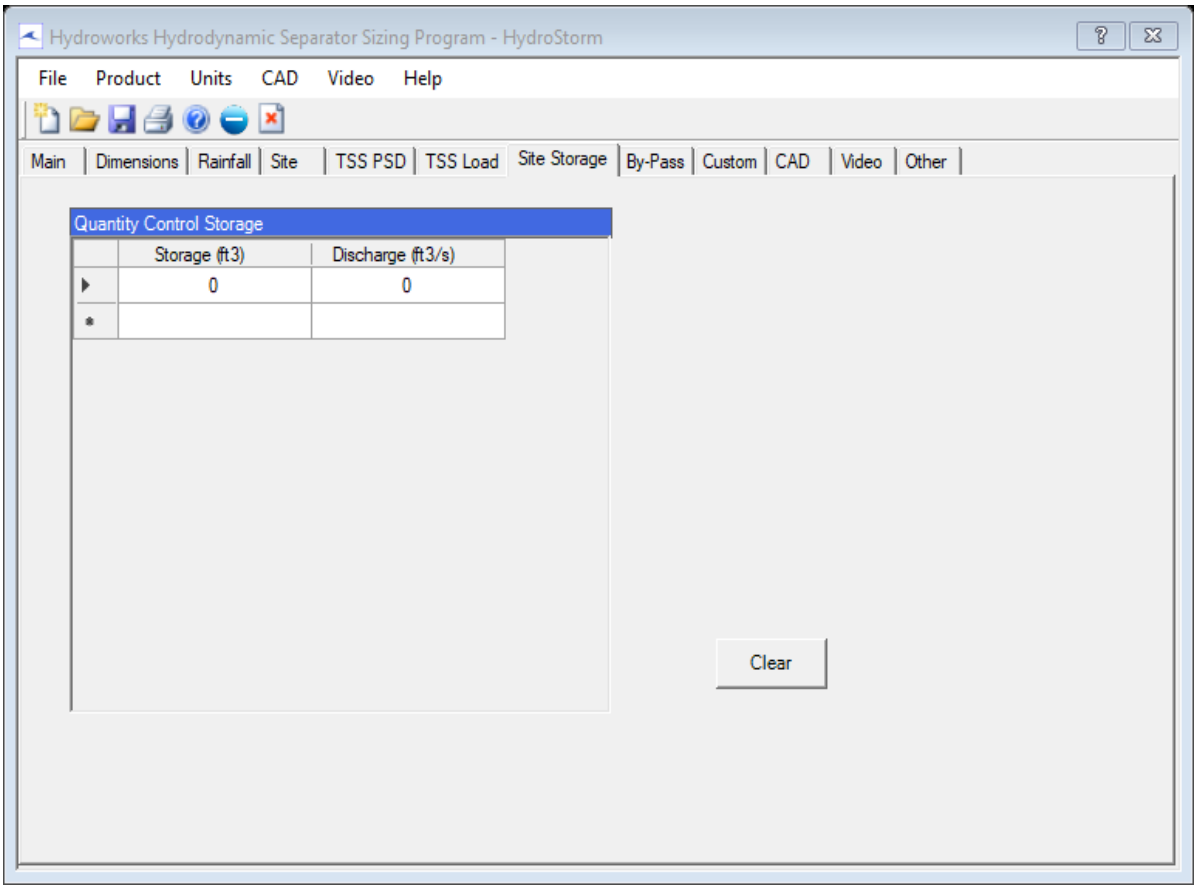
Generic HS 3i CAD Drawing



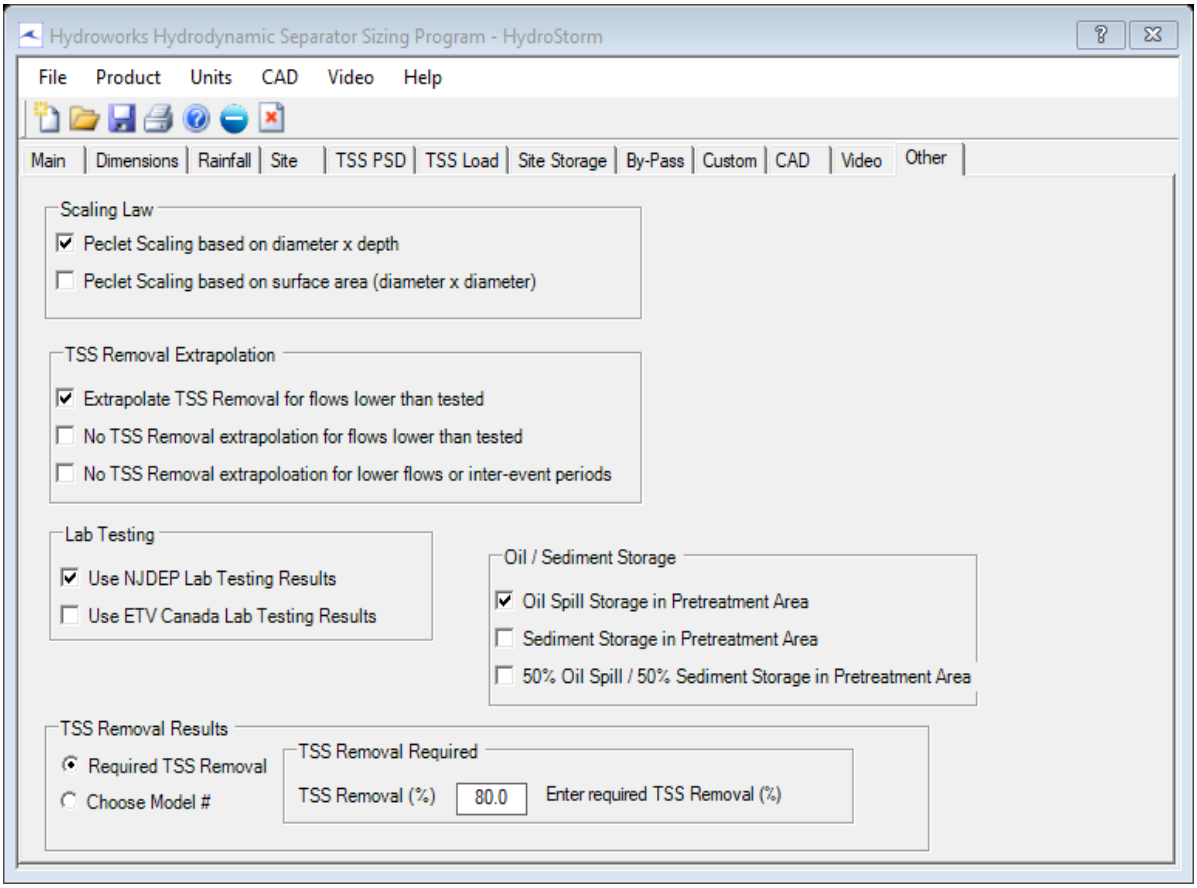
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Flagged Issues

None

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Hydroworks Sizing Summary

EDGEWOOD HDS-7

03-17-2026

Recommended Size: HydroStorm HS 5

Hydroworks Sizing Program Version 5.8.5

A HydroStorm HS 5 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.46 (ac) with an imperviousness of 82 % and Hartford Wso Airport, Connecticut rainfall for the Hydroworks standard particle size distribution.

The recommended HydroStorm HS 5 treats 99 % of the annual runoff and provides 83 % annual TSS removal for the Hartford Wso Airport rainfall records and Hydroworks standard particle size distribution.

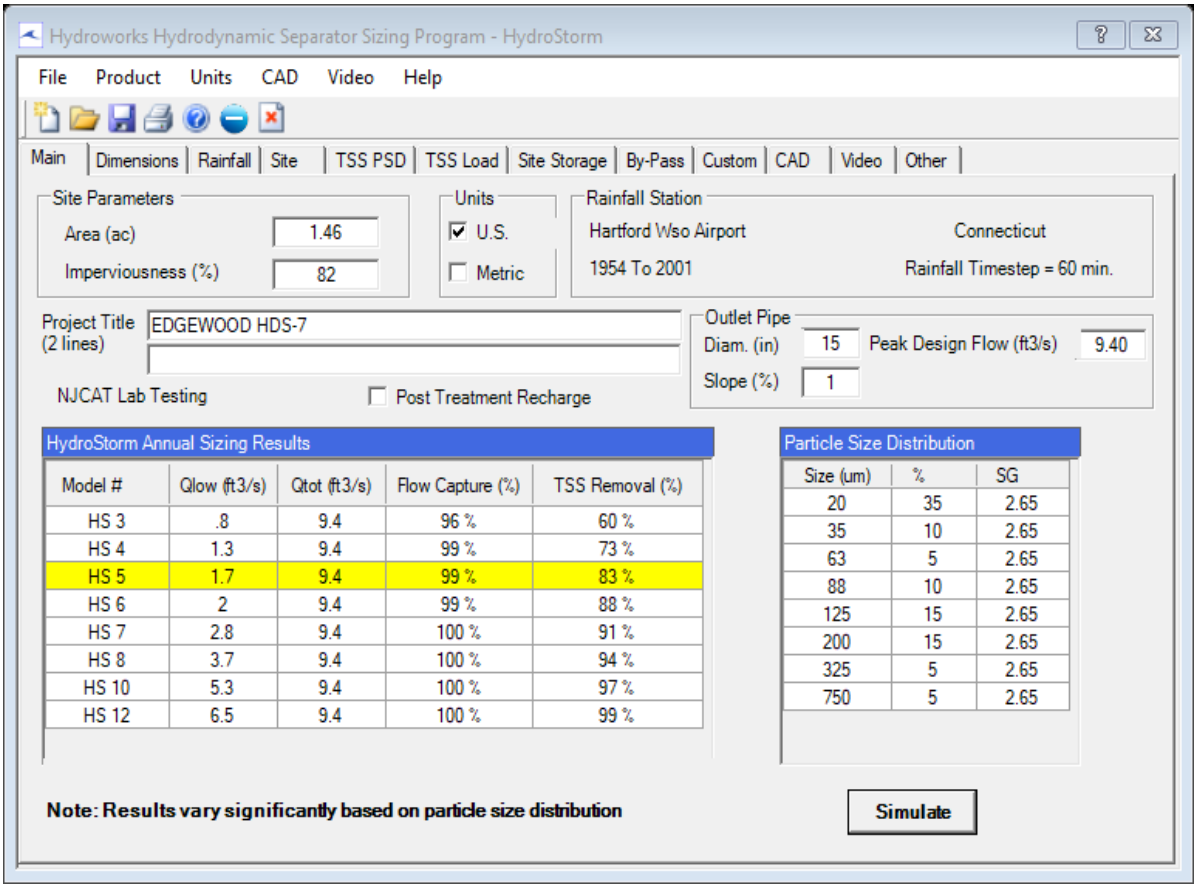
The HydroStorm has a headloss coefficient (K) of 1.04. The given peak flow of 9.4 (ft3/s) Is greater than the full pipe flow of 6.46 (ft3/s) indicating the pipe will be surcharged during the peak flow. Full pipe flow was assumed For the headloss calculations. The pressure head in the pipe was Not evaluated since this would require a hydraulic gradeline analysis. The headloss was calculated to be 11 (in) based on a flow depth of 15 (in) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

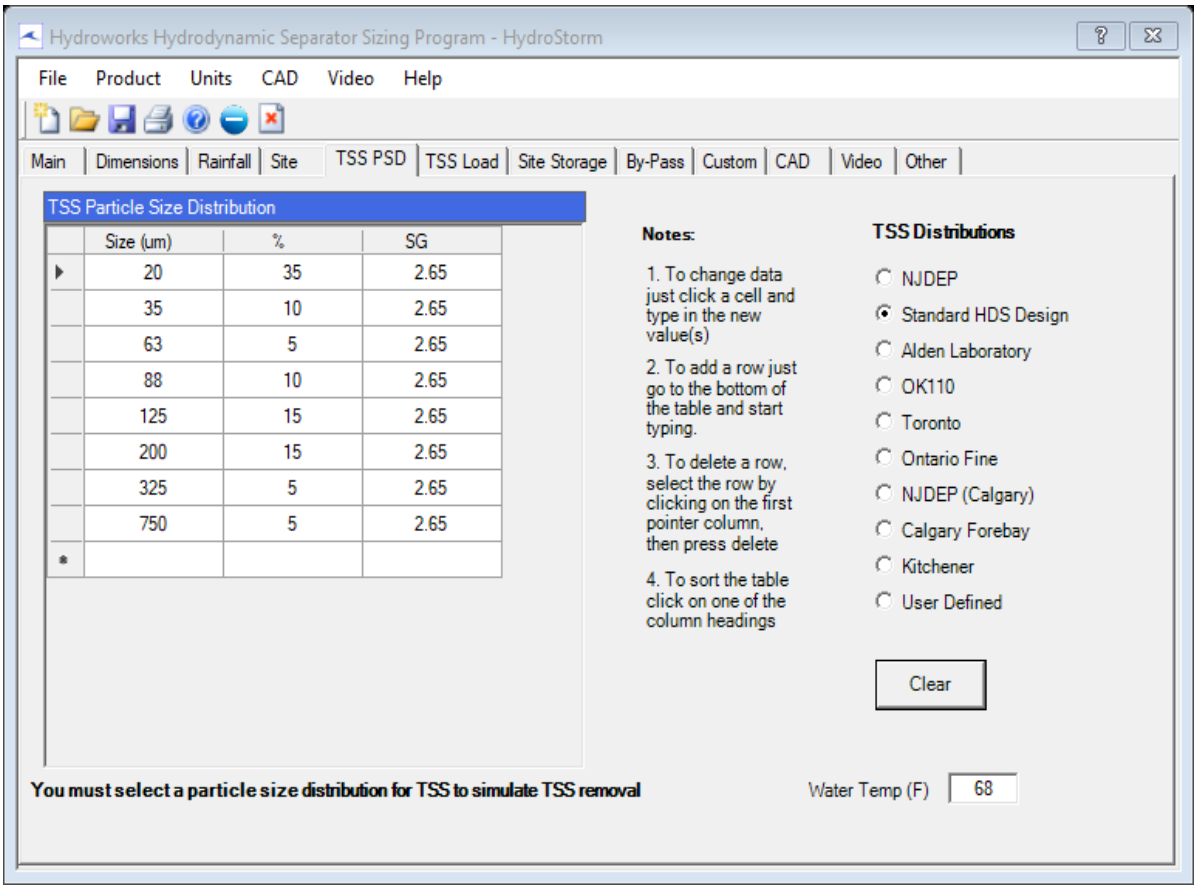
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

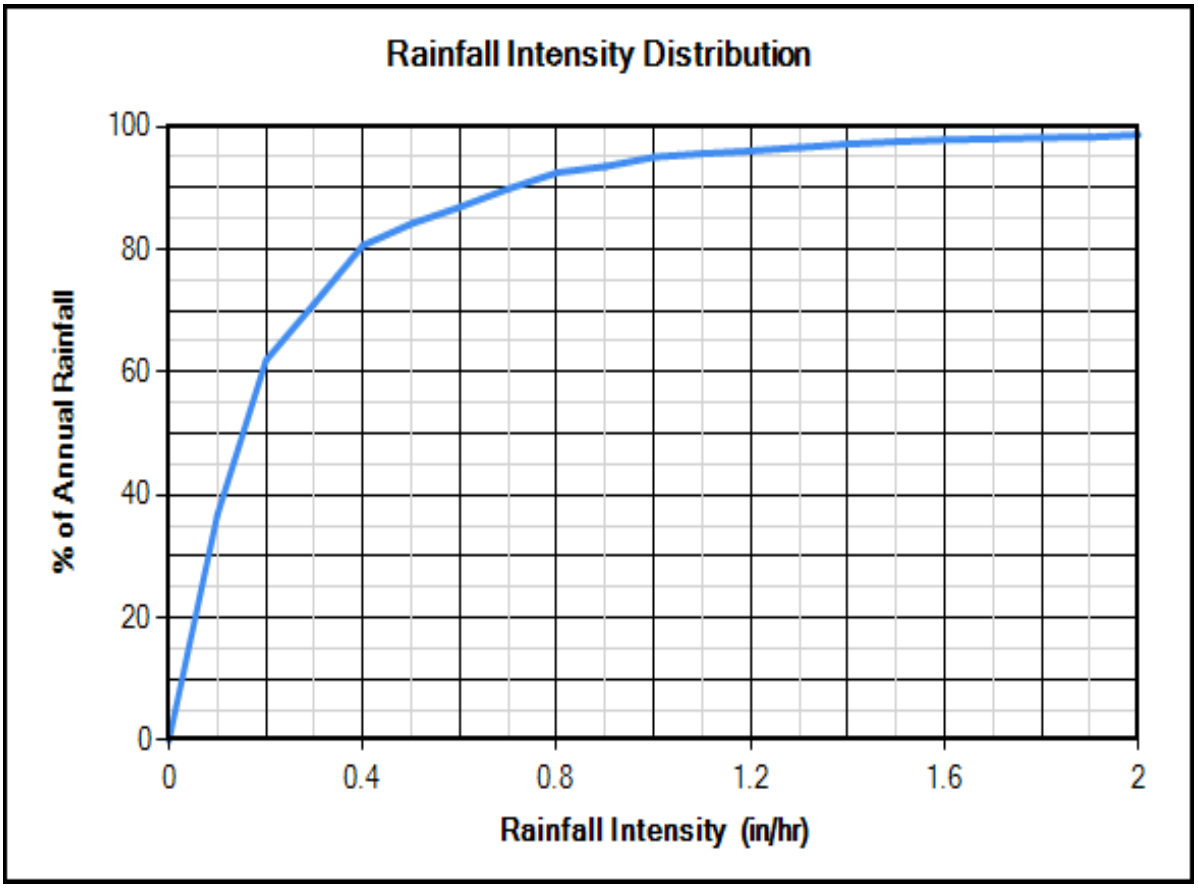
TSS Removal Sizing Summary



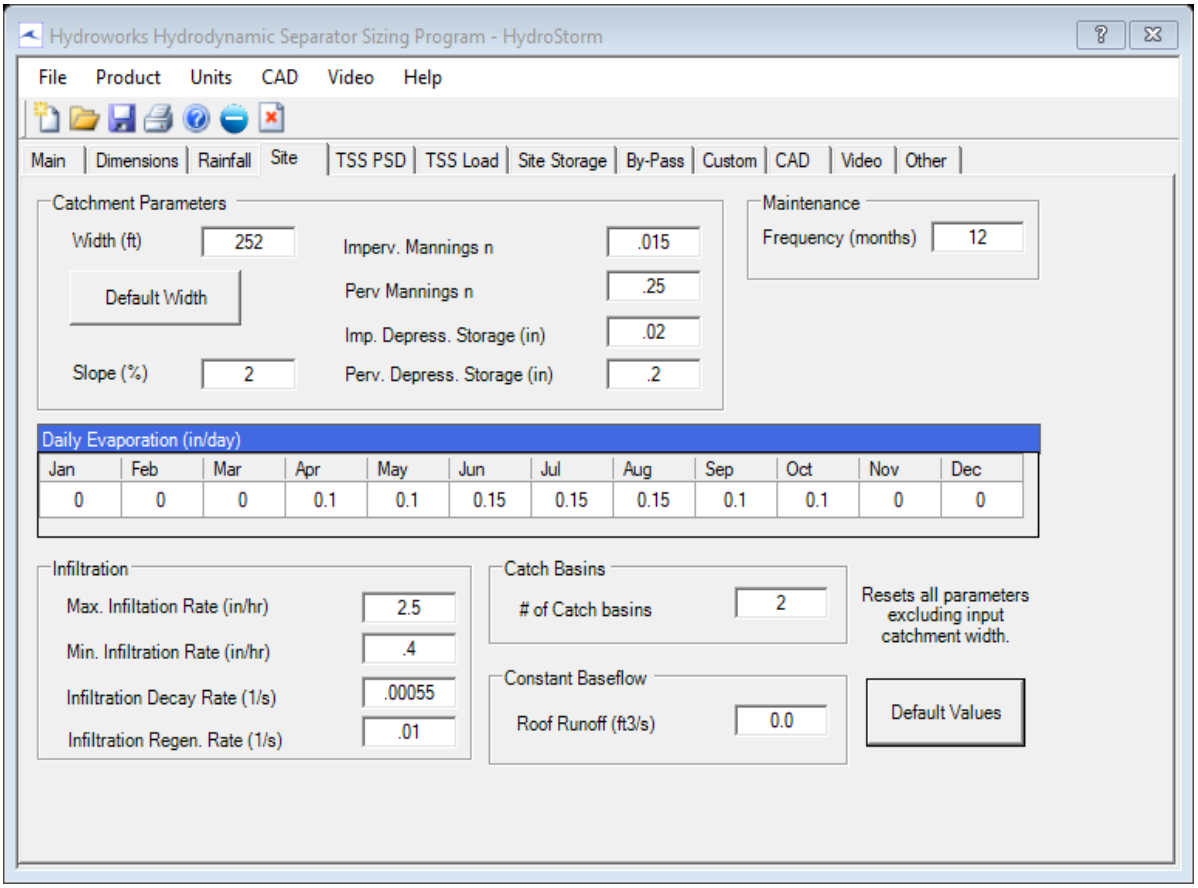
TSS Particle Size Distribution



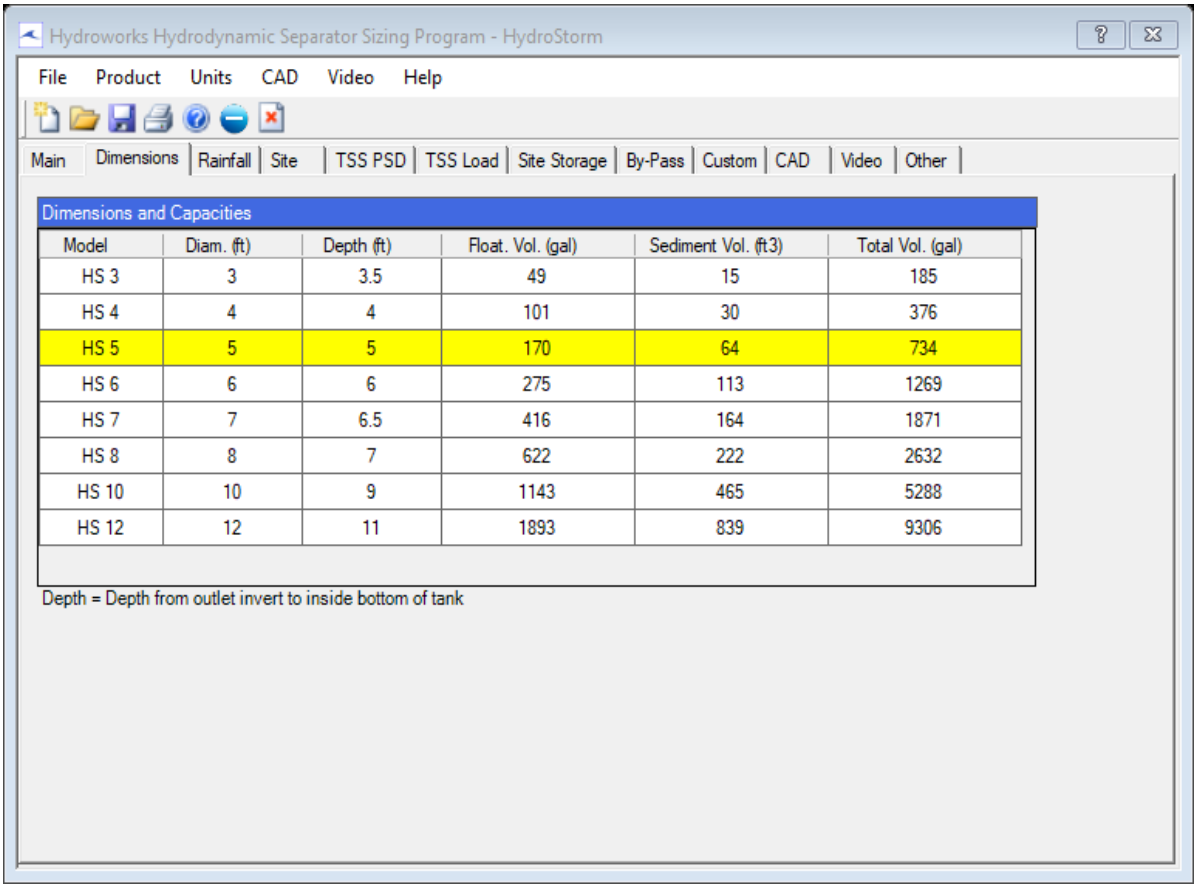
Rainfall Station - Hartford Wso Airport, Connecticut(1954 To 2001)



Site Physical Characteristics



Dimensions And Capacities

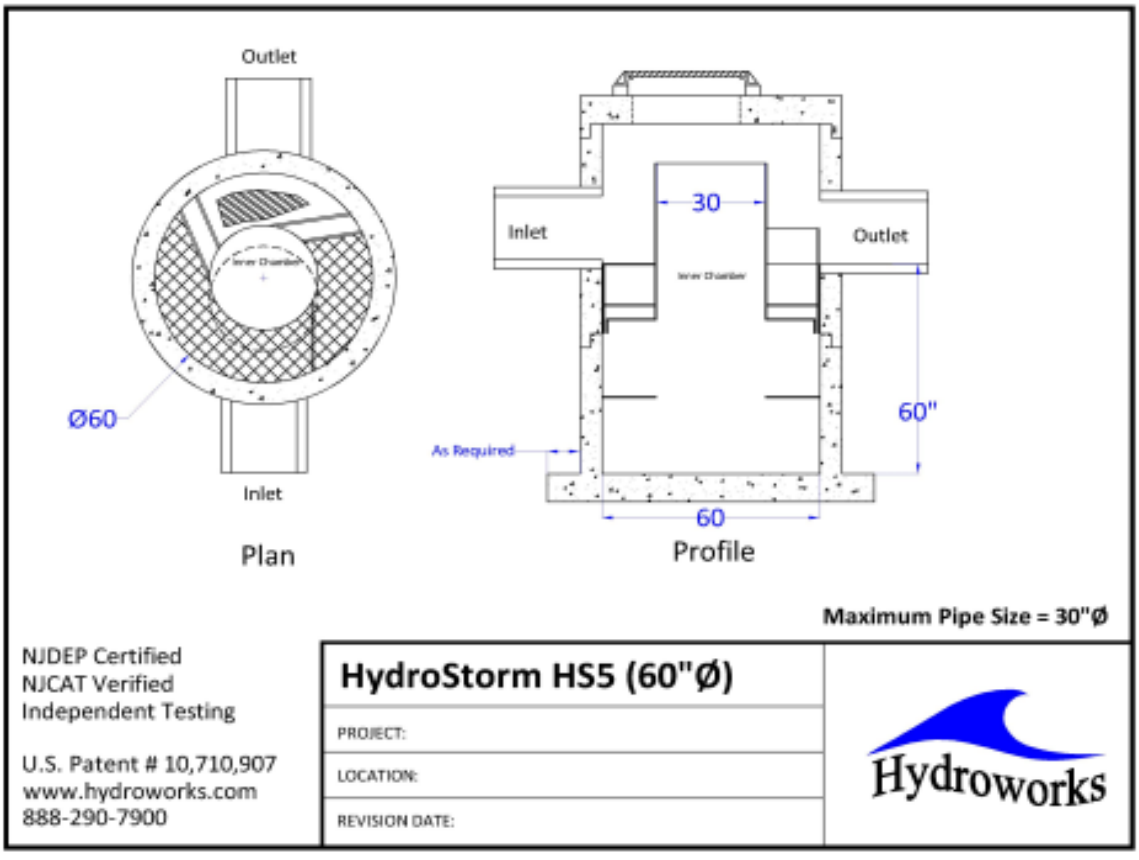


Dimensions and Capacities

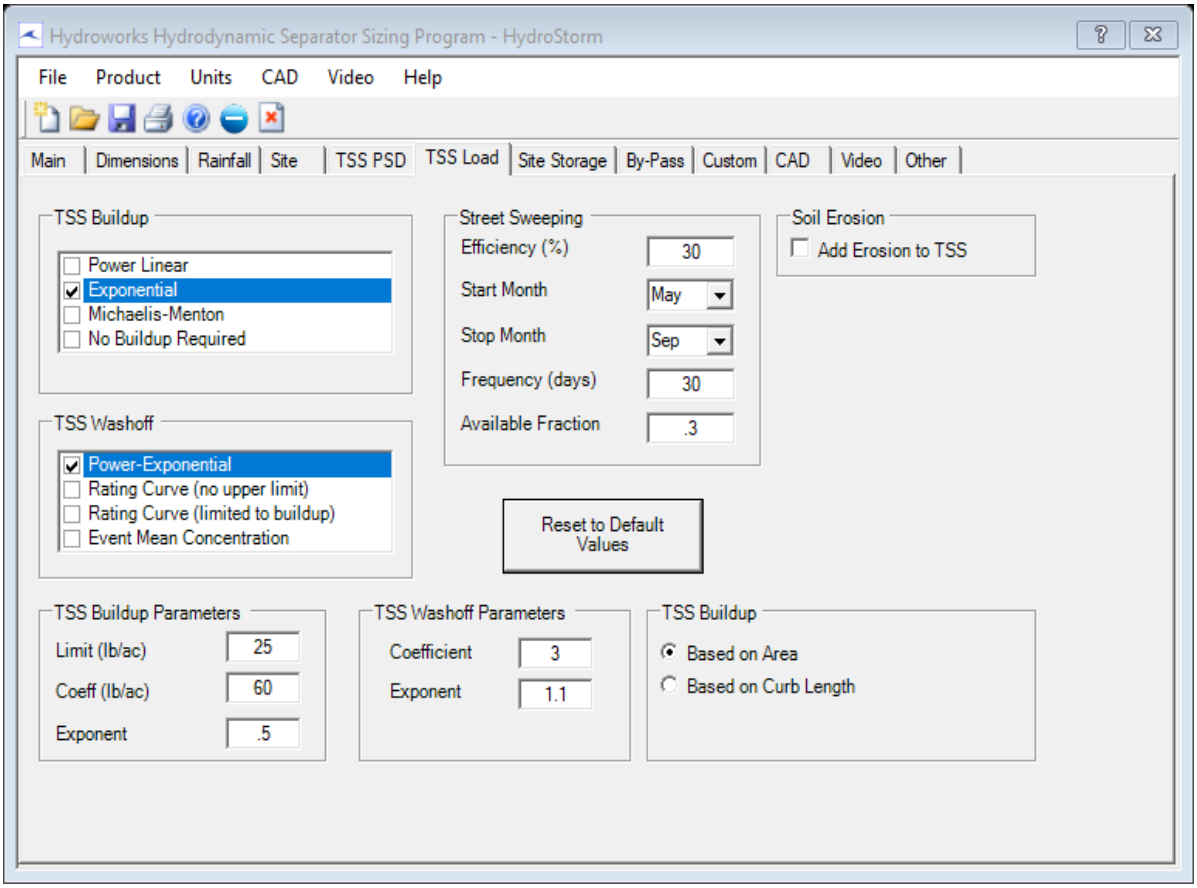
Model	Diam. (ft)	Depth (ft)	Float. Vol. (gal)	Sediment Vol. (ft3)	Total Vol. (gal)
HS 3	3	3.5	49	15	185
HS 4	4	4	101	30	376
HS 5	5	5	170	64	734
HS 6	6	6	275	113	1269
HS 7	7	6.5	416	164	1871
HS 8	8	7	622	222	2632
HS 10	10	9	1143	465	5288
HS 12	12	11	1893	839	9306

Depth = Depth from outlet invert to inside bottom of tank

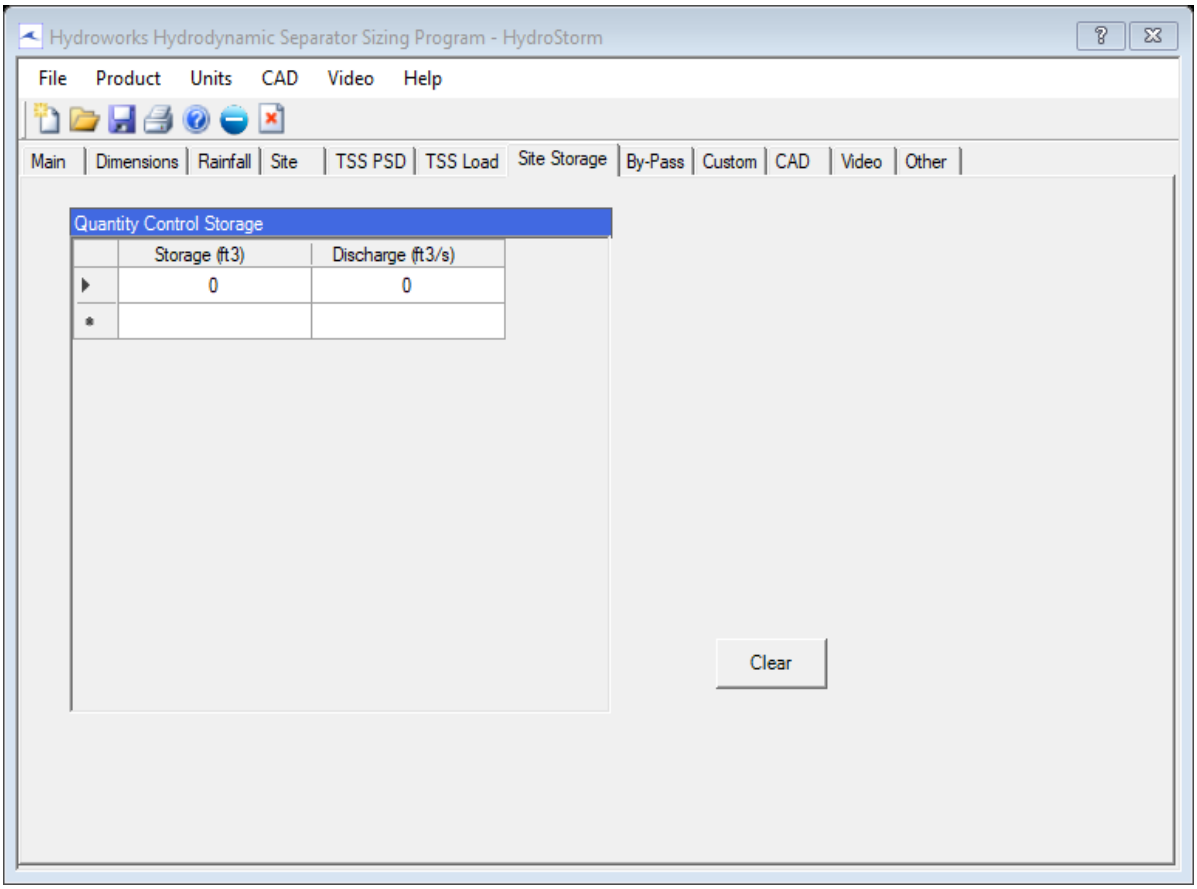
Generic HS 5 CAD Drawing



TSS Buildup And Washoff



Upstream Quantity Storage



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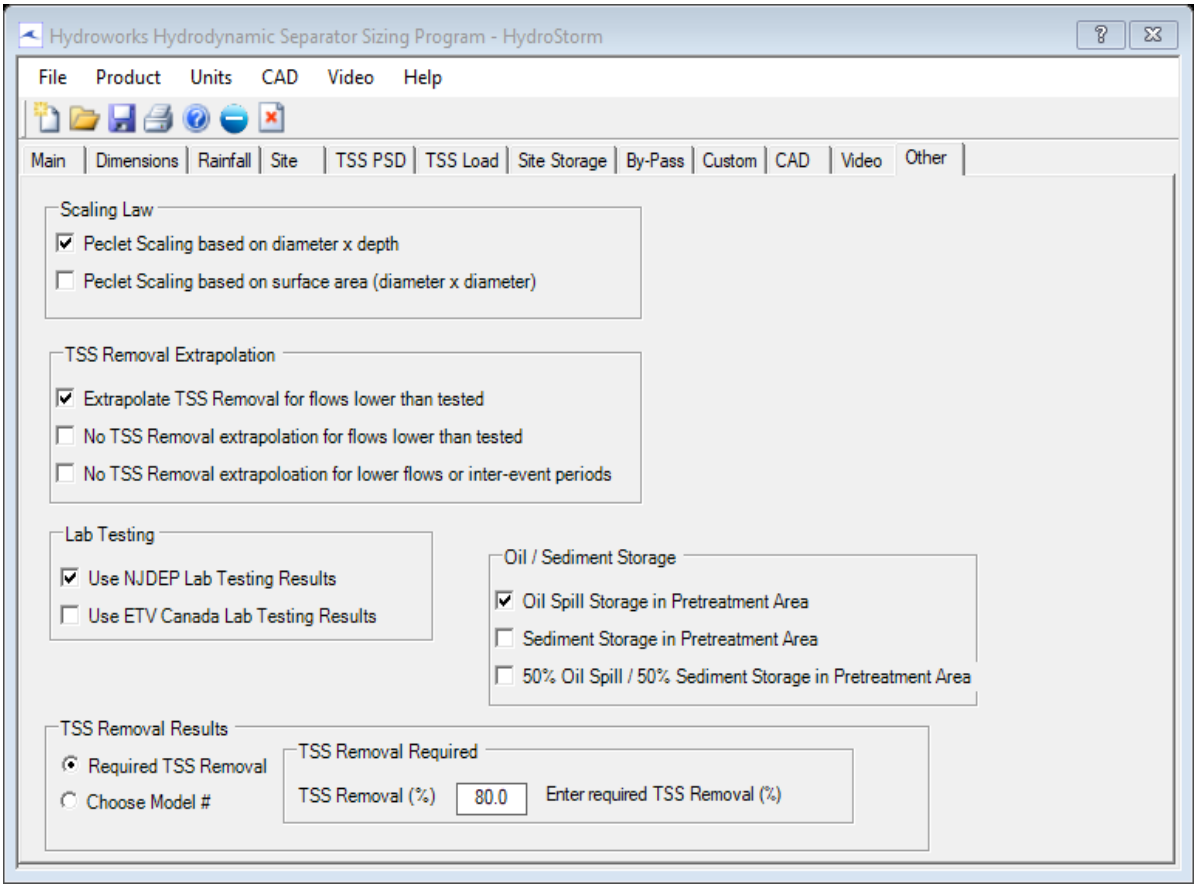

Flagged Issues

None

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Hydroworks Sizing Summary

EDGEWOOD HDS-9

03-17-2026

Recommended Size: HydroStorm HS 4i

Hydroworks Sizing Program Version 5.8.5

A HydroStorm HS 4i is recommended to provide 80 % annual TSS removal based on a drainage area of 1.10 (ac) with an imperviousness of 55. % and Hartford Wso Airport, Connecticut rainfall for the Hydroworks standard particle size distribution.

The recommended HydroStorm HS 4i treats 100 % of the annual runoff and provides 83 % annual TSS removal for the Hartford Wso Airport rainfall records and Hydroworks standard particle size distribution.

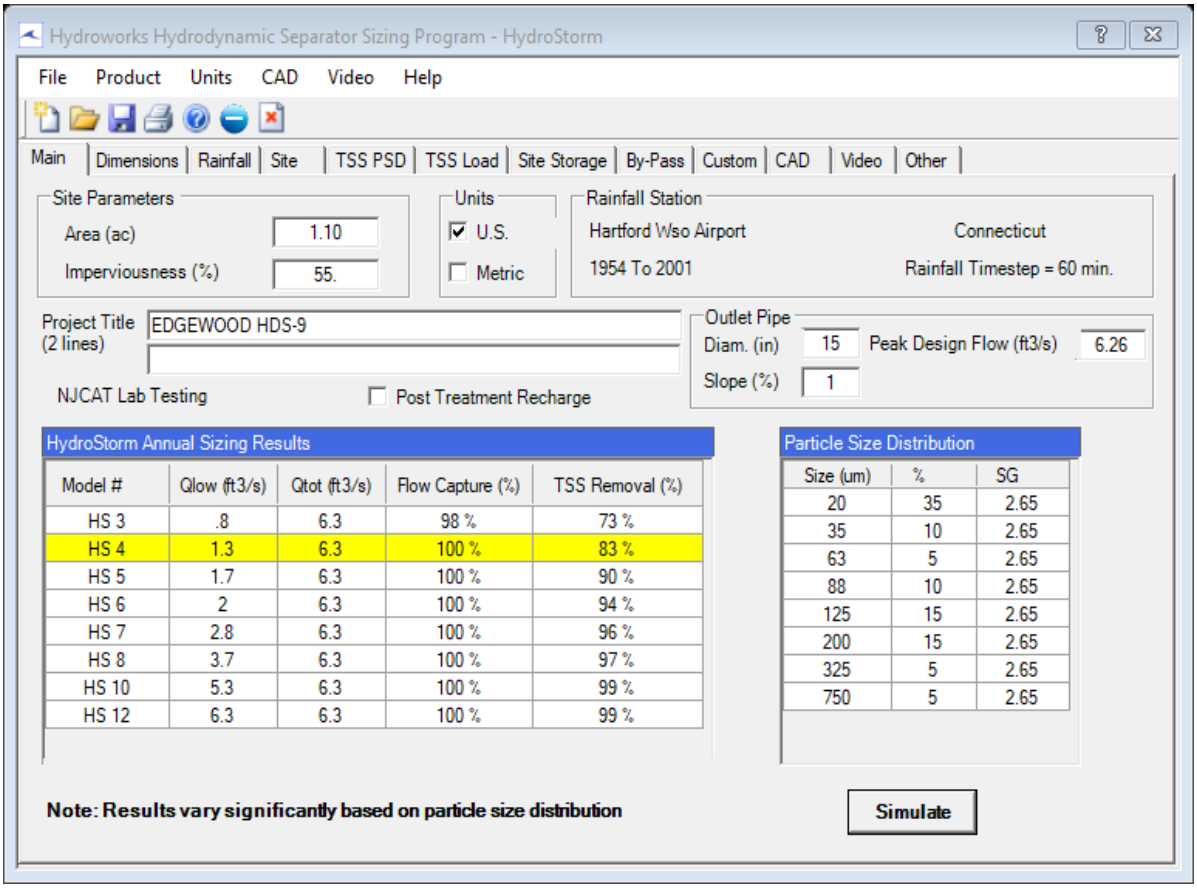
The HydroStorm has a headloss coefficient (K) of 1.04. The given peak flow of 6.26 (ft3/s) Is less than the full pipe flow of 6.46 (ft3/s) indicating free flow in the pipe during the peak flow assuming no tailwater condition. Partial pipe flow was assumed For the headloss calculations. The critical depth Is greater than the normal depth For the peak flow And 15 (in) pipe diameter And 1 % slope given. Critical depth was assumed For the headloss calculations. The headloss was calculated to be 7 (in) based on a flow depth of 12 (in) .

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

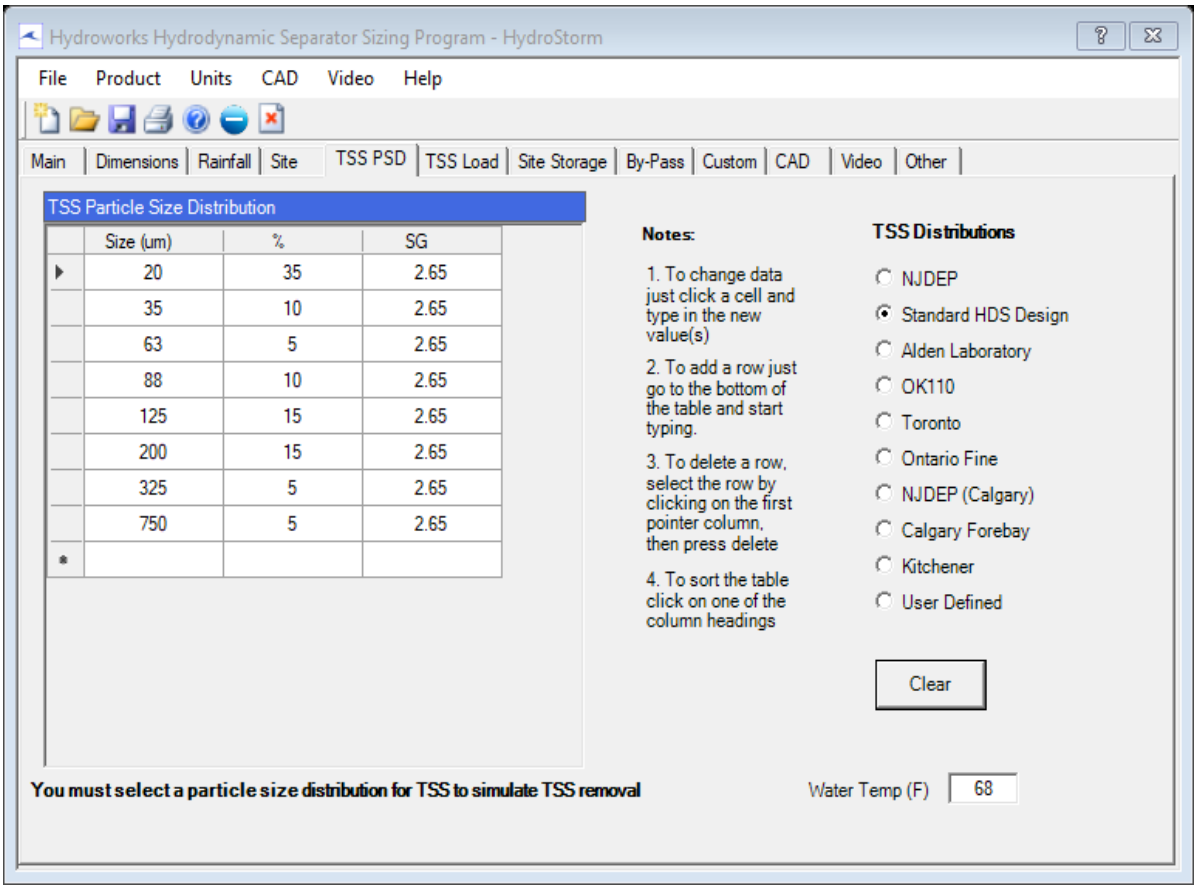
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

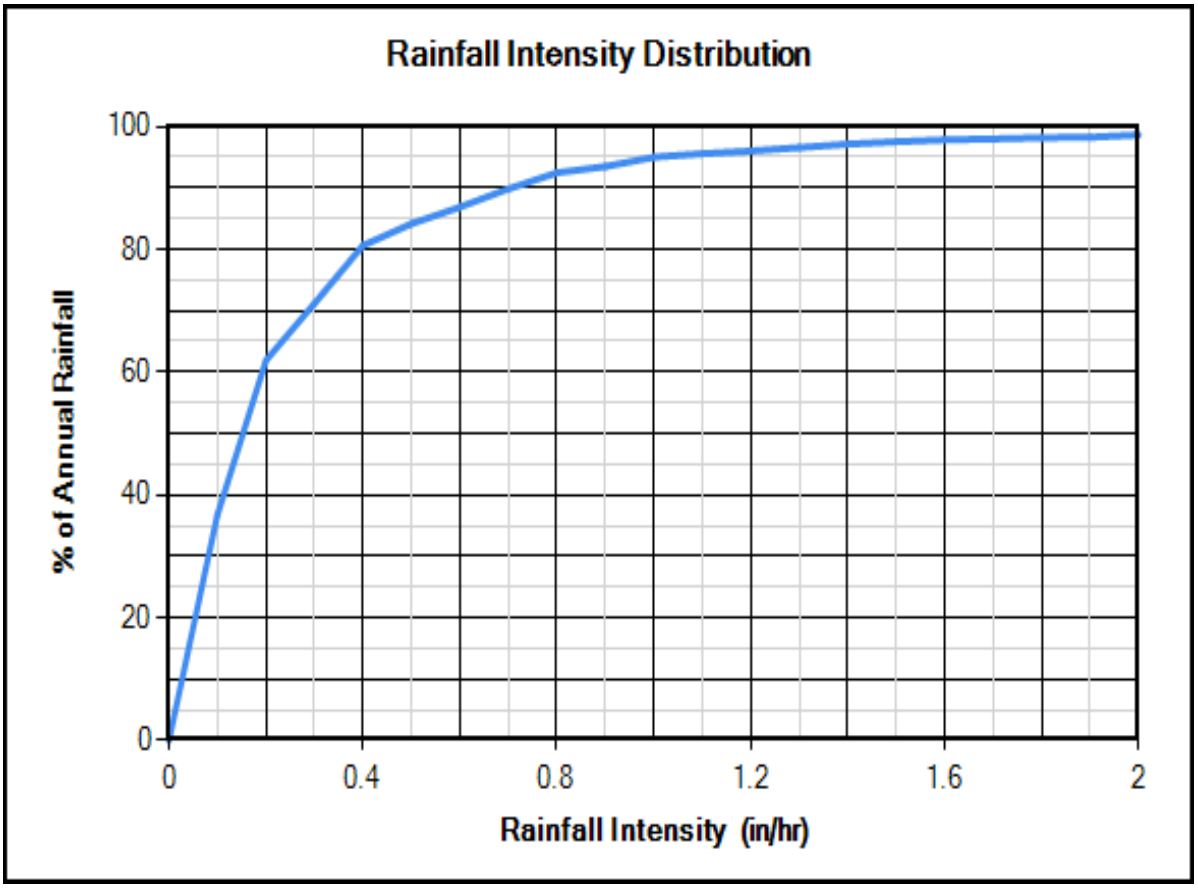
TSS Removal Sizing Summary



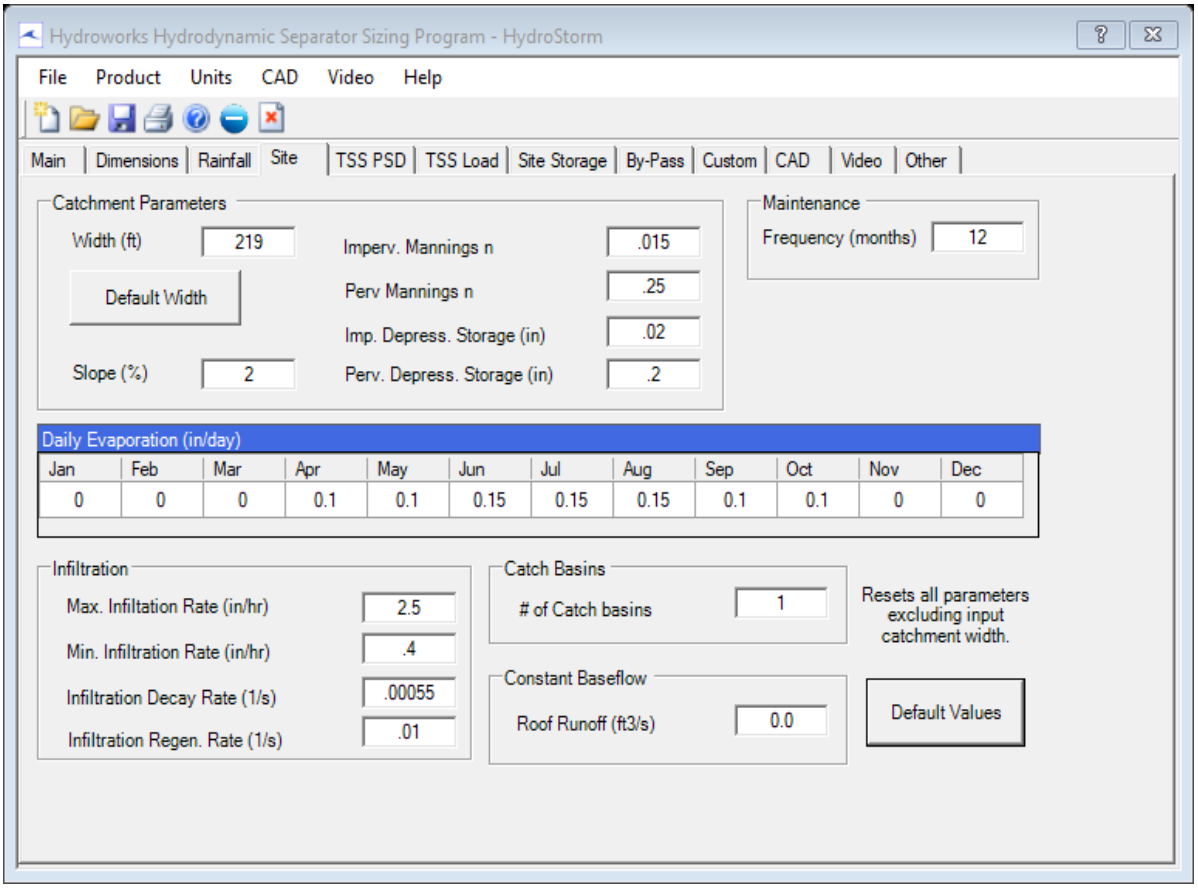
TSS Particle Size Distribution



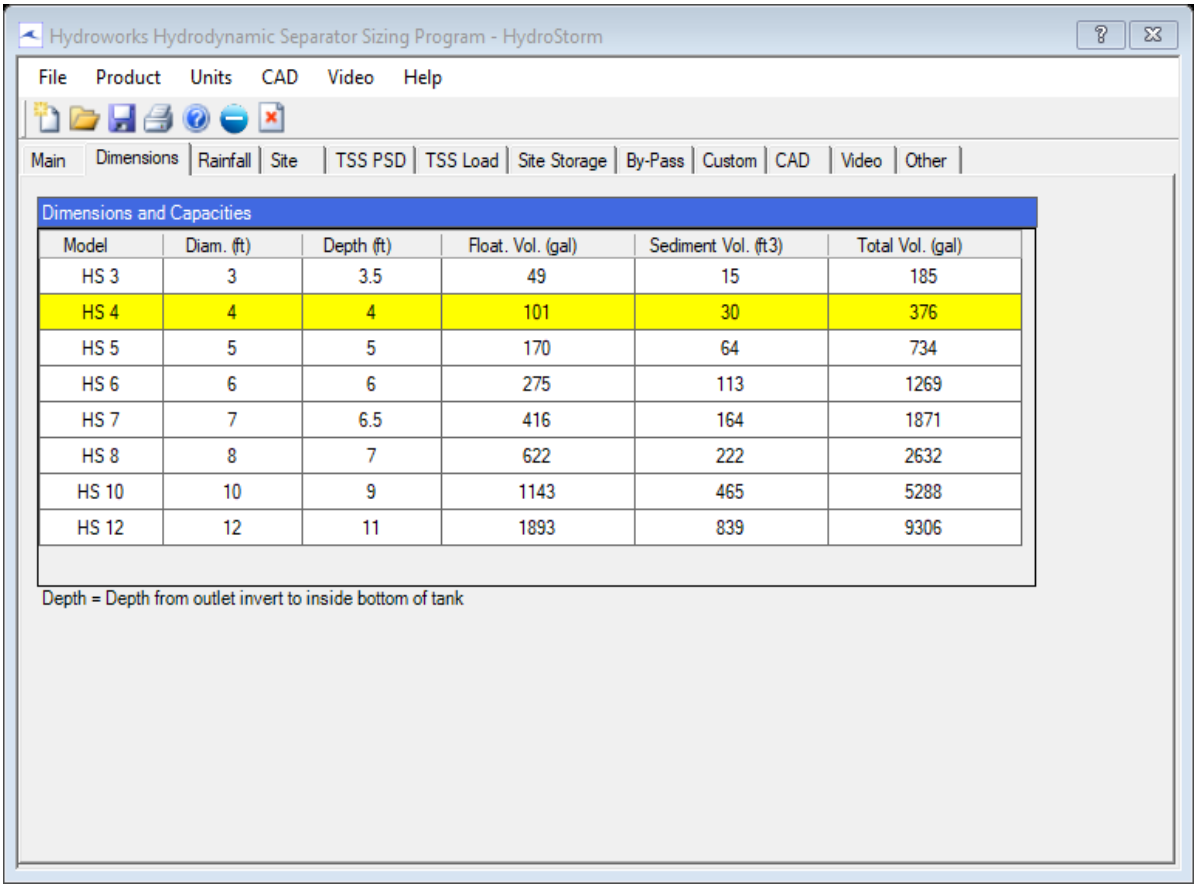
Rainfall Station - Hartford Wso Airport, Connecticut(1954 To 2001)



Site Physical Characteristics



Dimensions And Capacities



Dimensions and Capacities

Model	Diam. (ft)	Depth (ft)	Float. Vol. (gal)	Sediment Vol. (ft3)	Total Vol. (gal)
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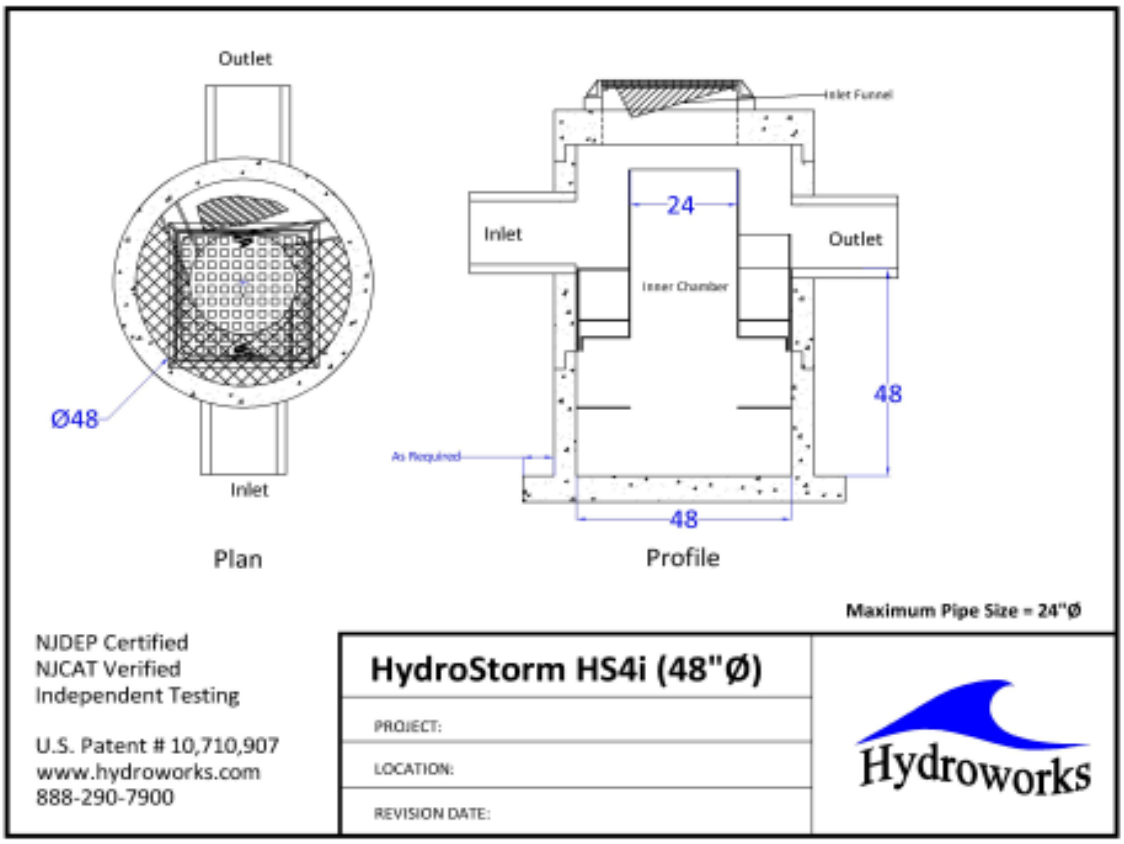
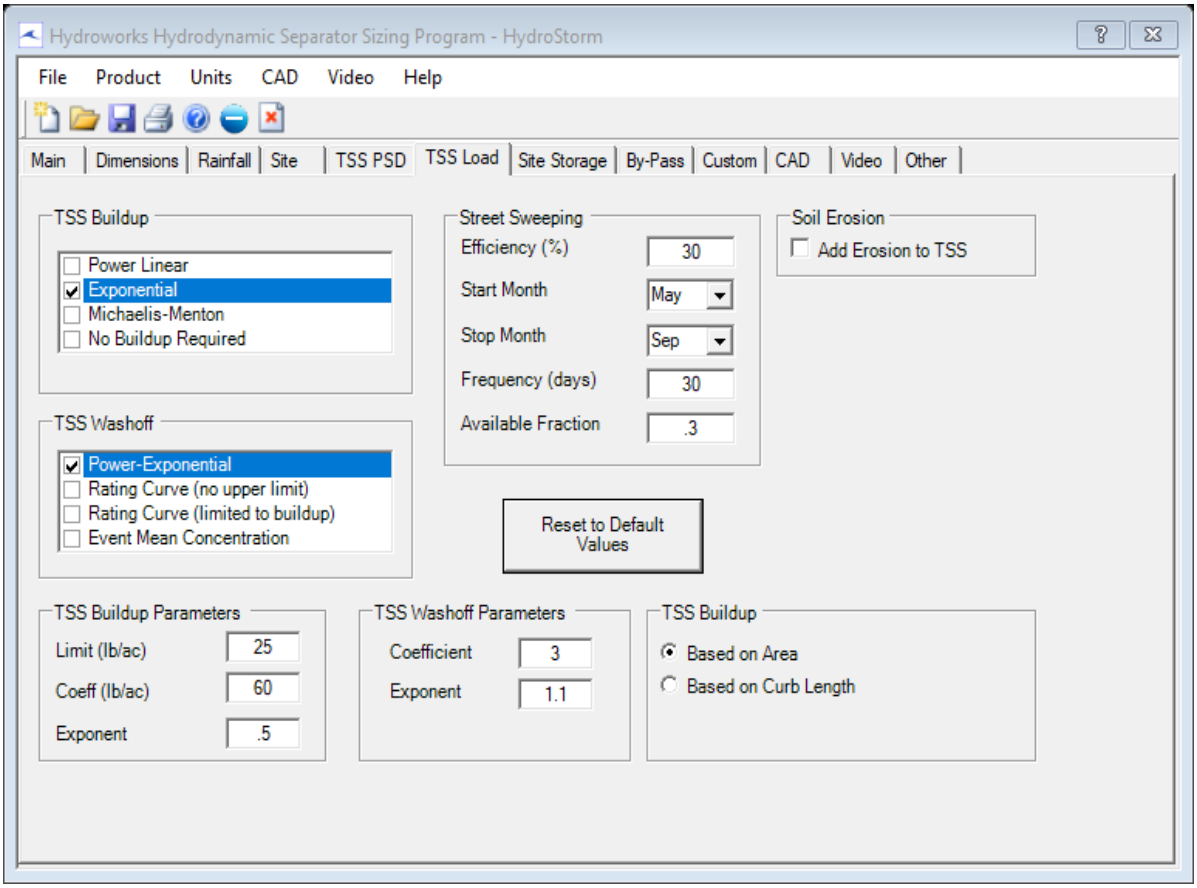
HS 8	8	7	622	222	2632
HS 10	10	9	1143	465	5288
HS 12	12	11	1893	839	9306

Depth = Depth from outlet invert to inside bottom of tank

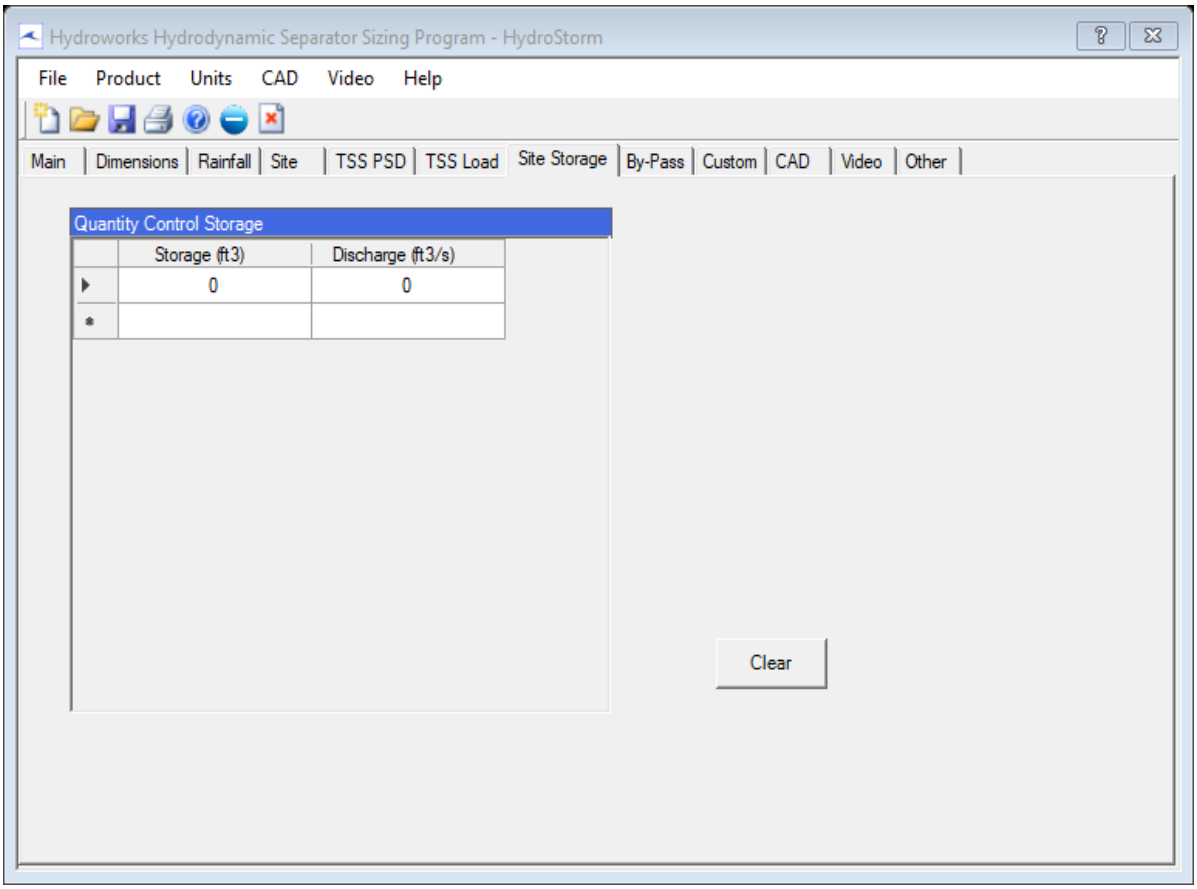
Generic HS 4i CAD Drawing



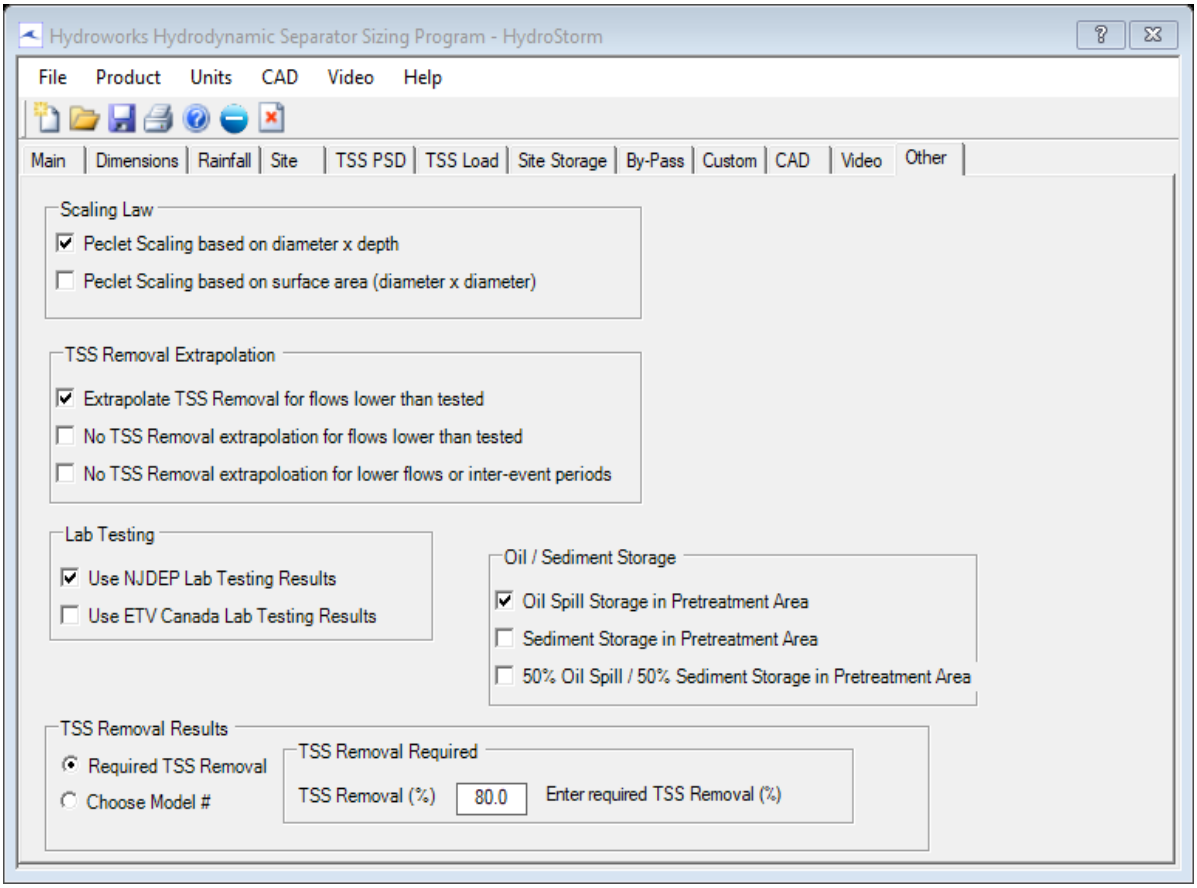
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Flagged Issues

None

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APPENDIX E

NOAA Rainfall Data

NOAA Atlas 14, Volume 10, Version 3
Location name: Bristol, Connecticut, USA*
Latitude: 41.6921°, Longitude: -72.9205°
Elevation: 266 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.356** (0.272-0.464)	**0.425** (0.325-0.555)	**0.538** (0.409-0.704)	**0.632** (0.479-0.832)	**0.762** (0.560-1.05)	**0.861** (0.620-1.21)	**0.962** (0.674-1.40)	**1.07** (0.718-1.60)	**1.22** (0.791-1.89)	**1.34** (0.851-2.12)
10-min	**0.504** (0.385-0.657)	**0.602** (0.460-0.786)	**0.763** (0.581-0.999)	**0.896** (0.679-1.18)	**1.08** (0.793-1.48)	**1.22** (0.879-1.71)	**1.36** (0.955-1.98)	**1.52** (1.02-2.26)	**1.73** (1.12-2.68)	**1.90** (1.20-3.00)
15-min	**0.593** (0.453-0.773)	**0.709** (0.541-0.925)	**0.898** (0.683-1.18)	**1.06** (0.798-1.39)	**1.27** (0.933-1.74)	**1.44** (1.04-2.01)	**1.60** (1.12-2.33)	**1.79** (1.20-2.67)	**2.04** (1.32-3.15)	**2.24** (1.42-3.54)
30-min	**0.806** (0.616-1.05)	**0.962** (0.735-1.26)	**1.22** (0.926-1.59)	**1.43** (1.08-1.88)	**1.72** (1.27-2.37)	**1.94** (1.40-2.73)	**2.17** (1.52-3.16)	**2.42** (1.62-3.61)	**2.77** (1.79-4.28)	**3.04** (1.92-4.80)
60-min	**1.02** (0.778-1.33)	**1.22** (0.928-1.59)	**1.54** (1.17-2.02)	**1.81** (1.37-2.38)	**2.18** (1.60-2.99)	**2.46** (1.77-3.44)	**2.74** (1.92-3.99)	**3.06** (2.05-4.56)	**3.50** (2.26-5.40)	**3.84** (2.43-6.06)
2-hr	**1.33** (1.02-1.72)	**1.58** (1.21-2.04)	**1.98** (1.51-2.58)	**2.31** (1.76-3.03)	**2.77** (2.05-3.79)	**3.12** (2.26-4.36)	**3.48** (2.46-5.05)	**3.88** (2.61-5.77)	**4.46** (2.89-6.86)	**4.92** (3.12-7.74)
3-hr	**1.54** (1.18-1.99)	**1.83** (1.40-2.36)	**2.29** (1.76-2.98)	**2.68** (2.05-3.50)	**3.22** (2.38-4.39)	**3.62** (2.63-5.05)	**4.04** (2.87-5.86)	**4.52** (3.04-6.70)	**5.22** (3.39-8.02)	**5.79** (3.68-9.08)
6-hr	**1.94** (1.50-2.50)	**2.33** (1.80-2.99)	**2.96** (2.28-3.82)	**3.48** (2.67-4.52)	**4.20** (3.13-5.72)	**4.74** (3.47-6.61)	**5.31** (3.80-7.72)	**5.99** (4.05-8.86)	**7.01** (4.57-10.7)	**7.87** (5.02-12.3)
12-hr	**2.38** (1.85-3.04)	**2.92** (2.26-3.72)	**3.78** (2.93-4.85)	**4.50** (3.47-5.81)	**5.49** (4.12-7.47)	**6.22** (4.59-8.68)	**7.02** (5.07-10.2)	**8.00** (5.42-11.8)	**9.51** (6.22-14.5)	**10.8** (6.92-16.8)
24-hr	**2.78** (2.17-3.53)	**3.48** (2.71-4.42)	**4.62** (3.59-5.89)	**5.56** (4.30-7.14)	**6.87** (5.19-9.32)	**7.82** (5.82-10.9)	**8.87** (6.48-13.0)	**10.2** (6.95-15.0)	**12.4** (8.12-18.9)	**14.3** (9.18-22.2)
2-day	**3.11** (2.44-3.92)	**3.97** (3.11-5.01)	**5.37** (4.20-6.80)	**6.54** (5.08-8.33)	**8.14** (6.19-11.0)	**9.30** (6.98-13.0)	**10.6** (7.85-15.6)	**12.4** (8.42-18.1)	**15.3** (10.0-23.2)	**17.9** (11.5-27.7)
3-day	**3.38** (2.66-4.24)	**4.32** (3.40-5.44)	**5.87** (4.60-7.41)	**7.15** (5.57-9.09)	**8.92** (6.81-12.1)	**10.2** (7.68-14.2)	**11.6** (8.65-17.1)	**13.6** (9.28-19.9)	**16.9** (11.1-25.6)	**19.9** (12.8-30.6)
4-day	**3.63** (2.86-4.54)	**4.64** (3.65-5.82)	**6.28** (4.93-7.92)	**7.65** (5.98-9.70)	**9.54** (7.30-12.9)	**10.9** (8.22-15.2)	**12.4** (9.26-18.3)	**14.5** (9.93-21.2)	**18.0** (11.9-27.3)	**21.2** (13.7-32.7)
7-day	**4.33** (3.42-5.40)	**5.46** (4.32-6.82)	**7.31** (5.76-9.16)	**8.84** (6.93-11.2)	**10.9** (8.40-14.7)	**12.5** (9.43-17.2)	**14.2** (10.6-20.7)	**16.5** (11.3-24.0)	**20.3** (13.4-30.6)	**23.7** (15.3-36.4)
10-day	**5.04** (4.00-6.26)	**6.23** (4.94-7.75)	**8.17** (6.46-10.2)	**9.78** (7.69-12.3)	**12.0** (9.21-16.0)	**13.6** (10.3-18.7)	**15.4** (11.5-22.3)	**17.8** (12.2-25.8)	**21.7** (14.3-32.5)	**25.1** (16.3-38.4)
20-day	**7.28** (5.81-9.00)	**8.52** (6.79-10.5)	**10.5** (8.37-13.1)	**12.2** (9.65-15.3)	**14.5** (11.2-19.2)	**16.2** (12.3-22.0)	**18.1** (13.3-25.7)	**20.4** (14.1-29.3)	**24.0** (16.0-35.9)	**27.2** (17.7-41.5)
30-day	**9.15** (7.32-11.3)	**10.4** (8.31-12.8)	**12.5** (9.92-15.4)	**14.2** (11.2-17.6)	**16.5** (12.7-21.6)	**18.2** (13.7-24.4)	**20.1** (14.7-28.1)	**22.3** (15.4-31.9)	**25.5** (17.0-38.0)	**28.3** (18.4-43.1)
45-day	**11.5** (9.19-14.1)	**12.7** (10.2-15.6)	**14.8** (11.8-18.3)	**16.6** (13.2-20.6)	**19.0** (14.6-24.6)	**20.8** (15.6-27.6)	**22.7** (16.5-31.2)	**24.7** (17.2-35.2)	**27.5** (18.4-40.7)	**29.7** (19.4-45.1)
60-day	**13.3** (10.7-16.3)	**14.7** (11.8-18.0)	**16.8** (13.5-20.7)	**18.6** (14.8-23.1)	**21.1** (16.2-27.2)	**23.0** (17.3-30.3)	**24.9** (18.1-34.0)	**26.8** (18.7-38.1)	**29.2** (19.6-43.1)	**30.9** (20.2-46.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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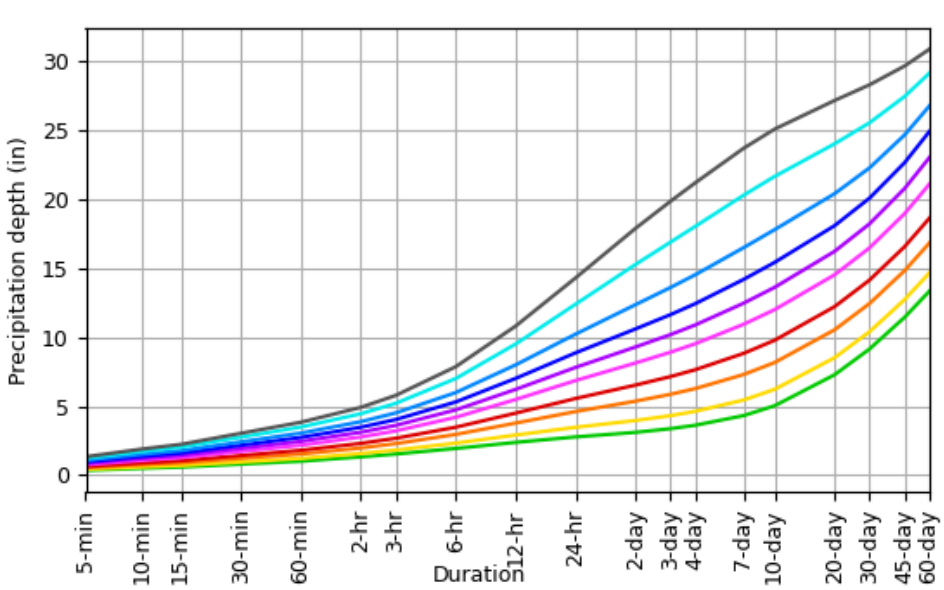
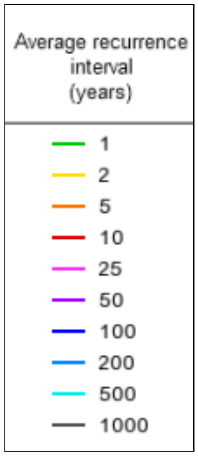
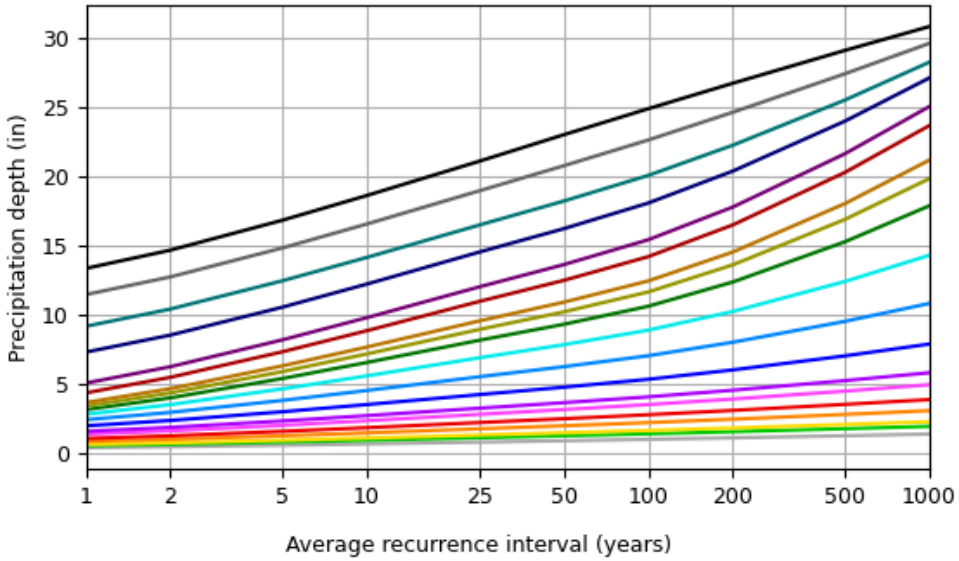
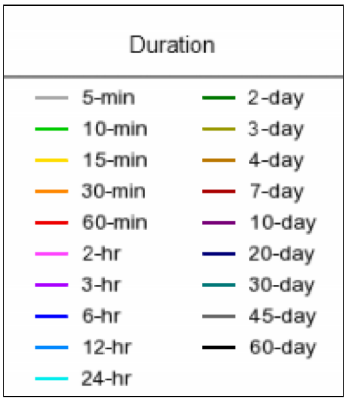
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.6921°, Longitude: -72.9205°









NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Mon Mar 16 13:45:21 2026

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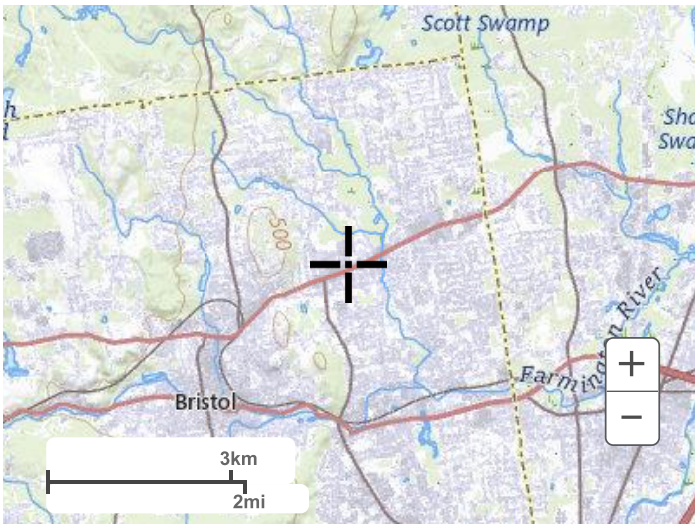
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 10, Version 3
Location name: Bristol, Connecticut, USA*
Latitude: 41.6921°, Longitude: -72.9205°
Elevation: 266 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.27** (3.26-5.57)	**5.10** (3.90-6.66)	**6.46** (4.91-8.45)	**7.58** (5.75-9.98)	**9.14** (6.72-12.6)	**10.3** (7.44-14.5)	**11.5** (8.09-16.8)	**12.9** (8.62-19.2)	**14.7** (9.49-22.7)	**16.1** (10.2-25.5)
10-min	**3.02** (2.31-3.94)	**3.61** (2.76-4.72)	**4.58** (3.49-5.99)	**5.38** (4.07-7.08)	**6.48** (4.76-8.90)	**7.31** (5.27-10.2)	**8.18** (5.73-11.9)	**9.11** (6.11-13.6)	**10.4** (6.73-16.1)	**11.4** (7.23-18.0)
15-min	**2.37** (1.81-3.09)	**2.84** (2.16-3.70)	**3.59** (2.73-4.70)	**4.22** (3.19-5.56)	**5.08** (3.73-6.98)	**5.74** (4.14-8.04)	**6.42** (4.50-9.31)	**7.14** (4.79-10.7)	**8.16** (5.28-12.6)	**8.96** (5.67-14.1)
30-min	**1.61** (1.23-2.10)	**1.92** (1.47-2.51)	**2.44** (1.85-3.19)	**2.86** (2.17-3.77)	**3.45** (2.53-4.73)	**3.89** (2.80-5.45)	**4.35** (3.05-6.31)	**4.84** (3.25-7.23)	**5.53** (3.58-8.55)	**6.08** (3.85-9.60)
60-min	**1.02** (0.778-1.33)	**1.22** (0.928-1.59)	**1.54** (1.17-2.02)	**1.81** (1.37-2.38)	**2.18** (1.60-2.99)	**2.46** (1.77-3.44)	**2.74** (1.92-3.99)	**3.06** (2.05-4.56)	**3.50** (2.26-5.40)	**3.84** (2.43-6.06)
2-hr	**0.665** (0.510-0.861)	**0.788** (0.604-1.02)	**0.989** (0.756-1.29)	**1.16** (0.879-1.51)	**1.39** (1.02-1.90)	**1.56** (1.13-2.18)	**1.74** (1.23-2.52)	**1.94** (1.30-2.89)	**2.23** (1.44-3.43)	**2.46** (1.56-3.87)
3-hr	**0.512** (0.394-0.662)	**0.608** (0.467-0.785)	**0.763** (0.585-0.991)	**0.893** (0.681-1.16)	**1.07** (0.793-1.46)	**1.20** (0.876-1.68)	**1.34** (0.954-1.95)	**1.50** (1.01-2.23)	**1.74** (1.13-2.67)	**1.93** (1.23-3.02)
6-hr	**0.324** (0.251-0.416)	**0.388** (0.300-0.499)	**0.494** (0.380-0.637)	**0.581** (0.445-0.754)	**0.701** (0.523-0.955)	**0.791** (0.579-1.10)	**0.887** (0.635-1.29)	**1.00** (0.676-1.48)	**1.17** (0.763-1.79)	**1.31** (0.838-2.05)
12-hr	**0.197** (0.153-0.252)	**0.241** (0.187-0.309)	**0.313** (0.243-0.402)	**0.373** (0.287-0.482)	**0.456** (0.342-0.619)	**0.516** (0.381-0.720)	**0.582** (0.421-0.849)	**0.664** (0.449-0.977)	**0.789** (0.515-1.20)	**0.897** (0.574-1.40)
24-hr	**0.115** (0.090-0.146)	**0.144** (0.113-0.184)	**0.192** (0.149-0.245)	**0.231** (0.179-0.297)	**0.286** (0.216-0.388)	**0.325** (0.242-0.454)	**0.369** (0.270-0.541)	**0.426** (0.289-0.625)	**0.516** (0.338-0.786)	**0.596** (0.382-0.925)
2-day	**0.064** (0.050-0.081)	**0.082** (0.064-0.104)	**0.111** (0.087-0.141)	**0.136** (0.105-0.173)	**0.169** (0.128-0.229)	**0.193** (0.145-0.270)	**0.220** (0.163-0.325)	**0.257** (0.175-0.376)	**0.318** (0.209-0.482)	**0.372** (0.239-0.576)
3-day	**0.046** (0.036-0.058)	**0.060** (0.047-0.075)	**0.081** (0.063-0.102)	**0.099** (0.077-0.126)	**0.123** (0.094-0.167)	**0.141** (0.106-0.197)	**0.161** (0.120-0.238)	**0.189** (0.128-0.275)	**0.234** (0.154-0.355)	**0.275** (0.177-0.425)
4-day	**0.037** (0.029-0.047)	**0.048** (0.038-0.060)	**0.065** (0.051-0.082)	**0.079** (0.062-0.101)	**0.099** (0.075-0.134)	**0.113** (0.085-0.157)	**0.129** (0.096-0.190)	**0.151** (0.103-0.220)	**0.187** (0.123-0.284)	**0.220** (0.142-0.340)
7-day	**0.025** (0.020-0.032)	**0.032** (0.025-0.040)	**0.043** (0.034-0.054)	**0.052** (0.041-0.066)	**0.065** (0.049-0.087)	**0.074** (0.056-0.102)	**0.084** (0.062-0.123)	**0.098** (0.067-0.142)	**0.120** (0.079-0.181)	**0.141** (0.091-0.216)
10-day	**0.020** (0.016-0.026)	**0.025** (0.020-0.032)	**0.034** (0.026-0.042)	**0.040** (0.032-0.051)	**0.050** (0.038-0.066)	**0.056** (0.042-0.077)	**0.064** (0.047-0.092)	**0.074** (0.050-0.107)	**0.090** (0.059-0.135)	**0.104** (0.067-0.160)
20-day	**0.015** (0.012-0.018)	**0.017** (0.014-0.021)	**0.021** (0.017-0.027)	**0.025** (0.020-0.031)	**0.030** (0.023-0.039)	**0.033** (0.025-0.045)	**0.037** (0.027-0.053)	**0.042** (0.029-0.061)	**0.050** (0.033-0.074)	**0.056** (0.036-0.086)
30-day	**0.012** (0.010-0.015)	**0.014** (0.011-0.017)	**0.017** (0.013-0.021)	**0.019** (0.015-0.024)	**0.022** (0.017-0.029)	**0.025** (0.019-0.033)	**0.027** (0.020-0.039)	**0.030** (0.021-0.044)	**0.035** (0.023-0.052)	**0.039** (0.025-0.059)
45-day	**0.010** (0.008-0.013)	**0.011** (0.009-0.014)	**0.013** (0.010-0.016)	**0.015** (0.012-0.019)	**0.017** (0.013-0.022)	**0.019** (0.014-0.025)	**0.020** (0.015-0.028)	**0.022** (0.015-0.032)	**0.025** (0.017-0.037)	**0.027** (0.017-0.041)
60-day	**0.009** (0.007-0.011)	**0.010** (0.008-0.012)	**0.011** (0.009-0.014)	**0.012** (0.010-0.016)	**0.014** (0.011-0.018)	**0.015** (0.012-0.021)	**0.017** (0.012-0.023)	**0.018** (0.012-0.026)	**0.020** (0.013-0.029)	**0.021** (0.014-0.032)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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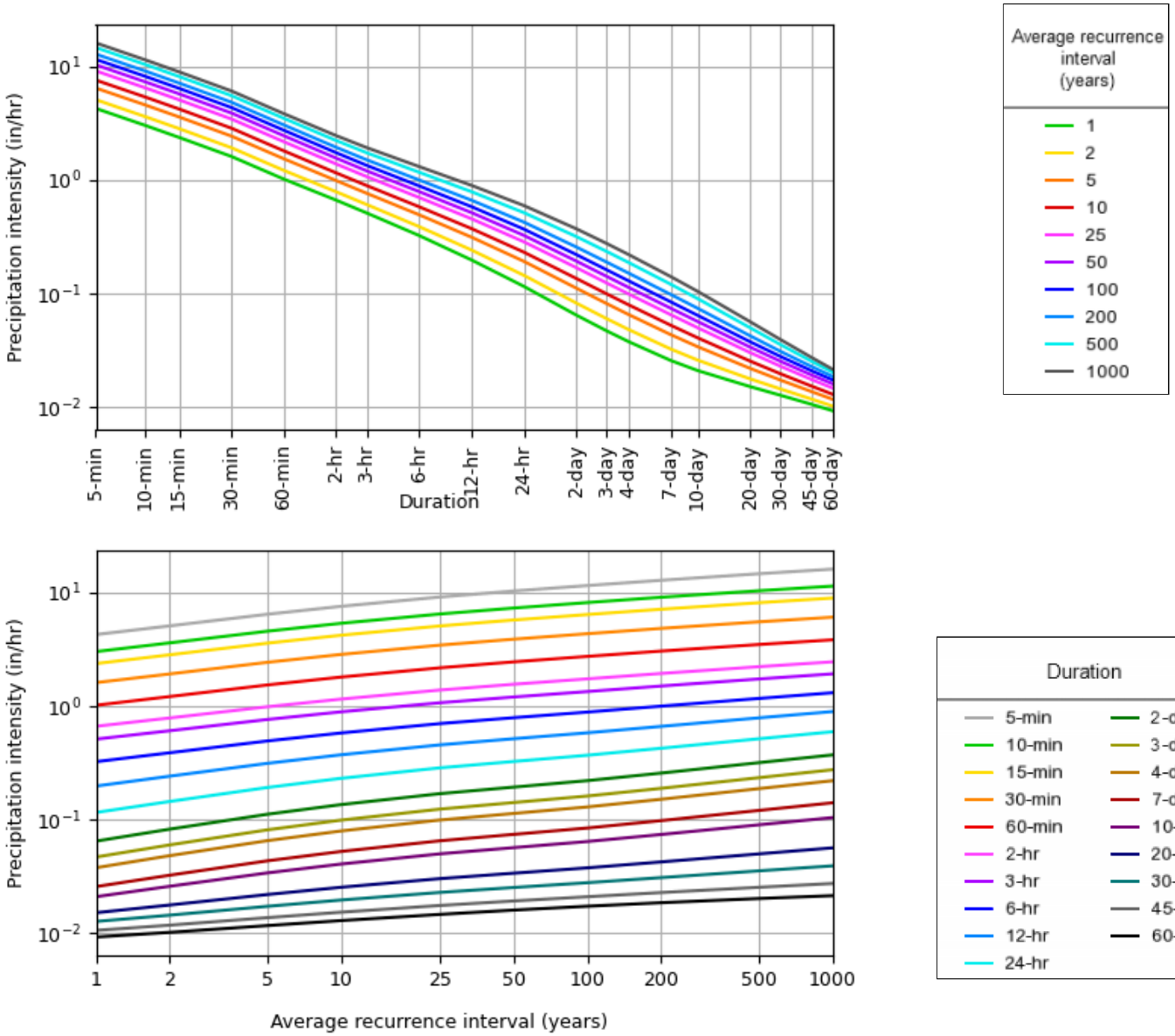
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 41.6921°, Longitude: -72.9205°



NOAA Atlas 14, Volume 10, Version 3

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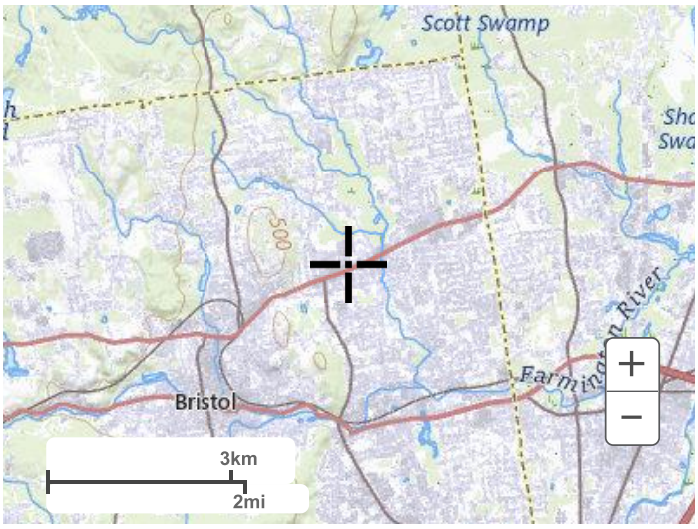
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
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Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX F

NRCS Soil Survey

benesch

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut, Western Part

March 13, 2026

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

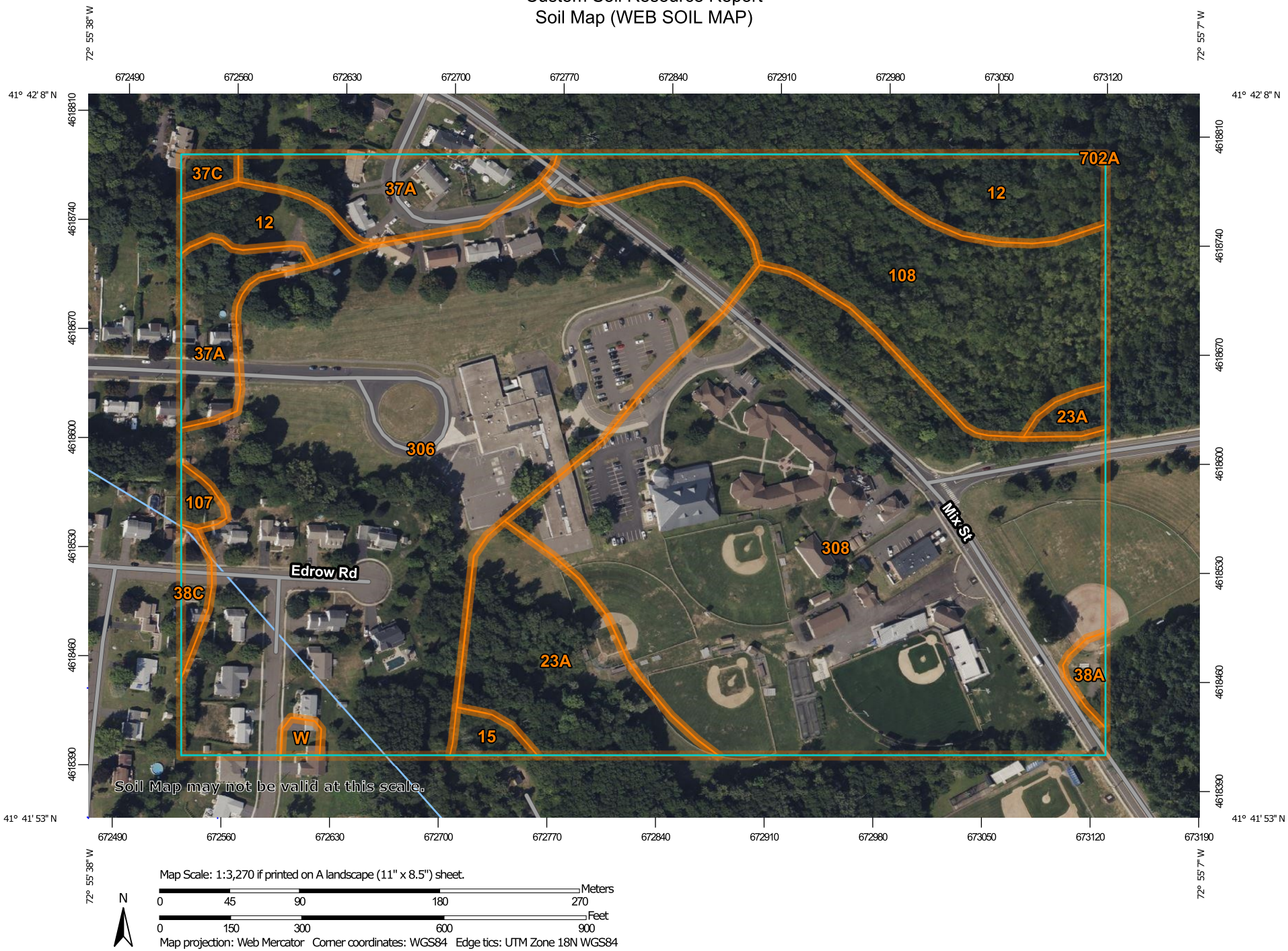
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map (WEB SOIL MAP)



Map Scale: 1:3,270 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut, Western Part
Survey Area Data: Version 6, Sep 16, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (WEB SOIL MAP)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam, 0 to 3 percent slopes	2.7	4.8%
15	Scarboro muck, 0 to 3 percent slopes	0.3	0.5%
23A	Sudbury sandy loam, 0 to 5 percent slopes	3.6	6.3%
37A	Manchester gravelly sandy loam, 0 to 3 percent slopes	3.2	5.6%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	0.2	0.4%
38A	Hinckley loamy sand, 0 to 3 percent slopes	0.3	0.5%
38C	Hinckley loamy sand, 3 to 15 percent slopes	0.3	0.6%
107	Limerick and Lim soils, 0 to 3 percent slopes, frequently flooded	0.2	0.3%
108	Saco silt loam, frequently ponded, 0 to 2 percent slopes, frequently flooded	6.6	11.6%
306	Udorthents-Urban land complex	19.5	34.3%
308	Udorthents, smoothed	19.9	34.9%
702A	Tisbury silt loam, 0 to 3 percent slopes	0.0	0.0%
W	Water	0.1	0.2%
Totals for Area of Interest		**57.0**	**100.0%**

Map Unit Descriptions (WEB SOIL MAP)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Connecticut, Western Part

12—Raypol silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9ljx
Landscape: Valleys
Elevation: 0 to 1,350 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Raypol and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Raypol

Setting

Landscape: Valleys
Landform: Drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bg1 - 8 to 12 inches: very fine sandy loam
Bg2 - 12 to 20 inches: silt loam
Bw1 - 20 to 26 inches: silt loam
Bw2 - 26 to 29 inches: very fine sandy loam
2C1 - 29 to 52 inches: stratified very gravelly coarse sand to loamy fine sand
2C2 - 52 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 28 to 32 inches to abrupt textural change
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 1.42 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F144AY028MA - Wet Outwash

Hydric soil rating: Yes

Minor Components

Enfield

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: F145XY009CT - Well Drained Outwash
Hydric soil rating: No

Scarboro

Percent of map unit: 5 percent
Landscape: Outwash plains
Landform: Depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Tisbury

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY026CT - Moist Silty Outwash
Hydric soil rating: No

Raynham

Percent of map unit: 5 percent
Landscape: Lake plains
Landform: Depressions
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F145XY004CT - Wet Lake Plain
Hydric soil rating: Yes

15—Scarboro muck, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkt
Landscape: Valleys, outwash plains
Elevation: 0 to 1,350 feet
Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landscape: Valleys, outwash plains
Landform: Drainageways, Depressions, Outwash deltas, Outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Linear, concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or gneiss and/or granite

Typical profile

Oa - 0 to 8 inches: muck
A - 8 to 14 inches: mucky fine sandy loam
Cg1 - 14 to 22 inches: sand
Cg2 - 22 to 65 inches: gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Minor Components

Timakwa

Percent of map unit: 10 percent
Landscape: Outwash plains
Landform: Swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear

Hydric soil rating: Yes

Walpole

Percent of map unit: 8 percent
Landscape: Outwash plains
Landform: Deltas, Depressions, Outwash plains, Depressions, Outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Deerfield

Percent of map unit: 2 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

23A—Sudbury sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 9lkv
Landscape: Valleys
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sudbury and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: sandy loam
Bw1 - 5 to 17 inches: gravelly sandy loam

Bw2 - 17 to 25 inches: sandy loam
2C - 25 to 60 inches: stratified gravel to sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 17 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Terraces, Outwash plains, Kames
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ninigret

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Tisbury

Percent of map unit: 3 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Walpole

Percent of map unit: 2 percent

Landscape: Outwash plains
Landform: Drainageways on terraces, Depressions on terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

37A—Manchester gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9ln5
Landscape: Valleys
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Manchester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manchester

Setting

Landscape: Valleys
Landform: Terraces, Outwash plains, Kames, Eskers
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Typical profile

Ap - 0 to 9 inches: gravelly sandy loam
Bw - 9 to 18 inches: gravelly loamy sand
C - 18 to 65 inches: stratified extremely gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Penwood

Percent of map unit: 5 percent
Landform: Terraces, Outwash plains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Hartford

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Branford

Percent of map unit: 3 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ellington

Percent of map unit: 3 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, nongravelly surface

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed, gravelly loamy sand surface

Percent of map unit: 2 percent
Hydric soil rating: No

37C—Manchester gravelly sandy loam, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9ln6
Landscape: Valleys
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Manchester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manchester

Setting

Landscape: Valleys
Landform: Terraces, Outwash plains, Kames, Eskers
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Typical profile

Ap - 0 to 9 inches: gravelly sandy loam
Bw - 9 to 18 inches: gravelly loamy sand
C - 18 to 65 inches: stratified extremely gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Penwood
Percent of map unit: 5 percent
Landform: Terraces, Outwash plains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Hartford
Percent of map unit: 5 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Branford
Percent of map unit: 3 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ellington
Percent of map unit: 3 percent
Landscape: Valleys
Landform: Terraces, Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, nongravelly surface
Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed, gravelly loamy sand surface
Percent of map unit: 2 percent
Hydric soil rating: No

38A—Hinckley loamy sand, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 2svm7
Landscape: Valleys
Elevation: 0 to 1,420 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landscape: Valleys
Landform: Outwash terraces, Outwash plains, Kame terraces, Outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Outwash deltas, Kame terraces, Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landscape: Valleys
Landform: Outwash deltas, Outwash terraces, Kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 4 percent
Landscape: Valleys
Landform: Outwash deltas, Outwash terraces, Kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Walpole

Percent of map unit: 1 percent
Landscape: Outwash plains
Landform: Deltas, Depressions, Outwash terraces, Depressions, Outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

38C—Hinckley loamy sand, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svmb
Landscape: Uplands, valleys
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landscape: Uplands, valleys
Landform: Outwash deltas, Outwash terraces, Moraines, Eskers, Kames, Outwash plains, Kame terraces

Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landscape: Uplands, valleys
Landform: Moraines, Eskers, Kames, Outwash deltas, Outwash terraces, Outwash plains, Kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landscape: Valleys, outwash plains
Landform: Kames, Outwash plains, Outwash terraces, Moraines, Eskers

Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landscape: Uplands, valleys
Landform: Eskers, Kames, Outwash plains, Kame terraces, Outwash deltas, Outwash terraces, Moraines
Landform position (two-dimensional): Summit, shoulder, backslope, toeslope, footslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landscape: Valleys, uplands
Landform: Outwash deltas, Moraines, Outwash plains, Kame terraces, Outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

107—Limerick and Lim soils, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 9ljt
Landscape: Valleys
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Limerick and similar soils: 50 percent
Lim and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Limerick

Setting

Landscape: Valleys
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty alluvium

Typical profile

Ap - 0 to 8 inches: silt loam
BCg1 - 8 to 20 inches: silt loam
BCg2 - 20 to 36 inches: silt loam
BCg3 - 36 to 54 inches: silt loam
Cg - 54 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Description of Lim

Setting

Landscape: Alluvial plains
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy alluvium

Typical profile

A - 0 to 6 inches: very fine sandy loam
Bg1 - 6 to 11 inches: very fine sandy loam
Bg2 - 11 to 15 inches: very fine sandy loam
Bg3 - 15 to 22 inches: silt loam
Bg4 - 22 to 29 inches: fine sandy loam
CBg5 - 29 to 42 inches: stratified very gravelly coarse sand to loamy fine sand
Cg6 - 42 to 50 inches: stratified very gravelly coarse sand to loamy fine sand
Cg7 - 50 to 57 inches: stratified very gravelly coarse sand to loamy fine sand

Cg8 - 57 to 65 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Minor Components

Saco

Percent of map unit: 5 percent
Landscape: River valleys
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Bash

Percent of map unit: 5 percent
Landscape: River valleys
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Winooski

Percent of map unit: 5 percent
Landscape: Alluvial plains
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F145XY002MA - Silty Low Floodplain
Hydric soil rating: No

Rippowam

Percent of map unit: 5 percent
Landscape: River valleys
Landform: Flood plains

Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F144AY014CT - Wet Sandy Low Floodplain
Hydric soil rating: Yes

108—Saco silt loam, frequently ponded, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 9ljv
Landscape: River valleys
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Saco and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saco

Setting

Landscape: River valleys
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty alluvium over sandy alluvium

Typical profile

A - 0 to 12 inches: silt loam
Cg1 - 12 to 32 inches: silt loam
Cg2 - 32 to 48 inches: silt loam
2Cg3 - 48 to 60 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Minor Components

Rippowam

Percent of map unit: 5 percent
Landscape: River valleys
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F144AY014CT - Wet Sandy Low Floodplain
Hydric soil rating: Yes

Lim

Percent of map unit: 5 percent
Landscape: Alluvial plains
Landform: Flood plains
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Bash

Percent of map unit: 5 percent
Landscape: River valleys
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY015NY - Wet Silty Low Floodplain
Hydric soil rating: Yes

Winooski

Percent of map unit: 3 percent
Landscape: Alluvial plains
Landform: Flood plains
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F145XY002MA - Silty Low Floodplain
Hydric soil rating: No

306—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 39 percent
Minor components: 11 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Anthropogenic Feature: Fills
Parent material: Human-transported material

Typical profile

^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam
^C2 - 21 to 79 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Setting

Anthropogenic Feature: Urban land

Typical profile

M - 0 to 6 inches: cemented material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Udorthents, wet substratum

Percent of map unit: 9 percent
Anthropogenic features: Fills
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Landscape: Uplands
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

308—Udorthents, smoothed

Map Unit Setting

National map unit symbol: 9lmj
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 87 percent
Minor components: 13 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Anthropogenic Feature: Fills
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Human-transported material

Typical profile

^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam

^C2 - 21 to 79 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Udorthents, wet substratum

Percent of map unit: 7 percent
Anthropogenic features: Fills
Hydric soil rating: No

Urban land

Percent of map unit: 5 percent
Anthropogenic features: Urban land
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Landscape: Uplands
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

702A—Tisbury silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2y07g
Landscape: Outwash plains, valleys
Elevation: 0 to 1,260 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Tisbury and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tisbury

Setting

Landscape: Outwash plains, valleys
Landform: Outwash terraces, Deltas, Outwash plains, Valley trains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bw1 - 8 to 18 inches: silt loam
Bw2 - 18 to 26 inches: silt loam
2C - 26 to 65 inches: extremely gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 24 to 36 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 16 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B/D
Ecological site: F144AY026CT - Moist Silty Outwash
Hydric soil rating: No

Minor Components

Agawam

Percent of map unit: 5 percent
Landscape: Valleys, outwash plains
Landform: Kame terraces, Outwash plains, Outwash terraces, Moraines, Kames
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landscape: Valleys, outwash plains
Landform: Outwash plains, Outwash terraces, Moraines, Eskers, Kames
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ninigret

Percent of map unit: 3 percent
Landscape: Outwash plains, valleys
Landform: Kame terraces, Outwash plains, Moraines, Kames, Outwash terraces
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landscape: Outwash plains, valleys
Landform: Drainageways, Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

W—Water

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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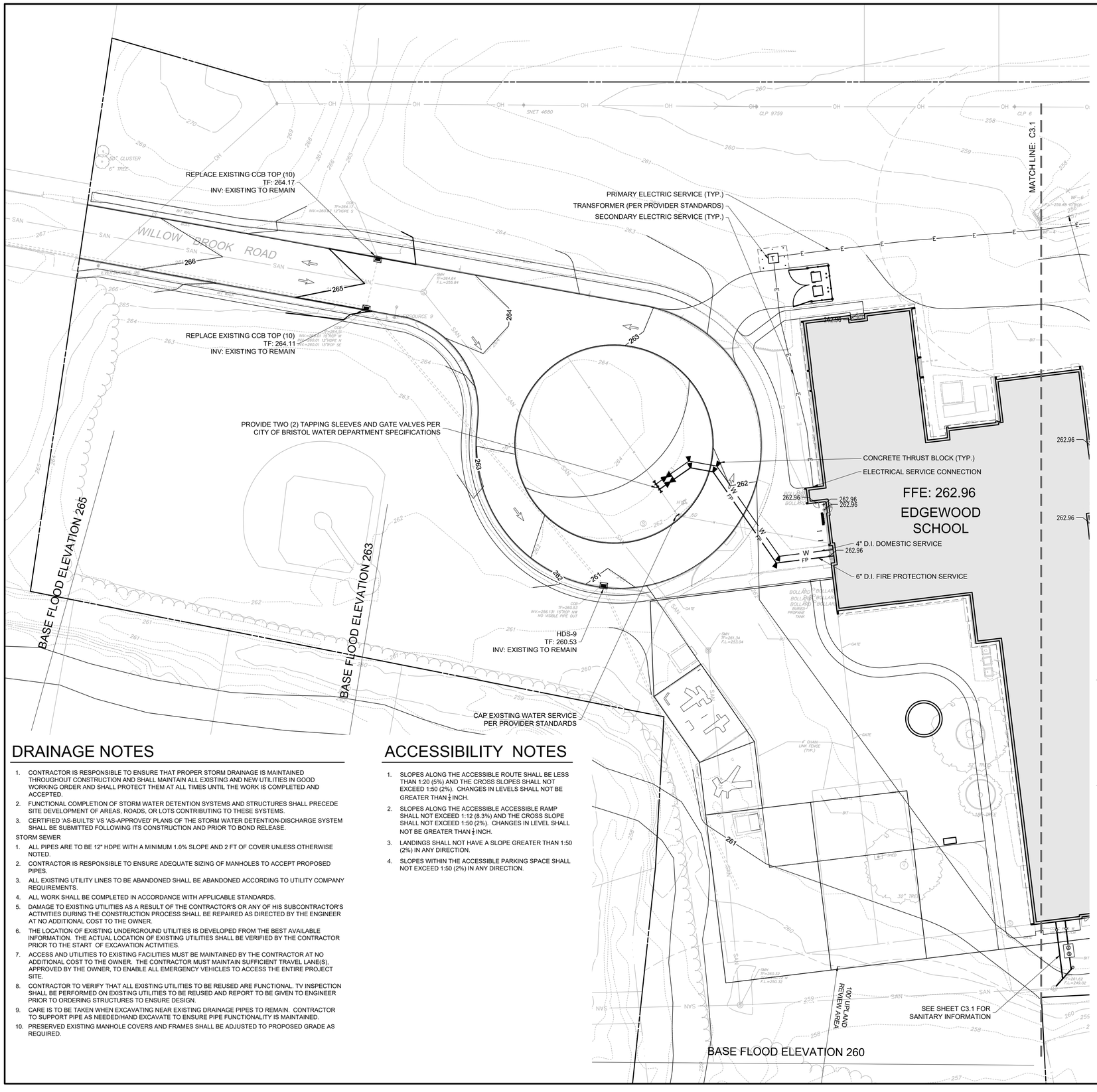
APPENDIX G

Grading & Drainage Plan & Details

benesch



GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED SPOT ELEVATION
- MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- SOIL BORING LOCATION

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- ROOF LEADER
- SANITARY MANHOLE
- SANITARY SEWER
- VENT LINE
- CLEANOUT
- WATER LINE / FIRE LINE
- WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WATER METER
- ELECTRIC / COMM. DUCT BANK
- GAS LINE
- GAS METER

DRAINAGE NOTES

1. CONTRACTOR IS RESPONSIBLE TO ENSURE THAT PROPER STORM DRAINAGE IS MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL MAINTAIN ALL EXISTING AND NEW UTILITIES IN GOOD WORKING ORDER AND SHALL PROTECT THEM AT ALL TIMES UNTIL THE WORK IS COMPLETED AND ACCEPTED.
2. FUNCTIONAL COMPLETION OF STORM WATER DETENTION SYSTEMS AND STRUCTURES SHALL PRECEDE SITE DEVELOPMENT OF AREAS, ROADS, OR LOTS CONTRIBUTING TO THESE SYSTEMS.
3. CERTIFIED 'AS-BUILTS' VS 'AS-APPROVED' PLANS OF THE STORM WATER DETENTION-DISCHARGE SYSTEM SHALL BE SUBMITTED FOLLOWING ITS CONSTRUCTION AND PRIOR TO BOND RELEASE.

STORM SEWER

1. ALL PIPES ARE TO BE 12" HDPE WITH A MINIMUM 1.0% SLOPE AND 2 FT OF COVER UNLESS OTHERWISE NOTED.
2. CONTRACTOR IS RESPONSIBLE TO ENSURE ADEQUATE SIZING OF MANHOLES TO ACCEPT PROPOSED PIPES.
3. ALL EXISTING UTILITY LINES TO BE ABANDONED SHALL BE ABANDONED ACCORDING TO UTILITY COMPANY REQUIREMENTS.
4. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH APPLICABLE STANDARDS.
5. DAMAGE TO EXISTING UTILITIES AS A RESULT OF THE CONTRACTOR'S OR ANY OF HIS SUBCONTRACTOR'S ACTIVITIES DURING THE CONSTRUCTION PROCESS SHALL BE REPAIRED AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
6. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS DEVELOPED FROM THE BEST AVAILABLE INFORMATION. THE ACTUAL LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF EXCAVATION ACTIVITIES.
7. ACCESS AND UTILITIES TO EXISTING FACILITIES MUST BE MAINTAINED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE CONTRACTOR MUST MAINTAIN SUFFICIENT TRAVEL LANE(S), APPROVED BY THE OWNER, TO ENABLE ALL EMERGENCY VEHICLES TO ACCESS THE ENTIRE PROJECT SITE.
8. CONTRACTOR TO VERIFY THAT ALL EXISTING UTILITIES TO BE REUSED ARE FUNCTIONAL. TV INSPECTION SHALL BE PERFORMED ON EXISTING UTILITIES TO BE REUSED AND REPORT TO BE GIVEN TO ENGINEER PRIOR TO ORDERING STRUCTURES TO ENSURE DESIGN.
9. CARE IS TO BE TAKEN WHEN EXCAVATING NEAR EXISTING DRAINAGE PIPES TO REMAIN. CONTRACTOR TO SUPPORT PIPE AS NEEDED/HAND EXCAVATE TO ENSURE PIPE FUNCTIONALITY IS MAINTAINED.
10. PRESERVED EXISTING MANHOLE COVERS AND FRAMES SHALL BE ADJUSTED TO PROPOSED GRADE AS REQUIRED.

ACCESSIBILITY NOTES

1. SLOPES ALONG THE ACCESSIBLE ROUTE SHALL BE LESS THAN 1:20 (5%) AND THE CROSS SLOPES SHALL NOT EXCEED 1:50 (2%). CHANGES IN LEVELS SHALL NOT BE GREATER THAN ¼ INCH.
2. SLOPES ALONG THE ACCESSIBLE ACCESSIBLE RAMP SHALL NOT EXCEED 1:12 (8.3%) AND THE CROSS SLOPE SHALL NOT EXCEED 1:50 (2%). CHANGES IN LEVEL SHALL NOT BE GREATER THAN ¼ INCH.
3. LANDINGS SHALL NOT HAVE A SLOPE GREATER THAN 1:50 (2%) IN ANY DIRECTION.
4. SLOPES WITHIN THE ACCESSIBLE PARKING SPACE SHALL NOT EXCEED 1:50 (2%) IN ANY DIRECTION.

ADDITIONAL NOTES

1. ALL STORM STRUCTURES TO HAVE TOP, FRAMES, AND GRATES/COVER REPLACED IN KIND UNLESS OTHERWISE NOTED.
2. ALL SANITARY STRUCTURES TO HAVE FRAMES AND COVERS REMOVED AND REPLACED IN KIND UNLESS OTHERWISE NOTED.
3. ALL STORM AND SANITARY PIPING TO REMAIN IS TO BE INSPECTED AND REPORT TO BE PROVIDED TO ENGINEER FOR REVIEW.
4. EXISTING WATER SERVICE TO BE REMOVED BACK TO GATE VALVE AT MAIN.
5. EXISTING ELECTRICAL SERVICE TO BE REMOVED BACK TO CONNECTION POINT.
6. GAS SERVICE TO REMAIN AND BE PROTECTED AT ALL TIMES DURING CONSTRUCTION.

AQUIFER PROTECTION AREA NOTES

TEMPORARY CONSTRUCTION MEASURES

1. SIGNIFICANT FUEL, CHEMICAL OR OTHER HAZARDOUS MATERIALS STORAGE AND HANDLING, INCLUDING FUELING OF CONSTRUCTION VEHICLES, SHOULD BE LOCATED OUTSIDE WELL FIELD AREA AND AQUIFER PROTECTION AREA.
2. NO REPAIR OR MAINTENANCE OF CONSTRUCTION VEHICLES OR WASHING OF CONSTRUCTION VEHICLES IS PERMITTED WITHIN THE AQUIFER PROTECTION AREA.
3. ANY NECESSARY TEMPORARY STORAGE SHOULD BE ABOVEGROUND, PROTECTED FROM RAINFALL, AND ON AN IMPERVIOUS CONTAINMENT SURFACE.
4. AN EMERGENCY SPILL AND RESPONSE PLAN SHOULD BE DEVELOPED, INCLUDING COORDINATION WITH THE WATER SUPPLIER.
5. THE SITE ACCESS SHOULD BE ADEQUATELY SECURED AT ALL TIMES TO PROHIBIT ANY UNAUTHORIZED DISPOSAL OF WASTE MATERIALS.

STORMWATER POLLUTION PREVENTION MEASURES:

1. DEICING MANAGEMENT AREAS SHOULD BE ESTABLISHED INCLUDING LOW SALT USE AREAS, ALTERNATIVE CHEMICAL OR SAND METHODS.
2. WELLHEAD PROTECTION SIGNS SHALL BE POSTED IN CLEAR VISIBILITY AT THE ENTRANCE AND EXIT POINTS OF THE AQUIFER PROTECTION AREA.

SEE SHEET C3.1 FOR UTILITY NOTES AND CONTACTS.

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Project #: 0726-500158.00

NOT FOR CONSTRUCTION
ISSUED FOR REVIEW ONLY

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 25064

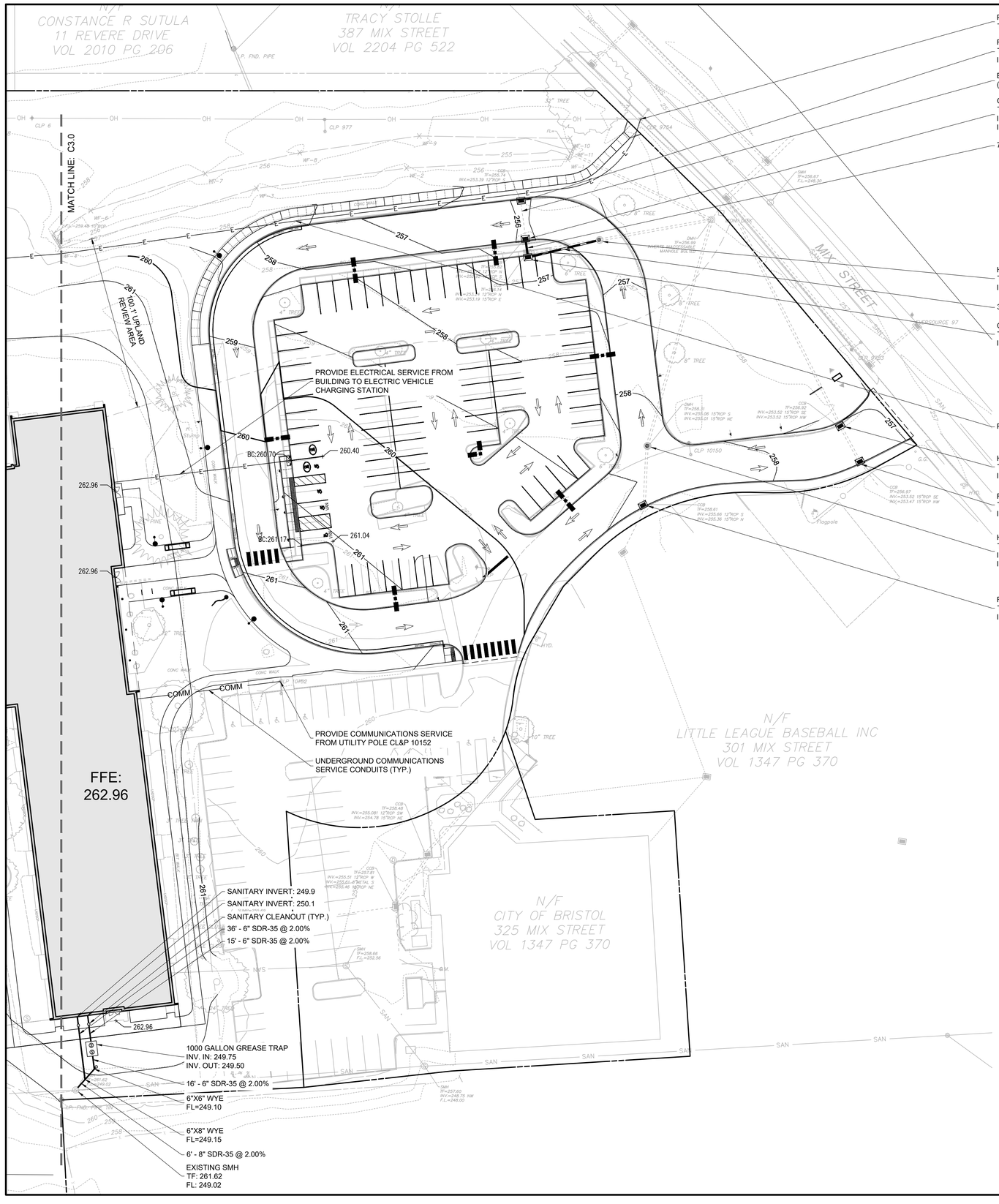
Revisions

0 30' 60'
SCALE: 1" = 30'

PHASE 2: DESIGN DEVELOPMENT
MARCH 20, 2026

GRADING, DRAINAGE & UTILITY PLAN (WEST)

C3.0



GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- 123 — PROPOSED INTERMEDIATE CONTOUR
- 120 — PROPOSED INDEX CONTOUR
- 123.45 — TW 123.45 / BW 122.45 — PROPOSED SPOT ELEVATION
- 123.45 (ME) — MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- B-# — SOIL BORING LOCATION

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- RL — ROOF LEADER
- SANITARY MANHOLE
- S — SANITARY SEWER
- VENT — VENT LINE
- CO — CLEANOUT
- W — WATER LINE / FIRE LINE
- W — WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WM — WATER METER
- E — ELECTRIC / COMM. DUCT BANK
- G — GAS LINE
- GM — GAS METER

UTILITY NOTES

SANITARY SEWER (CITY OF BRISTOL WATER & SEWER DEPARTMENT)

1. ALL SANITARY SEWER WORK TO COMPLY WITH CITY OF BRISTOL WATER & SEWER DEPARTMENT STANDARDS AND SPECIFICATIONS.
2. ALL SANITARY LATERALS ARE TO BE 6" SDR-35 WITH A MIN. PITCH OF 2% AND 3.5 FT OF COVER UNLESS OTHERWISE NOTED.
3. ALL SANITARY LATERALS ARE TO HAVE INTERNAL CLEANOUTS WITH INLINE BACKFLOW PREVENTER A CLEANOUT WITHIN 10 FT OF BUILDING FOOTPRINT.
4. LOCATION OF SANITARY LATERALS AT BUILDING TO BE COORDINATED WITH PLUMBING DRAWINGS.

WATER SERVICE (CITY OF BRISTOL WATER & SEWER DEPARTMENT)

1. ALL WATER SERVICE WORK TO COMPLY WITH CITY OF BRISTOL WATER & SEWER DEPARTMENT STANDARDS AND SPECIFICATIONS.
2. ALL DOMESTIC WATER SERVICES ARE TO BE 4" D.I. WITH 4.5 FT OF COVER.
3. ALL FIRE SERVICES ARE TO BE 6" D.I. WITH 4.5 FT OF COVER.
4. ALL WATER SERVICES ARE TO BE A MIN. 10 FT FROM ANY SANITARY SERVICE (UNLESS SHELVED IN THE SAME TRENCH) AND A MINIMUM OF 18" OF VERTICAL CLEARANCE FROM ANY OTHER UTILITY LINE.
5. LOCATION OF WATER SERVICES AT BUILDINGS TO BE COORDINATED WITH PLUMBING DRAWINGS.
6. ANY UNUSED WATER MAINS OR WATER SERVICES MUST BE DISCONNECTED AT THE WATER MAIN PRIOR TO DEMOLITION.
7. ALL TAPS ARE TO BE PERFORMED BY THE BRISTOL WATER DEPARTMENT, CONTRACTOR TO COORDINATE.
8. THRUST BLOCKS WILL BE REQUIRED AT EACH CUT AND CAP.
9. EACH CUT AND CAP REQUIRES TWO (2) JOINTS PRIOR TO CUT AND CAP.
10. ALL FITTINGS WILL REQUIRE JOINT RESTRAINTS BEFORE AND AFTER EACH FITTING.

ELECTRICAL SERVICES (EVERSOURCE)

1. ALL ELECTRICAL SERVICES ARE TO CONFORM TO EVERSOURCE CURRENT STANDARDS AND REGULATIONS.
2. FINAL DESIGN TO BE COORDINATED WITH EVERSOURCE.
3. METER LOCATIONS TO BE COORDINATED WITH ELECTRICAL DRAWINGS.
4. CONDUITS ARE FOR REFERENCE ONLY. REFER TO ELECTRIC SITE UTILITY PLAN FOR EXACT NUMBER OF CONDUITS, MATERIAL AND WIRING.

TELEPHONE SERVICES (FRONTIER/SNET)

1. ALL TELEPHONE SERVICES ARE TO CONFORM TO FRONTIER/SNET MOST CURRENT STANDARDS AND REGULATIONS.
2. FINAL DESIGN TO BE COORDINATED WITH FRONTIER/SNET.
3. SERVICE LOCATIONS TO BE COORDINATED WITH M.E.P. DRAWINGS.
4. CONDUITS ARE FOR REFERENCE ONLY. REFER TO ELECTRIC SITE UTILITY PLAN FOR EXACT NUMBER OF CONDUITS, MATERIAL AND WIRING.

CABLE TELEVISION SERVICES (COMCAST)

1. ALL CABLE TELEVISION SERVICES ARE TO CONFORM TO MOST CURRENT STANDARDS AND REGULATIONS.
2. FINAL DESIGN TO BE COORDINATED WITH COMCAST.
3. SERVICE LOCATIONS TO BE COORDINATED WITH M.E.P. DRAWINGS.
4. CONDUITS ARE FOR REFERENCE ONLY. REFER TO ELECTRIC SITE UTILITY PLAN FOR EXACT NUMBER OF CONDUITS, MATERIAL, AND WIRING.

UTILITY COMPANY CONTACTS

WATER: CITY OF BRISTOL WATER & SEWER DEPARTMENT - (860) 582-7431

SANITARY SEWER: CITY OF BRISTOL WATER & SEWER DEPARTMENT - (860) 584-6125

GAS: EVERSOURCE - (203) 317-4445

ELECTRIC: EVERSOURCE - (203) 271-4735

TELEPHONE: FRONTIER/SNET - (877) 308-8822

CATV: COMCAST - (800) 391-3000

SEE SHEET C3.0 FOR DRAINAGE, ACCESSIBILITY AND AQUIFER PROTECTION AREA NOTES.

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Project #: 0726-500158.00

NOT FOR CONSTRUCTION
ISSUED FOR REVIEW ONLY

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 25064

Revisions

0 30' 60'
SCALE: 1" = 30'

PHASE 2: DESIGN DEVELOPMENT
MARCH 20, 2026

GRADING, DRAINAGE & UTILITY PLAN (EAST)

C3.1

APPENDIX H

Wetland Delineation Report

benesch

Martin Brogie, Inc.
ENVIRONMENTAL SERVICES

• Environmental Site Investigations
• Building Contaminant Surveys
• Wetlands Consulting
• Remediation Contract Management

March 10, 2026

Ryan G. Scrittorale, PE
Project Manager
Alfred Benesch & Company
120 Hebron Avenue - 2nd Floor
Glastonbury, CT
06033

RE: Wetland Delineation Report
Edgewood School
345 Mix Street
Bristol, CT

Dear Ryan:

Martin Brogie, Inc. (MBI) is pleased to submit the following information regarding a wetland delineation performed for the above referenced property on June 2, 2023, and March 8, 2026. The work was completed to evaluate the presence and extent of wetlands on or near the property for purposes of assessing potential impacts to wetlands as a result of drainage improvement infrastructure installations and other site enhancement features.

Site Description

The subject Site consists of an approximate 15.88 acres of land occupied by an elementary school, paved parking and driveway areas, grassed lawn and landscaped areas, forested land and play areas. The site is accessed off of Mix Street to the east and Willow Brook Road to the west. The latter road terminates in a cul-de-sac adjacent to the west of the school building and serves as a bus drop-off and pick-up area. The Mix Street entrance provides access to a paved parking area on the east side of the building. Grassed lawn is located north of the school and paved parking/driveway areas and extends to the northern parking area. An open ditch/swale is located north of the eastern parking area and consisted of a gassed swale connecting two stormwater pipe headwalls to the east and west during our 2023 site visit and has been excavated and planted since that time according to our recent site visit. The southwestern portion of the site consisted of a mature forest and includes portions of Polkville Brook which generally flows from northwest to southeast through this area of the site.

28 Arbor Lane
Madison, CT 06443

martinbrogieinc@gmail.com
860-208-0360

A site location map is provided as Figure 1.

Wetland Delineation

On June 2, 2023, MBI's Soil Scientist Martin Brogie, LEP reported to the site to assess the presence of wetlands and watercourses/intermittent watercourses in accordance with the definitions provided in Connecticut General Statutes Section 22a-38 definitions (15) and (16) including: soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soils Survey; and, rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs and all other bodies of water, natural or artificial, vernal or intermittent. In addition, intermittent watercourses are defined as having a permanent channel and bank and the occurrence of two or more of the following characteristics: evidence of scour or deposits of recent alluvium or detritus; the presence of standing or flowing water for a duration longer than a storm incident; and/or the presence of hydrophytic vegetation were delineated.

MBI accessed the property via Mix Street and walked the northern portion of the site. A grassed swale located north of the eastern parking area was evaluated and determined not to constitute a wetland. MBI circled the site to the west and south and encountered a wet, forested area and a watercourse in the southwestern portion of the site. Soil exploration revealed poorly-drained soil and floodplain soils associated with the brook extending up on to a grassed area southwest of the building. Wetland flags WF-1 through WF-16 were placed southwest of the school and extended generally west to east from the western property boundary and onto the adjacent little league fields, offsite.

The USDA Soil Survey indicates that the majority of the soils on the site consist of man-made land (fill) in the area of the school and paved areas. Scarboro Muck is shown along the watercourse and is consistent with soils identified in this area of the site.

The Soil Survey map is provided as Attachment A.

On March 8, 2026, MBI returned to the site to confirm the previous delineation and to reinspect the property. The wetland in the southwestern portion of the site was confirmed; conditions remained the same. The previous grassed swale north of the eastern parking lot had been converted to a "bio-swale" since the previous site visit as indicated by the presence of standing water in a 5-6 foot wide channel extending from headwalls on each end of the swale. The swale contained various herbaceous wetland plants including Cattail, Soft Rush and Beggars Tick. The soil within the swale consisted of several inches of dark organic matter underlain with orange-brown sand and gravel with high chroma mottles. Based on the presence of standing water and hydrophytic vegetation MBI determined that the area met the definition of an intermittent watercourse and wetland flags WF-1 through WF-11 were placed around the perimeter.

An aerial view with approximate wetland limits is provided as Figure 2.

Photographs are provided in Attachment B.

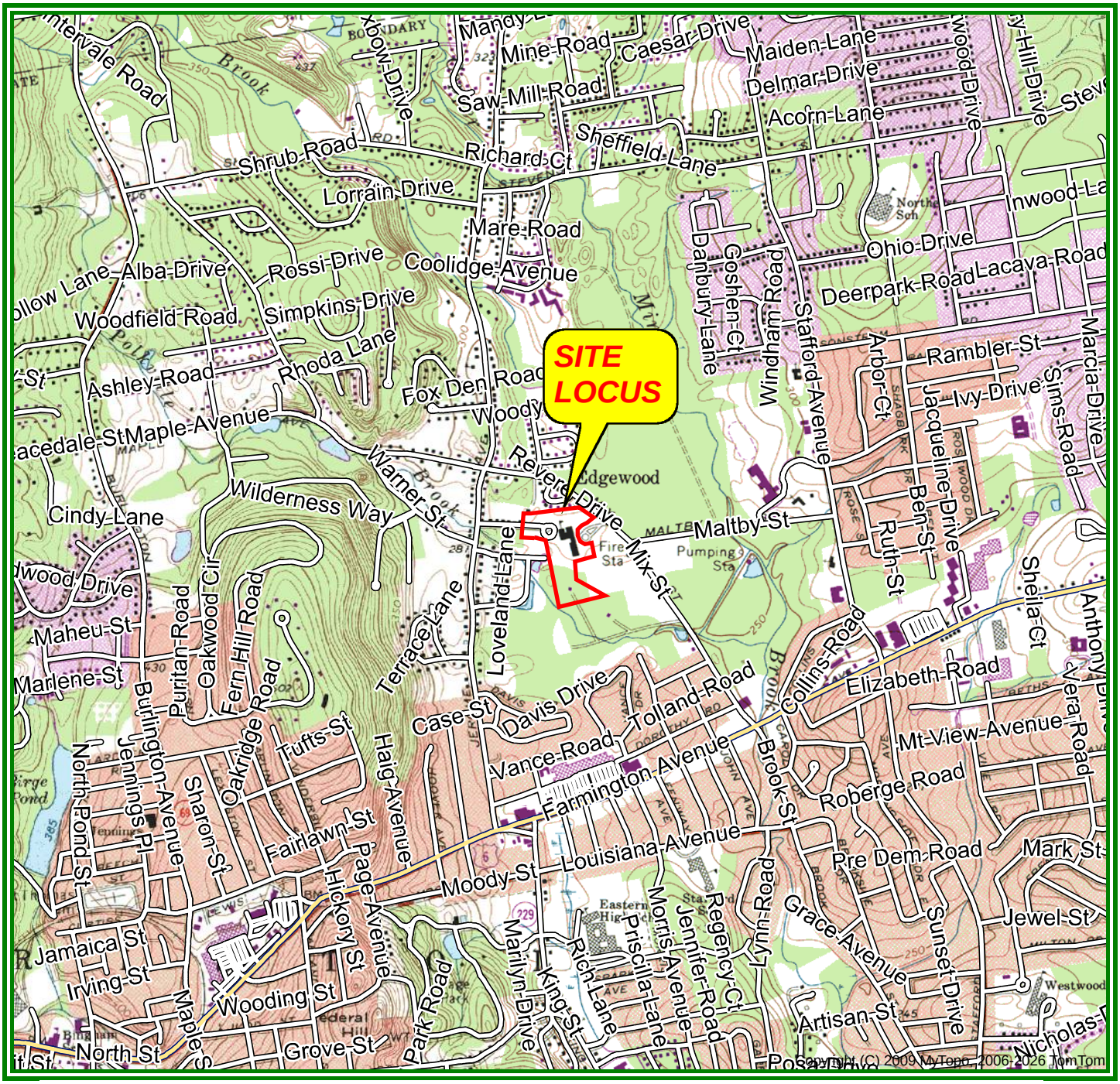
The proposed site improvement project consists of a variety on infrastructure improvements including paving, drainage, lighting and landscaping. Proposed work will be held outside the upland review zone of the southwestern wetland area which will maintain existing conditions in the area of that wetland. Some minor improvements will occur in the area of the new bio-swale wetland in the northern portion of the site. None of the improvements will have any direct impacts to this area. Overall, the site development project aspects will not affect the current site wetlands beyond current conditions.

Please contact the undersigned at 860-208-0360 if you have any questions or require further information. Thank you for the opportunity to be of service.

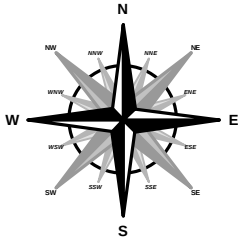
Sincerely,

Martin Brogie, LEP
Soil Scientist

w/Attachments



BRISTOL Topographic 1966 41072-F8-TF-024 National Geodetic Vertical Datum 1929



SCALE 1:24000

0 1000 2000 3000 4000 5000
FEET

0 1
MILE

Site Coordinates:
041° 42' 00.74" N, 072° 55' 28.72" W

Project:
Mix St & Willow Brook Rd

Site Location:
Mix St and Willow Brook Rd,
New London, Connecticut

Martin Brogie, Inc.
ENVIRONMENTAL SERVICES

28 Arbor Lane, Madison, Connecticut 06443
ph: (860) 208-0360
email: martinbrogieinc@gmail.com

Figure 1
Site Locus Map

SCALE

0 200 400

APPROXIMATE SCALE IN FEET

LEGEND

APPROXIMATE WETLAND BOUNDARY

APPROXIMATE PROPERTY BOUNDARY

Martin Brogie, Inc.
ENVIRONMENTAL SERVICES

28 Arbor Lane
Madison, Connecticut 06443
ph: (860) 208-0360
email: martinbrogieinc@gmail.com

Figure 2 - Aerial Site Plan

Mix Street and Willow Brook Road,
Bristol, Hartford County, Connecticut

Project:	Mix Street & Willow Brook Road
Drawn by:	K. Hazel
Date:	3/8/26
Scale:	AS SHOWN

ATTACHMENT A

SOIL SURVEY

Map Scale: 1:5,320 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut, Western Part
Survey Area Data: Version 6, Sep 16, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam, 0 to 3 percent slopes	7.2	6.0%
15	Scarboro muck, 0 to 3 percent slopes	13.7	11.3%
23A	Sudbury sandy loam, 0 to 5 percent slopes	7.8	6.5%
37A	Manchester gravelly sandy loam, 0 to 3 percent slopes	9.4	7.8%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	6.6	5.5%
38C	Hinckley loamy sand, 3 to 15 percent slopes	23.6	19.6%
107	Limerick and Lim soils, 0 to 3 percent slopes, frequently flooded	2.3	1.9%
108	Saco silt loam, frequently ponded, 0 to 2 percent slopes, frequently flooded	6.4	5.3%
305	Udorthents-Pits complex, gravelly	2.0	1.7%
306	Udorthents-Urban land complex	24.3	20.2%
308	Udorthents, smoothed	16.3	13.6%
W	Water	0.8	0.7%
Totals for Area of Interest		**120.4**	**100.0%**

ATTACHMENT B

PHOTOGRAPHS

Watercourse and floodplain wetlands in southwestern portion of site (2023).

Floodplain wetlands in southwestern portion of site.

2026 view looking southwest to floodplain area from lawn area by school.

View of swale north of eastern parking area in 2023.

Current view of swale (wetland) north of eastern parking area after bio-swale construction.

May 19, 2026

Ms. Julia McFadden, AIA, ALEP, WELL AP
Principal
Quisenberry Arcari Malik, LLC
195 Scott Swamp Road
Farmington, Connecticut 06032

RE: Pre-Construction Soil Sampling
Edgewood Pre-Kindergarten Academy
345 Mix Street
Bristol, Connecticut 06010
Eagle Project No. 26-108.10T1

Dear Ms. McFadden:

Eagle Environmental, Inc. (Eagle) has prepared this Pre-Construction Soil Sampling Letter Report to summarize the methods and results of the pre-construction soil sampling investigation conducted at the Edgewood Pre-Kindergarten Academy at 345 Mix Street in Bristol, Connecticut (the "Site"). Pre-construction soil sampling was completed at the request of Quisenberry Arcari Malik, LLC (QA+M) on behalf of the City of Bristol Board of Education as part of due diligence of environmental conditions prior to the installation of proposed utility lines and a grease trap. Pre-construction soil sampling was completed to comply with the Connecticut Department of Energy and Environmental Protection (CTDEEP) Hazardous Waste Determinations and Knowledge of Process regulations. The Site location is depicted on **FIG-1**, and an aerial photograph of the Site and vicinity is provided on **FIG-2**. **REM-1A** and **REM-1B** show the pre-construction soil sampling locations and soil management plan for the western and eastern portions of the Site, respectively.

Pre-construction soil sampling was completed to determine the waste characteristics of excavated soil after the installation of proposed utility lines and grease trap. Pre-construction soil sampling included the collection of fifteen (15) in situ discreet soil samples from the footprint of the proposed locations of the utility lines and grease trap using hand auger technology. Soil samples were collected from depth intervals of 0.0 to 0.5 feet below the ground surface (bgs), 0.5 feet to 1.0 feet bgs, and/or 2.0 to 2.5 feet bgs, including HA-1(0.0-0.5), HA-1(0.5-1.0), HA-1(2.0-2.5), HA-2(0.0-0.5), HA-2(0.5-1.0), HA-3(0.0-0.5), HA-3(0.5-1.0), HA-4(0.0-0.5), HA-4(0.5-1.0), HA-5(0.0-0.5), HA-5(0.5-1.0), HA-6(0.0-0.5), HA-6(0.5-1.0), HA-7(0.0-0.5), and HA-7(0.5-1.0). A composite soil sample (COMP-1) was created using soil from all seven (7) hand auger locations (HA-1 through HA-7). Soil from each in situ sampling location was containerized and homogenized and composite sample Comp-1 was collected from the soil mixture. The discreet samples were held for pending analysis in the event exceedances/detections in the composite sample required in situ delineation.

Composite sample COMP-1 was analyzed for semi-volatile organic compounds (SVOCs) via EPA Method 8270; extractable total petroleum hydrocarbons (ETPH) via the Connecticut Method; total polychlorinated biphenyls (PCBs) via EPA Method 8082; total pesticides via EPA Method 8081; chlorinated herbicides via EPA Method 8151; total Remediation Standard Regulation (RSR) 15 metals including antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc; and disposal facility parameters including corrosivity, flash point, ignitability, paint filter test, pH, and reactivity including for cyanide and sulfide. In situ discreet sample Ha-1 (2.0-2.5) was analyzed for total volatile organic compounds (VOCs) via EPA Method 8260.

Sampling Results

- VOCs were not detected above laboratory reporting limits in discreet sample HA-1(2.0-2.5).
- SVOCs, PCBs, herbicides, and pesticides were not detected above laboratory reporting limits in composite sample COMP-1.
- ETPH was detected at a concentration of 110 mg/kg in composite sample COMP-1, which is less than 25 percent of the CTDEEP Release-Based Cleanup Regulations (RBCRs) Residential Direct Exposure Criteria (RDEC) of 500 mg/kg. Due to the detected concentration of ETPH being below 25 percent of the RDEC, the ETPH detection does not meet the definition of a reportable release pursuant to the RBCRs, and additional sampling is not required.

- Hazardous waste characteristic parameters required for disposal were either not detected above laboratory reporting limits in composite sample Comp-1 or were detected at concentrations less than the concentration limits permitted by the facility.

- All metals except for copper, including arsenic, barium, chromium, copper, lead, nickel, vanadium, and zinc were detected at naturally occurring background concentrations in composite sample Comp-1. Total copper was detected at a concentration of 22.8 mg/kg in composite sample COMP-1, which is above the RBCR low background numerical criteria for copper of 17 mg/kg. Pursuant to the RBCRs, a detection of a metal above the low background numerical criteria requires collection and analysis of additional samples with resultant concentrations of the metal detected below the RBCR high background numerical criteria to comply with the RBCR's definition of background. To confirm the absence of a reportable release of total copper within the proposed footprint of the utility lines and grease trap, the 15 discreet in situ soil samples were analyzed for total copper. Total copper was detected at concentrations ranging from 11.5 mg/kg in HA-1(0.5-1.0) to 44.8 mg/kg in HA-6(0.0-0.5). Since total copper concentrations in all 15 discreet in situ soil samples were below the RBCR high background numerical criteria for copper of 45 mg/kg, the absence of a reportable release of copper was confirmed.

Based upon the results of the pre-construction soil sampling, soil in the footprint of the utility lines and grease trap is impacted with ETPH at trace concentrations, well below RBCR numerical criteria. No additional actions are required pursuant to the RBCRs. If excavated, the soil should either be disposed of as polluted soil at a state licensed and permitted disposal facility, left in situ, or relocated at the site to areas where soil and/or groundwater have been similarly impacted. Reuse at another property is not permitted without CTDEEP notification and approval.

If you have any questions, please do not hesitate to contact us at (860) 589-8257. Thank you for the opportunity to support you with this project.

Sincerely,
Eagle Environmental, Inc.

Report Prepared By:
Gabrielle Rohn
Environmental Consultant II

Report Reviewed By:
Rodd A. Dryfoos, LEP
Senior Manager, Environmental Sciences

Attachments:
FIG-1 Site Location
FIG-2 Aerial Photograph of Site and Vicinity
REM-1A Soil Management Plan (West)
REM-1B Soil Management Plan (East)
Table 1 Pre-Construction Soil Sampling Summary Table
Laboratory Analytical Data Report

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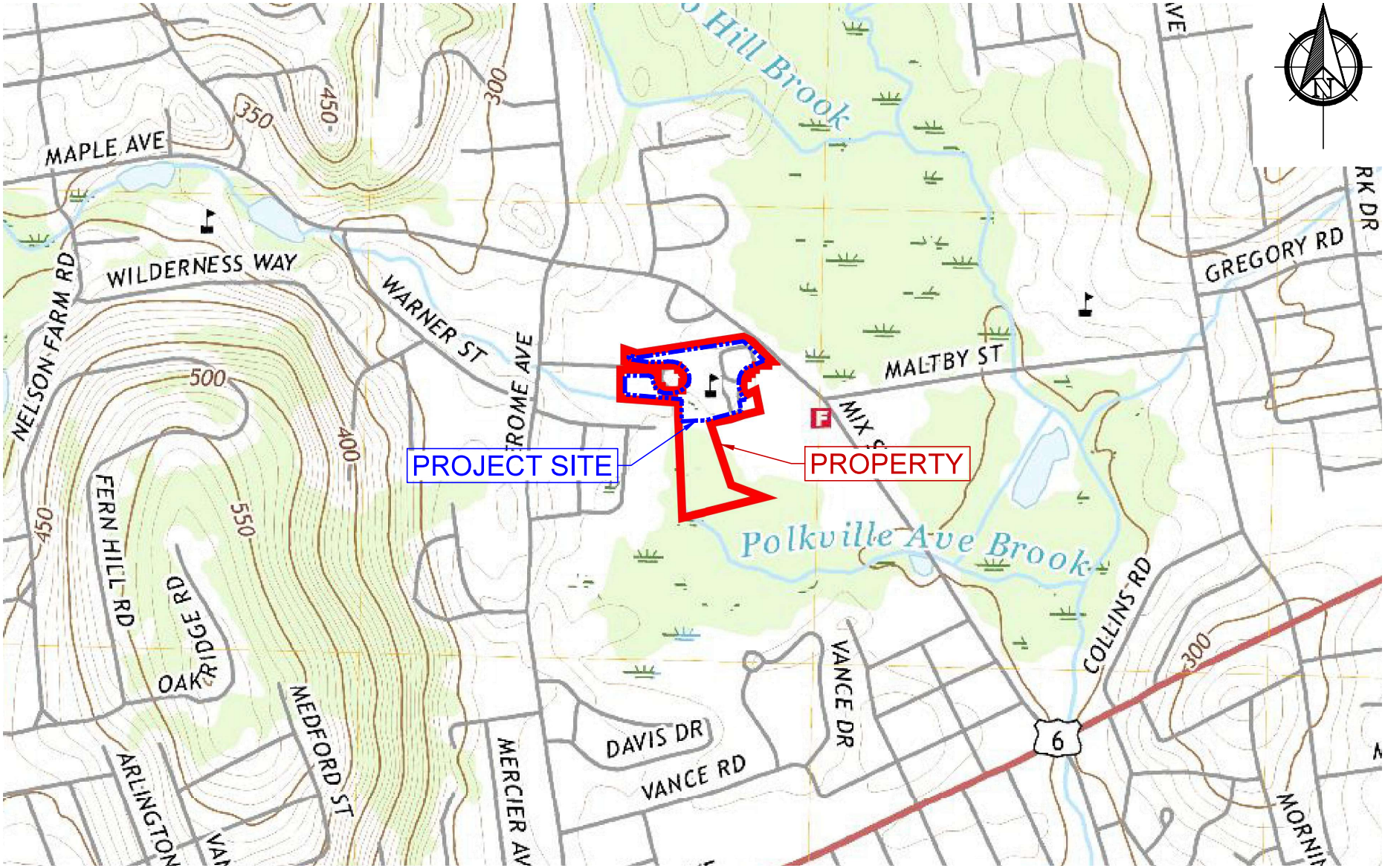

SITE LOCATION MAP

SCALE: 1" = 1000'

NOTE: SITE BOUNDARY IS APPROXIMATE.
SOURCE: 2021 EDR HISTORICAL TOPO MAP

EAGLE Environmental, Inc.
150 MAIN STREET, SUITE B
BRISTOL, CONNECTICUT 06010
860-589-8257

SOIL MANAGEMENT PLAN
QA+M
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CONNECTICUT

DATE: 03/20/2026
PROJECT NO.: 25-033.13T2
DRAWN BY: BB
REVIEWED BY: LW

SHEET NO.
FIG-1
SHEET 1 OF 4

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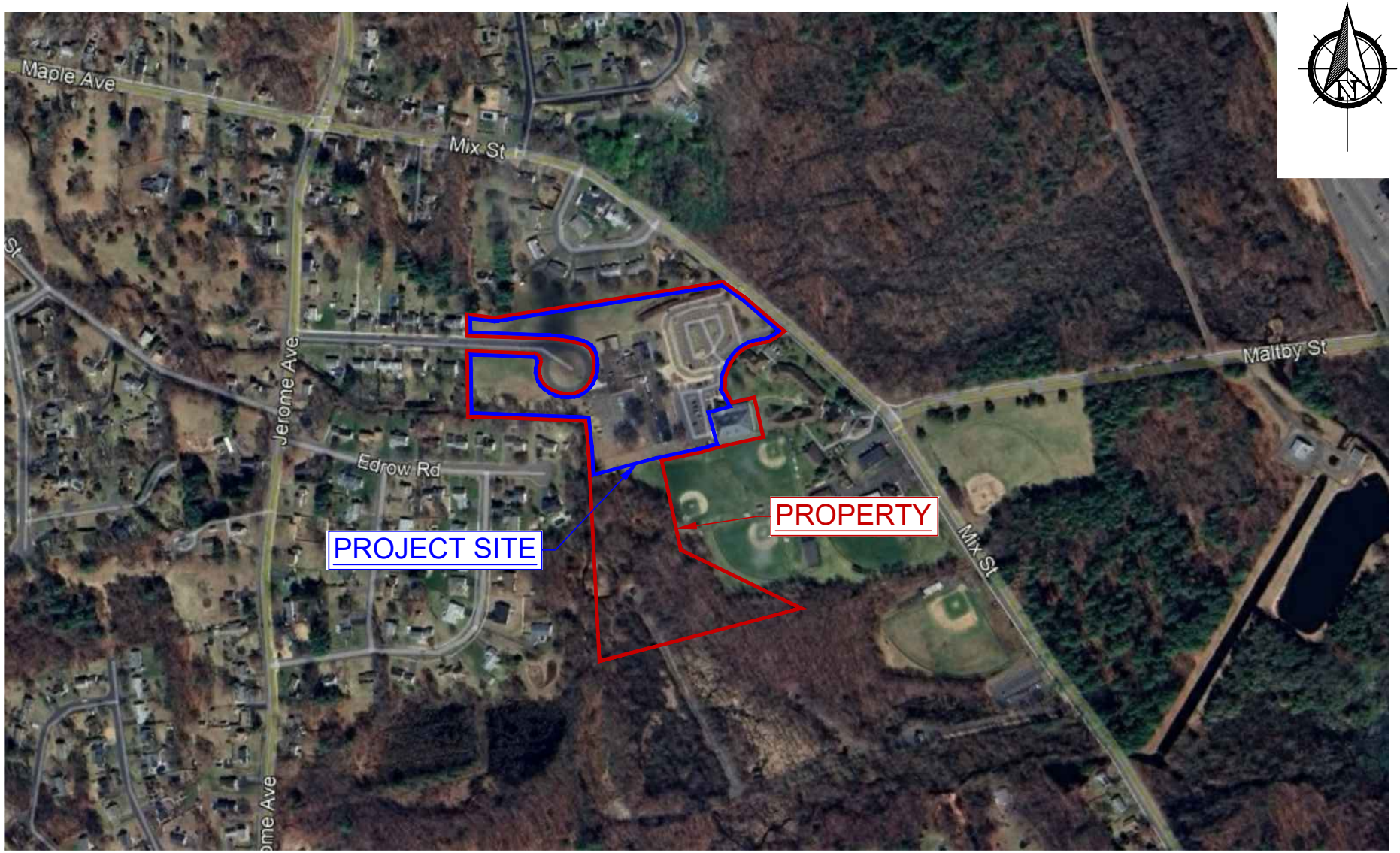

AERIAL PHOTOGRAPH OF SITE AND VICINITY

SCALE: 1" = 500'

NOTE: SITE BOUNDARY IS APPROXIMATE.
SOURCE: 2022 GOOGLE EARTH AERIAL PHOTOGRAPH

EAGLE Environmental, Inc.
150 MAIN STREET, SUITE B
BRISTOL, CONNECTICUT 06010
860-589-8257

SOIL MANAGEMENT PLAN
QA+M
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CONNECTICUT

DATE: 03/20/2026
PROJECT NO.: 25-033.13T2
DRAWN BY: BB
REVIEWED BY: LW

SHEET NO.
FIG-2
SHEET 2 OF 4

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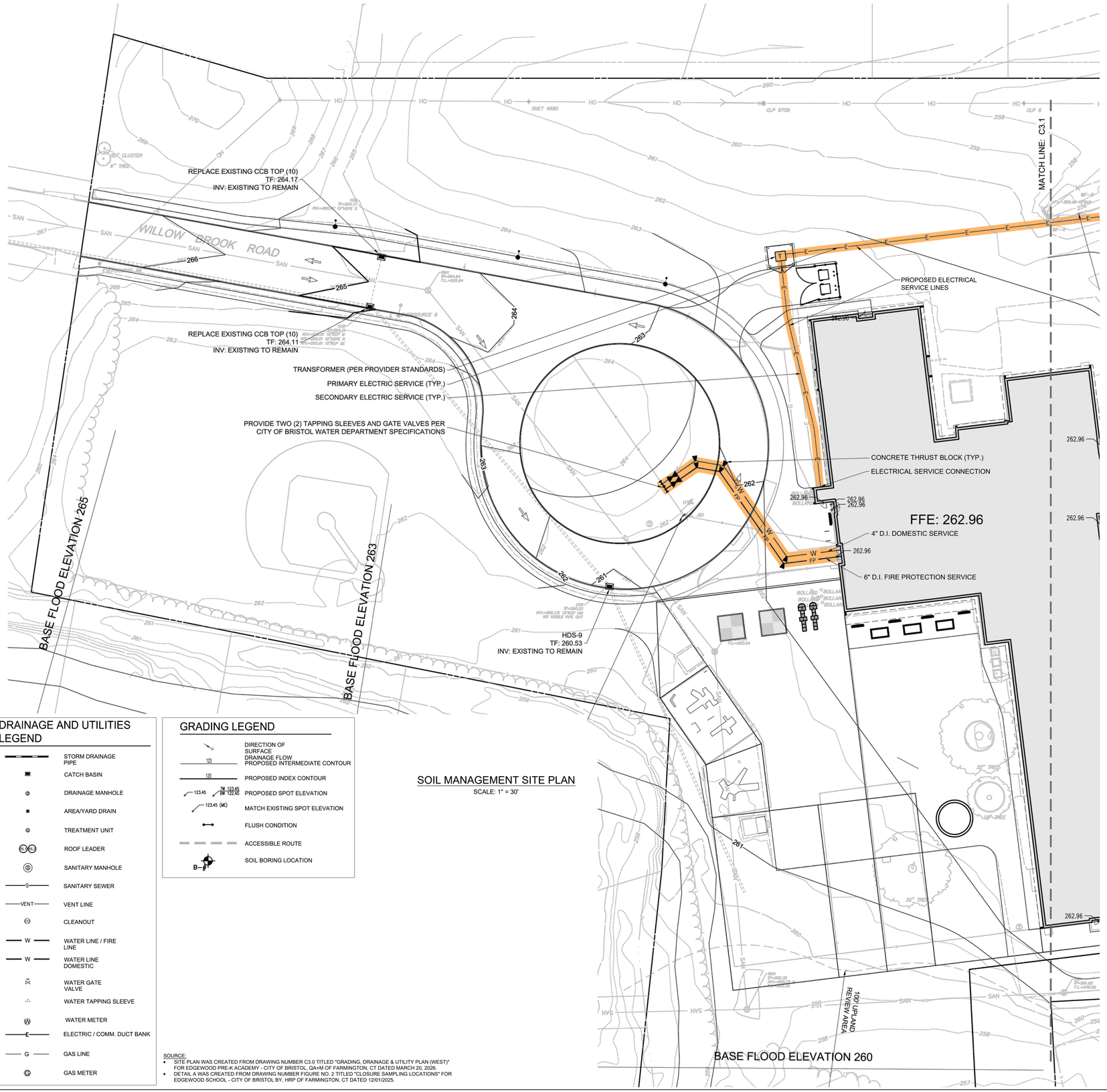


SOIL MANAGEMENT SITE PLAN

SCALE: 1" = 30'

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- ROOF LEADER
- SANITARY MANHOLE
- SANITARY SEWER
- VENT LINE
- CLEANOUT
- WATER LINE / FIRE LINE
- WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WATER METER
- ELECTRIC / COMM. DUCT BANK
- GAS LINE
- GAS METER

GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED SPOT ELEVATION
- MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- SOIL BORING LOCATION

SOURCE:

- SITE PLAN WAS CREATED FROM DRAWING NUMBER C3.0 TITLED "GRADING, DRAINAGE & UTILITY PLAN (WEST)" FOR EDGEWOOD PRE-K ACADEMY - CITY OF BRISTOL, QA+M OF FARMINGTON, CT DATED MARCH 20, 2026.
- DETAIL A WAS CREATED FROM DRAWING NUMBER FIGURE NO. 2 TITLED "CLOSURE SAMPLING LOCATIONS" FOR EDGEWOOD SCHOOL - CITY OF BRISTOL BY, HRP OF FARMINGTON, CT DATED 12/01/2025.

SOIL CLASSIFICATION KEY:

- CONTAMINATED SOIL
- POLLUTED SOIL
- UNCONTAMINATED / CLEAN SOIL
- UNINVESTIGATED AREA

CONTAMINATED SOIL: SOIL EXHIBITING EXCEEDANCES OF PERTINENT CONTAMINANT CONCENTRATION LIMITS IN THE CONNECTICUT FORMER REMEDIATION STANDARD REGULATIONS (RSR'S) / RELEASE-BASED CLEAN-UP REGULATIONS (RBCR).

POLLUTED SOIL: SOIL EXHIBITING DETECTABLE CONCENTRATIONS OF CONTAMINANTS, INCLUDING METAL CONCENTRATIONS ABOVE TYPICAL BACKGROUND LEVELS, BUT AT CONCENTRATIONS BELOW PERTINENT FORMER RSR CRITERIA / RELEASE-BASED CLEAN-UP REGULATIONS (RBCR)

UNCONTAMINATED / CLEAN SOIL: SOIL EXHIBITING NO DETECTABLE CONCENTRATIONS OF CONTAMINANTS OR DETECTABLE CONCENTRATIONS OF CONTAMINANTS, INCLUDING METALS CONCENTRATIONS BELOW TYPICAL BACKGROUND RANGES.

UNINVESTIGATED AREA: SOILS WITHIN AREAS THAT HAVE NOT BEEN INVESTIGATED. THESE SOILS ARE CONSIDERED CONTAMINATED FOR BIDDING PURPOSES. CHARACTERISTIC SOIL TESTING CAN BE COMPLETED TO RECLASSIFY SOIL.

GENERAL NOTES:

1. THIS GENERAL SITE SOIL CHARACTERIZATION DRAWING IS INTENDED FOR USE BY THE CONTRACTOR IN ASSISTING WITH DEVELOPING THEIR BID RELATED TO ALL SITE WORK AS IT RELATES TO THE DISPOSITION OF SOIL GENERATED FROM THE PROPOSED WORK AREA. THIS DRAWING WAS BASED UPON EXISTING SOIL ANALYTICAL DATA COLLECTED FOR PRE-CONSTRUCTION SOIL TESTING IN 2026 AS PART OF DESIGN PROCESS.
2. EXCESS POLLUTED AND CONTAMINATED SOILS SHALL BE PROPERLY HANDLED AND DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01 57 05 AND SECTION 02 61 23 AND OTHER PROJECT SPECIFICATIONS AS APPLICABLE.
3. STRIP AND EXCAVATE POLLUTED AND CONTAMINATED SOILS AT DESIGNATED LOCATIONS AS REQUIRED BY SITE WORK ACTIVITIES. EXCESS POLLUTED AND CONTAMINATED SOILS SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01 57 05 AND SECTION 02 61 23 AND OTHER PROJECT SPECIFICATIONS, AS APPLICABLE.
4. SOILS GENERATED FROM UNTESTED AREAS SHALL BE CLASSIFIED AS CONTAMINATED SOILS.
5. UNCONTAMINATED / CLEAN SOILS SHALL NOT BE COMINGLED WITH POLLUTED OR CONTAMINATED SOILS. UNCONTAMINATED SOILS MAY BE REUSED ON SITE, WHERE APPROPRIATE PER PROJECT SPECIFICATIONS. POLLUTED SOILS SHALL NOT BE COMINGLED WITH CONTAMINATED SOILS. POLLUTED SOILS MAY BE CONSIDERED FOR RE-USE WHERE APPROPRIATE PER PROJECT SPECIFICATIONS.
6. IT IS NOT THE INTENT OF THIS PROJECT TO EXCAVATE AND MANAGE OR DISPOSE OF CONTAMINATED OR POLLUTED SOILS BEYOND THE LIMITS OF THE WORK DESCRIBED IN THE ARCHITECT'S PLANS AND SPECIFICATIONS.
7. SOILS THAT WILL BE IMPACTED INCIDENTAL TO ANY WORK ON THE SITE ARE COVERED UNDER THESE PLANS AND SPECIFICATIONS AND ARE SUBJECT TO ALL SPECIFIED REQUIREMENTS.
8. IF POLLUTED AND CONTAMINATED SOILS ARE ENCOUNTERED THEY SHALL BE HANDLED IN ACCORDANCE WITH SECTION 01 57 05 AND SECTION 02 61 23.
9. MATERIAL FROM THE PAVEMENT RECLAMATION ON-SITE MAY BE CONSIDERED FOR RESUSE AS BASE MATERIAL BENEATH THE NEW PAVEMENT LAYER IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
10. DEWATERING IF NEEDED FOR UTILITY INSTALLATIONS WILL BE COMPLETED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
11. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
12. CALL-BEFORE-YOU-DIG (CBYD) / 811 IS REQUIRED TO BE CONTACTED PRIOR INTRUSIVE ACTIVITIES AT LEAST TWO BUSINESS DAYS BUT NOT MORE THAN 30 DAYS PRIOR TO INITIATION OF WORK.
13. EXECUTION AND HANDLING OF POLLUTED AND CONTAMINATED SOILS IS REQUIRED TO BE COMPLETED BY A GENERAL PERMIT TO ACT AS A CONTRACTOR TO CONTAIN OR REMOVE OR OTHERWISE MITIGATE THE EFFECTS OF CERTAIN RELEASES. (REGISTERED EXISTING RELEASE RESPONSE CONTRACTOR)
14. REFER TO MECHANICAL AND PLUMBING PLANS FOR BOILER ROOM AND CORRIDOR TRENCHING LOCATIONS NOT SOWN ON THIS DRAWING BUT INCLUDED IN THE CONTRACTORS BID FOR SOIL REMOVAL. SOIL REMOVED FROM WITHIN THE BOILER ROOM SHALL BE DISPOSED OF AS CONTAMINATED AND SOIL FROM THE INTERIOR TRENCHING SHALL BE DISPOSED OF AS POLLUTED.

DATE: 03/20/2026
DRAWN BY: BR
SCALE: AS NOTED
REVIEWED BY: LW
PROJECT NO.: 25-033-1072

REVISIONS

NO.	DATE:	DESCRIPTION:

PROJECT TITLE:

SOIL MANAGEMENT PLAN

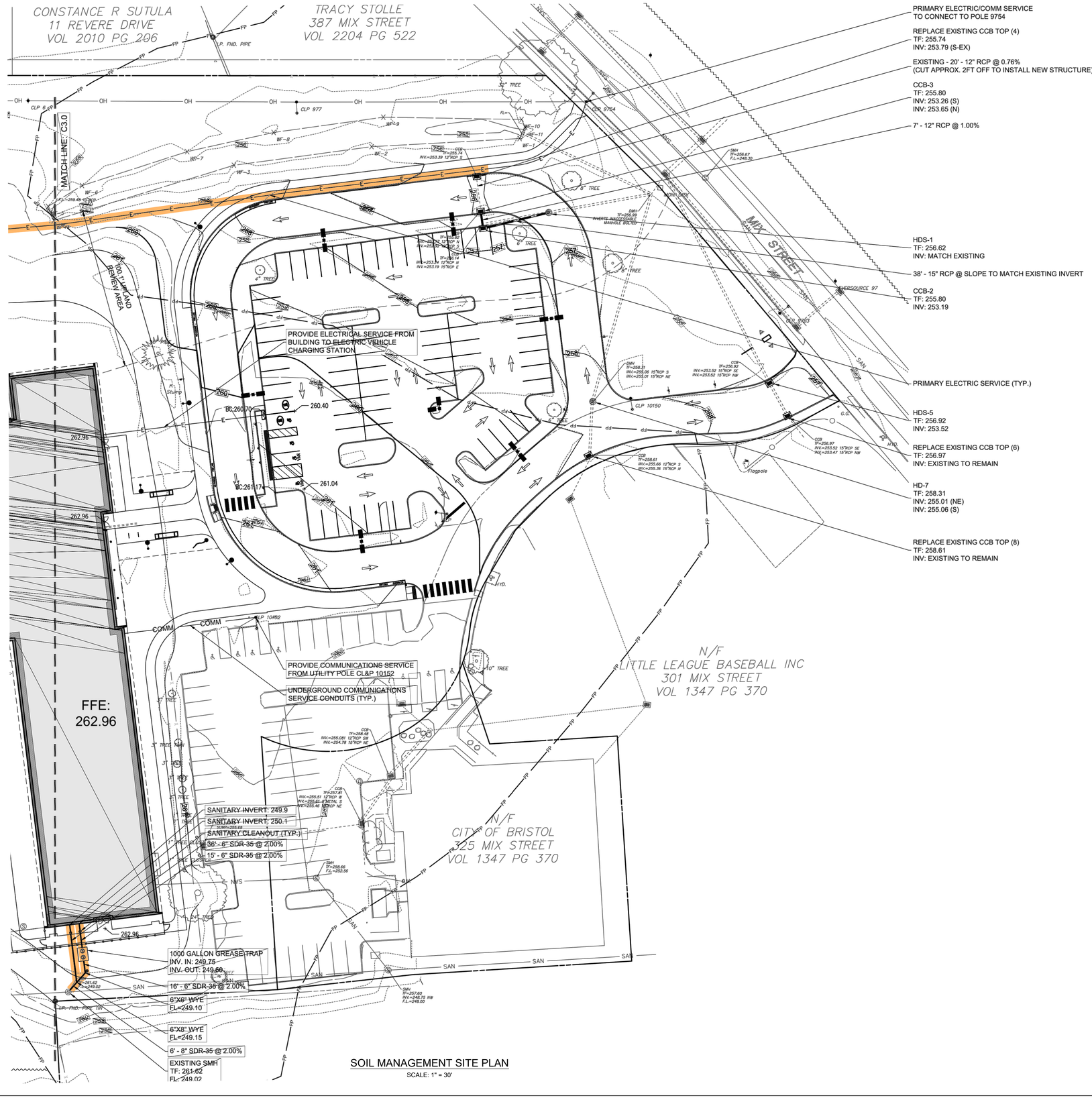
PROJECT CLIENT AND PROJECT ADDRESS:
QA+M
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CONNECTICUT 06010

CONSULTANTS SEAL

EAGLE Environmental, Inc.
150 MAIN STREET SUITE B
BRISTOL, CONNECTICUT 06010
860-589-8257

SHEET TITLE:
SMP SITE PLAN (WEST)

SHEET NO.
REM-1A



SOIL MANAGEMENT SITE PLAN

SCALE: 1" = 30'

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- ROOF LEADER
- SANITARY MANHOLE
- SANITARY SEWER
- VENT LINE
- CLEANOUT
- WATER LINE / FIRE LINE
- WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WATER METER
- ELECTRIC / COMM. DUCT BANK
- GAS LINE
- GAS METER

GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED SPOT ELEVATION
- MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- SOIL BORING LOCATION

SOIL CLASSIFICATION KEY:

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- UNCONTAMINATED / CLEAN SOIL
- UNINVESTIGATED AREA

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UNCONTAMINATED / CLEAN SOIL: SOIL EXHIBITING NO DETECTABLE CONCENTRATIONS OF CONTAMINANTS OR DETECTABLE CONCENTRATIONS OF CONTAMINANTS, INCLUDING METALS CONCENTRATIONS BELOW TYPICAL BACKGROUND RANGES.

UNINVESTIGATED AREA: SOILS WITHIN AREAS THAT HAVE NOT BEEN INVESTIGATED. THESE SOILS ARE CONSIDERED CONTAMINATED FOR BIDDING PURPOSES. CHARACTERISTIC SOIL TESTING CAN BE COMPLETED TO RECLASSIFY SOIL.

GENERAL NOTES:

1. THIS GENERAL SITE SOIL CHARACTERIZATION DRAWING IS INTENDED FOR USE BY THE CONTRACTOR IN ASSISTING WITH DEVELOPING THEIR BID RELATED TO ALL SITE WORK AS IT RELATES TO THE DISPOSITION OF SOIL GENERATED FROM THE PROPOSED WORK AREA. THIS DRAWING WAS BASED UPON EXISTING SOIL ANALYTICAL DATA COLLECTED FOR PRE-CONSTRUCTION SOIL TESTING IN 2026 AS PART OF DESIGN PROCESS.
2. EXCESS POLLUTED AND CONTAMINATED SOILS SHALL BE PROPERLY HANDLED AND DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01 57 05 AND SECTION 02 61 23 AND OTHER PROJECT SPECIFICATIONS AS APPLICABLE.
3. STRIP AND EXCAVATE POLLUTED AND CONTAMINATED SOILS AT DESIGNATED LOCATIONS AS REQUIRED BY SITE WORK ACTIVITIES. EXCESS POLLUTED AND CONTAMINATED SOILS SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01 57 05 AND SECTION 02 61 23 AND OTHER PROJECT SPECIFICATIONS, AS APPLICABLE.
4. SOILS GENERATED FROM UNTESTED AREAS SHALL BE CLASSIFIED AS CONTAMINATED SOILS.
5. UNCONTAMINATED / CLEAN SOILS SHALL NOT BE COMINGLED WITH POLLUTED OR CONTAMINATED SOILS. UNCONTAMINATED SOILS MAY BE REUSED ON SITE, WHERE APPROPRIATE PER PROJECT SPECIFICATIONS. POLLUTED SOILS SHALL NOT BE COMINGLED WITH CONTAMINATED SOILS. POLLUTED SOILS MAY BE CONSIDERED FOR RE-USE WHERE APPROPRIATE PER PROJECT SPECIFICATIONS.
6. IT IS NOT THE INTENT OF THIS PROJECT TO EXCAVATE AND MANAGE OR DISPOSE OF CONTAMINATED OR POLLUTED SOILS BEYOND THE LIMITS OF THE WORK DESCRIBED IN THE ARCHITECT'S PLANS AND SPECIFICATIONS.
7. SOILS THAT WILL BE IMPACTED INCIDENTAL TO ANY WORK ON THE SITE ARE COVERED UNDER THESE PLANS AND SPECIFICATIONS AND ARE SUBJECT TO ALL SPECIFIED REQUIREMENTS.
8. IF POLLUTED AND CONTAMINATED SOILS ARE ENCOUNTERED THEY SHALL BE HANDLED IN ACCORDANCE WITH SECTION 01 57 05 AND SECTION 02 61 23.
9. MATERIAL FROM THE PAVEMENT RECLAMATION ON-SITE MAY BE CONSIDERED FOR RESUSE AS BASE MATERIAL BENEATH THE NEW PAVEMENT LAYER IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
10. DEWATERING IF NEEDED FOR UTILITY INSTALLATIONS WILL BE COMPLETED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
11. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
12. CALL-BEFORE-YOU-DIG (CBYD) / 811 IS REQUIRED TO BE CONTACTED PRIOR INTRUSIVE ACTIVITIES AT LEAST TWO BUSINESS DAYS BUT NOT MORE THAN 30 DAYS PRIOR TO INITIATION OF WORK.
13. EXECUTION AND HANDLING OF POLLUTED AND CONTAMINATED SOILS IS REQUIRED TO BE COMPLETED BY A GENERAL PERMIT TO ACT AS A CONTRACTOR TO CONTAIN OR REMOVE OR OTHERWISE MITIGATE THE EFFECTS OF CERTAIN RELEASES. (REGISTERED EXISTING RELEASE RESPONSE CONTRACTOR)
14. REFER TO MECHANICAL AND PLUMBING PLANS FOR BOILER ROOM AND CORRIDOR TRENCHING LOCATIONS NOT SOWN ON THIS DRAWING BUT INCLUDED IN THE CONTRACTORS BID FOR SOIL REMOVAL. SOIL REMOVED FROM WITHIN THE BOILER ROOM SHALL BE DISPOSED OF AS CONTAMINATED AND SOIL FROM THE INTERIOR TRENCHING SHALL BE DISPOSED OF AS POLLUTED.

SOURCE:

- SITE PLAN WAS CREATED FROM DRAWING NUMBER C3.1 TITLED "GRADING, DRAINAGE & UTILITY PLAN (EAST)" FOR EDGEWOOD PRE-K ACADEMY - CITY OF BRISTOL, QA+M OF FARMINGTON, CT DATED MARCH 20, 2026.
- DETAIL A WAS CREATED FROM DRAWING NUMBER FIGURE NO. 2 TITLED "CLOSURE SAMPLING LOCATIONS" FOR EDGEWOOD SCHOOL - CITY OF BRISTOL BY, HRP OF FARMINGTON, CT DATED 12/01/2025.

DATE: 03/20/2026
DRAWN BY: BH
SCALE: AS NOTED
REVIEWED BY: LW
PROJECT NO.: 25-033.10T2

REVISIONS

NO.	DATE:	DESCRIPTION

PROJECT TITLE:

SOIL MANAGEMENT PLAN

PROJECT CLIENT AND PROJECT ADDRESS:

Q A + M

EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CONNECTICUT 06010

CONSULTANTS SEAL

EAGLE Environmental, Inc.
150 MAIN STREET, SUITE B
BRISTOL, CONNECTICUT 06010
860-589-8257

SHEET TITLE:

SMP SITE PLAN
(EAST)

SHEET NO.

REM-1B

SHEET 4 OF 4

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TABLE 1

PRE-CONSTRUCTION SOIL SAMPLING
EDGEWOOD PRE-K ACADEMY
345 MIX STREET, BRISTOL, CONNECTICUT

MAY 2026

Sample Location		HA-1	HA-1	HA-1	HA-2	HA-2	HA-3	HA-3	HA-4	HA-4	HA-5	HA-5	HA-6	HA-6	HA-7	HA-7	COMP-1
Sample Depth (feet)		0.0-0.5	0.5-1.0	2.0-2.5	0.0-0.5	0.5-1.0	0.0-0.5	0.5-1.0	0.0-0.5	0.5-1.0	0.0-0.5	0.5-1.0	0.0-0.5	0.5-1.0	0.0-0.5	0.5-1.0	N/A
Laboratory ID		CV72671	CV72672	CV72673	CV72674	CV72675	CV72676	CV72677	CV72678	CV72679	CV72680	CV72681	CV72682	CV72683	CV72684	CV72685	CV72670
Sample Date		4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026	4/10/2026
Parameters	**RSR Criteria**																
	Res DEC	**GA PMC**																
Volatile Organic Compounds (VOCs) - µg/kg																		
VOCs	Varies	Varies	---	---	ND	---	---	---	---	---	---	---	---	---	---	---	---	---
Oxygenates & Dioxane - µg/kg																		
1,4-Dioxane	*6,100*	*100*	---	---	ND < 100	---	---	---	---	---	---	---	---	---	---	---	---	ND < 74
Extractable Total Petroleum Hydrocarbons (ETPH) - mg/kg																		
ETPH	500	500	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**110**
Semi-volatile Organic Compounds (SVOCs) - µg/kg																		
SVOCs	Varies	Varies	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
Polychlorinated Biphenyls (PCBs) - µg/kg																		
PCBs*	1,000	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND < 380
Total Metals - mg/kg																		
Arsenic	10	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**1.52**
Barium	4,700	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**39.3**
Chromium	NE	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**10.7**
Copper	2,500	NA	**17.5**	**11.5**	---	**23**	**23.1**	**20.9**	**20.7**	**37.1**	**28.2**	**22.6**	**20.2**	**44.8**	**40.5**	**41.1**	**37.1**	**22.8**
Lead	400	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**8.88**
Nickel	1,400	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**7.99**
Vanadium	470	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**27.4**
Zinc	20,000	NA	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**27.1**
Pesticides - µg/Kg																		
Pesticides	Varies	Varies	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
Herbicides - µg/Kg																		
Herbicides	Varies	Varies	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND
Miscellaneous/ Inorganics																		
Corrosivity - Pos/Neg	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Negative
Flash Point - Degree Fahrenheit	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND > 200
Ignitability - Degree Fahrenheit	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Passed
Paint Filter Test - PASS/FAIL	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Passed
pH at 22C - Soil - pH Units	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**6.29**
Reactivity Cyanide - mg/kg	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND < 5
Reactivity Sulfide - mg/kg	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ND < 20
Reactivity - Pos/Neg	NE	NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Negative

Notes:

For each parameter list, only compounds detected in one or more samples are listed.

2. Units: µg = micrograms; mg = milligrams; kg = kilogram; L = liter
3. --- = Sample not tested for this compound
4. ND < [value] = Not detected at specified laboratory reporting limit
5. Listed criteria are from Connecticut Release-Based Cleanup Regulations (RBCRs) effective March 1, 2026, or Table 10 of DEEP Technical Support Document: Recommended Criteria Values for Common Additional Polluting Substances and Alternative Criteria Requests, dated September 2018 *Italicized* criteria have not been promulgated and would require DEEP approval for use as part of a formal RBCR compliance demonstration.
6. RBCR Criteria - Res = Residential; I/C = Industrial Commercial; DEC = Direct Exposure Criteria; PMC = Pollutant Mobility Criteria
7. NE = None established
8. NA = Not applicable
9. **Bolded value indicates a detected concentration**
10. **Bolded and shaded value indicates a concentration that exceeds RSR or APS criteria**
11. * = Per DEEP policy, PMC compliance is presumed for soils containing less than 1.0mg/kg of total PCBs

PHOENIX
Environmental Laboratories, Inc.

Wednesday, May 13, 2026

Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
SDG ID: GCV72670
Sample ID#s: CV72670 - CV72685

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

SDG Comments

May 13, 2026

SDG I.D.: GCV72670

Version 2

Client added analyses

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Sample Id Cross Reference

May 13, 2026

SDG I.D.: GCV72670

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION

Client Id	Lab Id	Matrix	Col Date
COMP-1	CV72670	SOIL	04/10/26 11:20
HA-1 (0.0-0.5)	CV72671	SOIL	04/10/26 10:00
HA-1 (0.5-1.0)	CV72672	SOIL	04/10/26 10:00
HA-1 (2.0-2.5)	CV72673	SOIL	04/10/26 10:00
HA-2 (0.0-0.5)	CV72674	SOIL	04/10/26 9:35
HA-2 (0.5-1.0)	CV72675	SOIL	04/10/26 9:35
HA-3 (0.0-0.5)	CV72676	SOIL	04/10/26 9:20
HA-3 (0.5-1.0)	CV72677	SOIL	04/10/26 9:20
HA-4 (0.0-0.5)	CV72678	SOIL	04/10/26 9:00
HA-4 (0.5-1.0)	CV72679	SOIL	04/10/26 9:00
HA-5 (0.0-0.5)	CV72680	SOIL	04/10/26 8:50
HA-5 (0.5-1.0)	CV72681	SOIL	04/10/26 8:50
HA-6 (0.0-0.5)	CV72682	SOIL	04/10/26 11:10
HA-6 (0.5-1.0)	CV72683	SOIL	04/10/26 11:10
HA-7 (0.0-0.5)	CV72684	SOIL	04/10/26 10:45
HA-7 (0.5-1.0)	CV72685	SOIL	04/10/26 10:45

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	11:20
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72670

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: COMP-1

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Silver	< 0.39	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Arsenic	1.52	0.79	mg/Kg	1	04/16/26	CPP	SW6010D
Barium	39.3	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Beryllium	< 0.32	0.32	mg/Kg	1	04/16/26	CPP	SW6010D
Cadmium	< 0.39	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Chromium	10.7	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Copper	22.8	0.8	mg/kg	1	04/16/26	CPP	SW6010D
Mercury	< 0.03	0.03	mg/Kg	2	04/15/26	ZT	SW7471B
Nickel	7.99	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Lead	8.88	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Antimony	< 3.9	3.9	mg/Kg	1	04/16/26	CPP	SW6010D
Selenium	< 1.6	1.6	mg/Kg	1	04/16/26	CPP	SW6010D
Thallium	< 3.6	3.6	mg/Kg	1	04/16/26	CPP	SW6010D
Vanadium	27.4	0.39	mg/Kg	1	04/16/26	CPP	SW6010D
Zinc	27.1	0.8	mg/Kg	1	04/16/26	CPP	SW6010D
Percent Solid	88		%		04/13/26	CV	SW846-%Solid
Conductivity - Soil Matrix	46	5	umhos/cm	1	04/13/26	KG	SW9050A
Corrosivity	Negative		Pos/Neg	1	04/13/26	KL1	SW846-Corr
Flash Point	>200	200	Degree F	1	04/17/26	G	SW1010B
Ignitability	Passed	140	Degree F	1	04/17/26	G	SW846-Ignit
pH at 20.7C - Soil	6.29	1.00	pH Units	1	04/13/26 22:13	KL1	SW846 9045D
Reactivity Cyanide	< 5	5	mg/Kg	1	04/22/26	NP/GD	SW846 7.3.3.1/90
Reactivity Sulfide	< 20	20	mg/Kg	1	04/22/26	NP/GD	SW846 CH7
Reactivity	Negative		Pos/Neg	1	04/22/26	NP/GD	SW846-React
Extraction for SVOA SIM	Completed				04/24/26	A/U	SW3545A
Mercury Digestion	Completed				04/14/26	SM1/SM1	SW7471B
Extraction of ETPH	Completed				04/21/26	A/Z	SW3546

Ver 1

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: COMP-1

Phoenix I.D.: CV72670

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Soil Extraction for Herbicide	Completed				04/17/26	X/D	SW3546
Soil Extraction for PCB	Completed				04/22/26	SM1/C/U	SW3546
Soil Extraction for Pesticide	Completed				04/22/26	SM1/C/U	SW3546
Soil Extraction for SVOA	Completed				04/22/26	/U	SW3546
Paint Filter Test	Passed		PASS/FAIL		04/13/26	O	SW9095B
Total Metals Digest	Completed				04/14/26	C/AG/BF	SW3050B
Chlorinated Herbicides							
2,4,5-T	ND	140	ug/Kg	10	04/21/26	JRB	SW8151A
2,4,5-TP (Silvex)	ND	140	ug/Kg	10	04/21/26	JRB	SW8151A
2,4-D	ND	280	ug/Kg	10	04/21/26	JRB	SW8151A
2,4-DB	ND	2800	ug/Kg	10	04/21/26	JRB	SW8151A
Dalapon	ND	140	ug/Kg	10	04/21/26	JRB	SW8151A
Dicamba	ND	140	ug/Kg	10	04/21/26	JRB	SW8151A
Dichloroprop	ND	280	ug/Kg	10	04/21/26	JRB	SW8151A
Dinoseb	ND	280	ug/Kg	10	04/21/26	JRB	SW8151A
MCPA	ND	42000	ug/Kg	10	04/21/26	JRB	SW8151A
MCPP	ND	42000	ug/Kg	10	04/21/26	JRB	SW8151A
QA/QC Surrogates							
% DCAA	122		%	10	04/21/26	JRB	30 - 150 %
% DCAA (Confirmation)	82		%	10	04/21/26	JRB	30 - 150 %
TPH by GC (Extractable Products)							
Ext. Petroleum H.C. (C9-C36)	110	56	mg/Kg	1	04/22/26	JRB	CTETPH
Identification	**		mg/Kg	1	04/22/26	JRB	CTETPH
QA/QC Surrogates							
% Terphenyl-d14	58		%	1	04/22/26	JRB	50 - 150 %
% Tricosane(C23)	61		%	1	04/22/26	JRB	50 - 150 %
Polychlorinated Biphenyls							
PCB-1016	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1221	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1232	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1242	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1248	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1254	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1260	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1262	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
PCB-1268	ND	380	ug/Kg	10	04/23/26	SC	SW8082A
QA/QC Surrogates							
% DCBP	85		%	10	04/23/26	SC	30 - 150 %
% DCBP (Confirmation)	83		%	10	04/23/26	SC	30 - 150 %
% TCMX	69		%	10	04/23/26	SC	30 - 150 %
% TCMX (Confirmation)	78		%	10	04/23/26	SC	30 - 150 %
Pesticides							
4,4' -DDD	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
4,4' -DDE	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
4,4' -DDT	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
a-BHC	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Alachlor	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Aldrin	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
b-BHC	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
Chlordane	ND	38	ug/Kg	2	04/24/26	AW	SW8081B
d-BHC	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
Dieldrin	ND	3.8	ug/Kg	2	04/24/26	AW	SW8081B
Endosulfan I	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Endosulfan II	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Endosulfan sulfate	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Endrin	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Endrin aldehyde	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Endrin ketone	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
g-BHC	ND	1.5	ug/Kg	2	04/24/26	AW	SW8081B
Heptachlor	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Heptachlor epoxide	ND	7.6	ug/Kg	2	04/24/26	AW	SW8081B
Methoxychlor	ND	38	ug/Kg	2	04/24/26	AW	SW8081B
Toxaphene	ND	150	ug/Kg	2	04/24/26	AW	SW8081B
QA/QC Surrogates							
% DCBP	79		%	2	04/24/26	AW	30 - 150 %
% DCBP (Confirmation)	66		%	2	04/24/26	AW	30 - 150 %
% TCMX	61		%	2	04/24/26	AW	30 - 150 %
% TCMX (Confirmation)	61		%	2	04/24/26	AW	30 - 150 %
Semivolatiles							
1,2,4,5-Tetrachlorobenzene	ND	100	ug/Kg	1	04/23/26	KCA	SW8270E
1,2,4-Trichlorobenzene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
1,2-Dichlorobenzene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
1,2-Diphenylhydrazine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
1,3-Dichlorobenzene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
1,4-Dichlorobenzene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2,2'-Oxybis(1-Chloropropane)	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2,4,5-Trichlorophenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2,4,6-Trichlorophenol	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
2,4-Dichlorophenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2,4-Dimethylphenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2,4-Dinitrophenol	ND	300	ug/Kg	1	04/23/26	KCA	SW8270E
2,4-Dinitrotoluene	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
2,6-Dinitrotoluene	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
2-Chloronaphthalene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2-Chlorophenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2-Methylnaphthalene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2-Methylphenol (o-cresol)	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
2-Nitroaniline	ND	300	ug/Kg	1	04/23/26	KCA	SW8270E
2-Nitrophenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
3&4-Methylphenol (m&p-cresol)	ND	380	ug/Kg	1	04/23/26	KCA	SW8270E
3,3'-Dichlorobenzidine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
3-Nitroaniline	ND	300	ug/Kg	1	04/23/26	KCA	SW8270E
4,6-Dinitro-2-methylphenol	ND	300	ug/Kg	1	04/23/26	KCA	SW8270E
4-Bromophenyl phenyl ether	ND	380	ug/Kg	1	04/23/26	KCA	SW8270E
4-Chloro-3-methylphenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: COMP-1

Phoenix I.D.: CV72670

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
4-Chloroaniline	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
4-Chlorophenyl phenyl ether	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
4-Nitroaniline	ND	300	ug/Kg	1	04/23/26	KCA	SW8270E
4-Nitrophenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Acenaphthene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Acenaphthylene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Acetophenone	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Aniline	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
Anthracene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Benzidine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
Benzo(a)anthracene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Benzo(a)pyrene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Benzo(b)fluoranthene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Benzo(ghi)perylene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Benzo(k)fluoranthene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Benzoic acid	ND	760	ug/Kg	1	04/23/26	KCA	SW8270E
Benzyl butyl phthalate	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Bis(2-chloroethoxy)methane	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Bis(2-chloroethyl)ether	ND	380	ug/Kg	1	04/23/26	KCA	SW8270E
Bis(2-ethylhexyl)phthalate	ND	380	ug/Kg	1	04/23/26	KCA	SW8270E
Carbazole	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
Chrysene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Dibenz(a,h)anthracene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Dibenzofuran	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
Diethyl phthalate	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Dimethylphthalate	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Di-n-butylphthalate	ND	380	ug/Kg	1	04/23/26	KCA	SW8270E
Di-n-octylphthalate	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Fluoranthene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Fluorene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Hexachlorobenzene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Hexachlorobutadiene	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
Hexachlorocyclopentadiene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Hexachloroethane	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Indeno(1,2,3-cd)pyrene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Isophorone	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Naphthalene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Nitrobenzene	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
N-Nitrosodimethylamine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
N-Nitrosodi-n-propylamine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
N-Nitrosodiphenylamine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
Pentachloronitrobenzene	ND	140	ug/Kg	1	04/23/26	KCA	SW8270E
Pentachlorophenol	ND	380	ug/Kg	1	04/23/26	KCA	SW8270E
Phenanthrene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Phenol	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Pyrene	ND	260	ug/Kg	1	04/23/26	KCA	SW8270E
Pyridine	ND	200	ug/Kg	1	04/23/26	KCA	SW8270E
QA/QC Surrogates							
% 2,4,6-Tribromophenol	74		%	1	04/23/26	KCA	30 - 130 %

Ver 1

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: COMP-1

Phoenix I.D.: CV72670

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
% 2-Fluorobiphenyl	57		%	1	04/23/26	KCA	30 - 130 %
% 2-Fluorophenol	47		%	1	04/23/26	KCA	30 - 130 %
% Nitrobenzene-d5	59		%	1	04/23/26	KCA	30 - 130 %
% Phenol-d5	60		%	1	04/23/26	KCA	30 - 130 %
% Terphenyl-d14	56		%	1	04/23/26	KCA	30 - 130 %
1,4-Dioxane							
1,4-dioxane	ND	74	ug/Kg	1	04/28/26	MR	SW8270E (SIM)
QA/QC Surrogates							
% 2-Fluorobiphenyl	58		%	1	04/28/26	MR	30 - 130 %
% Nitrobenzene-d5	54		%	1	04/28/26	MR	30 - 130 %
% Terphenyl-d14	76		%	1	04/28/26	MR	30 - 130 %

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Paint Filter Test:
Pass = no free liquids were detected. Fail = free liquids were detected.

Per 1.4.6 of EPA method 8270D, 1,2-Diphenylhydrazine is unstable and readily converts to Azobenzene. Azobenzene is used for the calibration of 1,2-Diphenylhydrazine.

Corrosivity is based solely on the pH analysis performed above.

Ignitability is based solely on the results of the closed cup flashpoint analysis performed above. Passed is >140 degree F.

The regulatory hold time for pH is immediately. This pH was performed in the laboratory and may be considered outside of hold-time.

The reactivity, reported above, is based only on the EPA Interim Guidance for Reactive Cyanide. This method is no longer listed in the current version of SW-846.

The reactivity, reported above, is based only on the EPA Interim Guidance for Reactive Sulfide. This method is no longer listed in the current version of SW-846.

TPH Comment:
**Petroleum hydrocarbon chromatogram contains a multicomponent hydrocarbon distribution in the range of C19 to C36. The sample was quantitated against a C9-C36 alkane hydrocarbon standard.

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Phyllis Shiller, Laboratory Director
May 13, 2026
Reviewed and Released by: Greg Lawrence, Assistant Lab Director

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	10:00
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72671

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-1 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	17.5	0.8	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	81		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
May 13, 2026
Reviewed and Released by: Greg Lawrence, Assistant Lab Director

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	10:00
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72672

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-1 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	11.5	0.7	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	93		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director
May 13, 2026
Reviewed and Released by: Greg Lawrence, Assistant Lab Director

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	10:00
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72673

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-1 (2.0-2.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Field Extraction	Completed				04/10/26		SW5035A
Volatiles							
1,1,1,2-Tetrachloroethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,1,1-Trichloroethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,1,2,2-Tetrachloroethane	ND	3.4	ug/Kg	1	04/15/26	JLI	SW8260D
1,1,2-Trichloroethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,1-Dichloroethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,1-Dichloroethene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,1-Dichloropropene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2,3-Trichlorobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2,3-Trichloropropane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2,4-Trichlorobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2,4-Trimethylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2-Dibromo-3-chloropropane	ND	5.0	ug/Kg	1	04/15/26	JLI	SW8260D
1,2-Dibromoethane	ND	0.57	ug/Kg	1	04/15/26	JLI	SW8260D
1,2-Dichlorobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2-Dichloroethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,2-Dichloropropane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,3,5-Trimethylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,3-Dichlorobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,3-Dichloropropane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
1,4-Dichlorobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
2,2-Dichloropropane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
2-Chlorotoluene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
2-Hexanone	ND	29	ug/Kg	1	04/15/26	JLI	SW8260D
2-Isopropyltoluene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Phoenix I.D.: CV72673
Client ID: HA-1 (2.0-2.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
4-Chlorotoluene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
4-Methyl-2-pentanone	ND	29	ug/Kg	1	04/15/26	JLI	SW8260D
Acetone	ND	290	ug/Kg	1	04/15/26	JLI	SW8260D
Acrylonitrile	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Benzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Bromobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Bromochloromethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Bromodichloromethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Bromoform	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Bromomethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Carbon Disulfide	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Carbon tetrachloride	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Chlorobenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Chloroethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Chloroform	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Chloromethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
cis-1,2-Dichloroethene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
cis-1,3-Dichloropropene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Dibromochloromethane	ND	3.4	ug/Kg	1	04/15/26	JLI	SW8260D
Dibromomethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Dichlorodifluoromethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Ethylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Hexachlorobutadiene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Isopropylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
m&p-Xylene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Methyl Ethyl Ketone	ND	34	ug/Kg	1	04/15/26	JLI	SW8260D
Methyl t-butyl ether (MTBE)	ND	11	ug/Kg	1	04/15/26	JLI	SW8260D
Methylene chloride	ND	11	ug/Kg	1	04/15/26	JLI	SW8260D
Naphthalene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
n-Butylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
n-Propylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
o-Xylene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
p-Isopropyltoluene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
sec-Butylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Styrene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
tert-Butylbenzene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Tetrachloroethene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Tetrahydrofuran (THF)	ND	11	ug/Kg	1	04/15/26	JLI	SW8260D
Toluene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Total Xylenes	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
trans-1,2-Dichloroethene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
trans-1,3-Dichloropropene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
trans-1,4-dichloro-2-butene	ND	11	ug/Kg	1	04/15/26	JLI	SW8260D
Trichloroethene	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Trichlorofluoromethane	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
Trichlorotrifluoroethane	ND	11	ug/Kg	1	04/15/26	JLI	SW8260D
Vinyl chloride	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D
QA/QC Surrogates							
% 1,2-dichlorobenzene-d4	98		%	1	04/15/26	JLI	70 - 130 %

Ver 1

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-1 (2.0-2.5)

Phoenix I.D.: CV72673

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
% Bromofluorobenzene	90		%	1	04/15/26	JLI	70 - 130 %
% Dibromofluoromethane	108		%	1	04/15/26	JLI	70 - 130 %
% Toluene-d8	97		%	1	04/15/26	JLI	70 - 130 %
Oxygenates & Dioxane							
1,4-Dioxane	ND	100	ug/Kg	1	04/15/26	JLI	SW8260D (OXY)
Diethyl ether	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D (OXY)
Ethyl tert-butyl ether	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D (OXY)
tert-amyl methyl ether	ND	5.7	ug/Kg	1	04/15/26	JLI	SW8260D (OXY)

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Sample received was a solid, bulk, or caulk matrix; dry weight is assumed.
If sample is a trip blank, dry weight is assumed.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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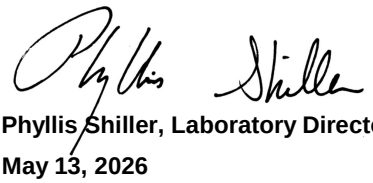

Phyllis Shiller, Laboratory Director

May 13, 2026

Reviewed and Released by: Greg Lawrence, Assistant Lab Director

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	9:35
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72674

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-2 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	23.0	0.9	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	77		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Phyllis Shiller, Laboratory Director
May 13, 2026
Reviewed and Released by: Greg Lawrence, Assistant Lab Director

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	9:35
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72675

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-2 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	23.1	0.7	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	84		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Phyllis Shiller, Laboratory Director
May 13, 2026
Reviewed and Released by: Greg Lawrence, Assistant Lab Director

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	9:20
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72676

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-3 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	20.9	0.8	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	78		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	9:20
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72677

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-3 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	20.7	0.9	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	77		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	9:00
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72678

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-4 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	37.1	0.9	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	81		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	9:00
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72679

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-4 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	28.2	0.8	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	80		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	8:50
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72680

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-5 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	22.6	0.8	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	84		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	8:50
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72681

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-5 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	20.2	0.7	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	93		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Analysis Report

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FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
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Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	11:10
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72682

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-6 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	44.8	0.7	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	95		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

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Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	11:10
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72683

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-6 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	40.5	0.7	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	93		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

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Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	10:45
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72684

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-7 (0.0-0.5)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	41.1	0.7	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	94		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

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Analysis Report

May 13, 2026

FOR: Attn Rodd Dryfoos
Eagle Environmental Inc.
150 Main Street Suite B
Bristol, CT 06010

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:	GR	04/10/26	10:45
Location Code:	EAGLEENV	Received by:	B	04/13/26	15:28
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	26-108.10T1				

Laboratory Data

SDG ID: GCV72670
Phoenix ID: CV72685

Project ID: QAM EDGEWOOD SCHOOL PRE-CHARACTERIZATION
Client ID: HA-7 (0.5-1.0)

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Copper	37.1	0.8	mg/kg	1	05/13/26	TH	SW6010D
Percent Solid	81		%		05/12/26	CV	SW846-%Solid
Total Metals Digest	Completed				05/12/26	C/AG	SW3050B

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

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QA/QC Report

May 13, 2026

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	Sample Result	Dup Result	Dup RPD	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 835194 (mg/kg), QC Sample No: CV72577 (CV72670)													
Mercury - Soil	BRL	0.03	<0.03	<0.03	NC	99.4	90.2	9.7	93.5	86.0	8.4	70 - 130	30
Comment:													
Additional Mercury Criteria: LCS acceptance range is 80-120% for aqueous and for soils the acceptance range is set by vendor limits. MS acceptance range is 75-125% for aqueous and 80-120% for soils.													
QA/QC Batch 840212 (mg/kg), QC Sample No: CV72671 (CV72671, CV72672, CV72674, CV72675, CV72676, CV72677, CV72678, CV72679, CV72680, CV72681, CV72682, CV72683, CV72684, CV72685)													
ICP Metals - Soil													
Copper	BRL	0.67	17.5	19.0	8.20	108	112	3.6	103			75 - 125	30
Comment:													
Additional Criteria: LCS acceptance range is 80-120% for aqueous and for soils the acceptance range is set by vendor limits. MS acceptance range 75-125%.													
QA/QC Batch 835277 (mg/kg), QC Sample No: CV73052 (CV72670)													
ICP Metals - Soil													
Antimony	BRL	3.3	<2.0	<3.6	NC	111	107	3.7	86.1			75 - 125	30
Arsenic	BRL	0.67	3.73	3.95	5.70	106	109	2.8	97.5			75 - 125	30
Barium	BRL	0.33	95.4	70.2	30.4	120	120	0.0	94.2			75 - 125	30
Beryllium	BRL	0.27	0.59	0.62	NC	114	117	2.6	106			75 - 125	30
Cadmium	BRL	0.33	<0.37	<0.36	NC	115	120	4.3	102			75 - 125	30
Chromium	BRL	0.33	21.8	21.7	0.50	118	120	1.7	108			75 - 125	30
Copper	BRL	0.67	26.5	27.4	3.30	117	120	2.5	110			75 - 125	30
Lead	BRL	0.33	57.1	57.2	0.20	114	116	1.7	99.4			75 - 125	30
Nickel	BRL	0.33	17.8	19.1	7.00	117	121	3.4	106			75 - 125	30
Selenium	BRL	1.3	<1.5	<1.4	NC	106	112	5.5	88.5			75 - 125	30
Silver	BRL	0.33	<0.37	<0.36	NC	113	117	3.5	104			75 - 125	30
Thallium	BRL	3.0	<0.8	<3.2	NC	114	120	5.1	103			75 - 125	30
Vanadium	BRL	0.33	38.9	38.9	0	120	123	2.5	111			75 - 125	30
Zinc	BRL	0.67	60.8	64.9	6.50	113	116	2.6	105			75 - 125	30
Comment:													
Additional Criteria: LCS acceptance range is 80-120% for aqueous and for soils the acceptance range is set by vendor limits. MS acceptance range 75-125%.													

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QA/QC Report

May 13, 2026

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	Sample Result	Dup Result	Dup RPD	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 836632 (mg/Kg), QC Sample No: CV72589 (CV72670)													
Reactivity Cyanide	BRL	5	<6	<5.5	NC	95.6						85 - 115	30
Reactivity Sulfide	BRL	20	<20	<20	NC	92.0						80 - 120	30
QA/QC Batch 835095 (umhos/cm), QC Sample No: CV65859 (CV72670)													
Conductivity - Soil Matrix	BRL	5	517	517	0	108						75 - 125	30
Comment:													
Additional criteria matrix spike acceptance range is 75-125%.													
QA/QC Batch 835149 (PH), QC Sample No: CV72581 (CV72670)													
pH			7.35	7.36	0.10	101						85 - 115	20
QA/QC Batch 835919 (Degree F), QC Sample No: CV75636 (CV72670)													
Flash Point			>200	>200	NC	103						75 - 125	30
Comment:													
Additional criteria matrix spike acceptance range is 75-125%.													

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QA/QC Report

May 13, 2026

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
QA/QC Batch 836524 (mg/Kg), QC Sample No: CV72670 (CV72670)											
TPH by GC (Extractable Products) - Soil											
Ext. Petroleum H.C. (C9-C36)	ND	50	79	75	5.2	64	77	18.4	60 - 120	30	
% Terphenyl-d14	64	%	71	66	7.3	56	59	5.2	50 - 150	30	
% Tricosane(C23)	67	%	71	67	5.8	50	53	5.8	60 - 150	30	
Comment:											
Additional surrogate criteria: LCS acceptance range is 60-120% Sur. acceptance range 50-150%.											
QA/QC Batch 836030 (ug/Kg), QC Sample No: CV72577 (CV72670)											
Chlorinated Herbicides - Soil											
2,4,5-T	ND	130	94	87	7.7				40 - 140	30	
2,4,5-TP (Silvex)	ND	130	100	90	10.5				40 - 140	30	
2,4-D	ND	250	102	74	31.8				40 - 140	30	r
2,4-DB	ND	2500	92	77	17.8				40 - 140	30	
Dalapon	ND	130	86	85	1.2				40 - 140	30	
Dicamba	ND	130	73	66	10.1				40 - 140	30	
Dichloroprop	ND	130	88	78	12.0				40 - 140	30	
Dinoseb	ND	130	90	83	8.1				40 - 140	30	
MCPA	ND	38000	91	87	4.5				40 - 140	30	
MCPP	ND	38000	82	73	11.6				40 - 140	30	
% DCAA (Surrogate Rec)	113	%	120	108	10.5				30 - 150	30	
% DCAA (Surrogate Rec) (Confirm	95	%	110	105	4.7				30 - 150	30	
Comment:											
8151 additional criteria: (LCS/LCSD)10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. LCS acceptance range is 40-140% MS acceptance range 30-150%.											
QA/QC Batch 836634 (ug/Kg), QC Sample No: CV72577 (CV72670)											
Polychlorinated Biphenyls - Soil											
PCB-1016	ND	33	85	84	1.2	77	77	0.0	40 - 140	30	
PCB-1221	ND	33							40 - 140	30	
PCB-1232	ND	33							40 - 140	30	
PCB-1242	ND	33							40 - 140	30	
PCB-1248	ND	33							40 - 140	30	
PCB-1254	ND	33							40 - 140	30	
PCB-1260	ND	33	85	85	0.0	80	81	1.2	40 - 140	30	
PCB-1262	ND	33							40 - 140	30	
PCB-1268	ND	33							40 - 140	30	
% DCBP (Surrogate Rec)	73	%	105	93	12.1	87	85	2.3	30 - 150	30	
% DCBP (Surrogate Rec) (Confirm	77	%	91	94	3.2	89	84	5.8	30 - 150	30	
% TCMX (Surrogate Rec)	71	%	89	87	2.3	84	81	3.6	30 - 150	30	
% TCMX (Surrogate Rec) (Confirm	70	%	89	91	2.2	85	86	1.2	30 - 150	30	

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
QA/QC Batch 836635 (ug/Kg), QC Sample No: CV72577 (CV72670)											
Pesticides - Soil											
4,4' -DDD	ND	1.7	85	82	3.6	72	63	13.3	40 - 140	30	
4,4' -DDE	ND	1.7	91	86	5.6	81	47	53.1	40 - 140	30	r
4,4' -DDT	ND	1.7	84	80	4.9	76	64	17.1	40 - 140	30	
a-BHC	ND	1.0	83	81	2.4	75	69	8.3	40 - 140	30	
Alachlor	ND	3.3	NA	NA	NC	NA	NA	NC	40 - 140	30	
Aldrin	ND	1.0	90	84	6.9	79	67	16.4	40 - 140	30	
b-BHC	ND	1.0	88	83	5.8	117	72	47.6	40 - 140	30	r
Chlordane	ND	33	86	83	3.6	87	72	18.9	40 - 140	30	
d-BHC	ND	3.3	75	72	4.1	65	52	22.2	40 - 140	30	
Dieldrin	ND	1.0	91	87	4.5	78	63	21.3	40 - 140	30	
Endosulfan I	ND	3.3	89	87	2.3	77	78	1.3	40 - 140	30	
Endosulfan II	ND	3.3	91	85	6.8	75	65	14.3	40 - 140	30	
Endosulfan sulfate	ND	3.3	84	79	6.1	71	70	1.4	40 - 140	30	
Endrin	ND	3.3	91	86	5.6	76	68	11.1	40 - 140	30	
Endrin aldehyde	ND	3.3	74	71	4.1	56	55	1.8	40 - 140	30	
Endrin ketone	ND	3.3	90	86	4.5	78	65	18.2	40 - 140	30	
g-BHC	ND	1.0	98	92	6.3	84	70	18.2	40 - 140	30	
Heptachlor	ND	3.3	87	82	5.9	73	68	7.1	40 - 140	30	
Heptachlor epoxide	ND	3.3	92	88	4.4	84	68	21.1	40 - 140	30	
Methoxychlor	ND	3.3	86	80	7.2	84	60	33.3	40 - 140	30	r
Toxaphene	ND	130	NA	NA	NC	NA	NA	NC	40 - 140	30	
% DCBP	79	%	87	81	7.1	74	57	26.0	30 - 150	30	
% DCBP (Confirmation)	55	%	57	54	5.4	54	75	32.6	30 - 150	30	r
% TCMX	83	%	88	81	8.3	72	72	0.0	30 - 150	30	
% TCMX (Confirmation)	76	%	76	71	6.8	70	71	1.4	30 - 150	30	
Comment:											
8081 additional criteria: (LCS/LCSD)10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. LCS acceptance range is 40-140% MS acceptance range 30-150%.											
QA/QC Batch 836637 (ug/kg), QC Sample No: CV72593 (CV72670)											
Semivolatiles - Soil											
1,2,4,5-Tetrachlorobenzene	ND	230	54	49	9.7	54	50	7.7	40 - 140	30	
1,2,4-Trichlorobenzene	ND	230	49	46	6.3	51	48	6.1	40 - 140	30	
1,2-Dichlorobenzene	ND	180	41	42	2.4	46	43	6.7	40 - 140	30	
1,2-Diphenylhydrazine	ND	230	61	57	6.8	65	55	16.7	40 - 140	30	
1,3-Dichlorobenzene	ND	230	39	39	0.0	44	42	4.7	40 - 140	30	l
1,4-Dichlorobenzene	ND	230	41	41	0.0	45	43	4.5	40 - 140	30	
2,2'-Oxybis(1-Chloropropane)	ND	230	39	38	2.6	41	40	2.5	40 - 140	30	l
2,4,5-Trichlorophenol	ND	230	69	62	10.7	72	62	14.9	40 - 140	30	
2,4,6-Trichlorophenol	ND	130	67	63	6.2	67	59	12.7	30 - 130	30	
2,4-Dichlorophenol	ND	130	68	61	10.9	66	61	7.9	30 - 130	30	
2,4-Dimethylphenol	ND	230	72	64	11.8	60	59	1.7	30 - 130	30	
2,4-Dinitrophenol	ND	230	78	77	1.3	81	72	11.8	30 - 130	30	
2,4-Dinitrotoluene	ND	130	72	70	2.8	79	68	15.0	30 - 130	30	
2,6-Dinitrotoluene	ND	130	69	67	2.9	73	65	11.6	40 - 140	30	
2-Chloronaphthalene	ND	230	58	52	10.9	58	52	10.9	40 - 140	30	
2-Chlorophenol	ND	230	53	49	7.8	54	51	5.7	30 - 130	30	
2-Methylnaphthalene	ND	230	62	56	10.2	62	57	8.4	40 - 140	30	
2-Methylphenol (o-cresol)	ND	230	57	52	9.2	57	52	9.2	40 - 140	30	
2-Nitroaniline	ND	330	110	104	5.6	112	101	10.3	40 - 140	30	
2-Nitrophenol	ND	230	66	60	9.5	65	64	1.6	40 - 140	30	

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
3&4-Methylphenol (m&p-cresol)	ND	230	67	58	14.4	65	58	11.4	30 - 130	30	
3,3'-Dichlorobenzidine	ND	130	81	79	2.5	52	43	18.9	40 - 140	30	
3-Nitroaniline	ND	330	80	77	3.8	85	72	16.6	40 - 140	30	
4,6-Dinitro-2-methylphenol	ND	230	78	75	3.9	83	73	12.8	30 - 130	30	
4-Bromophenyl phenyl ether	ND	230	65	61	6.3	68	58	15.9	40 - 140	30	
4-Chloro-3-methylphenol	ND	230	71	64	10.4	71	63	11.9	30 - 130	30	
4-Chloroaniline	ND	230	68	64	6.1	69	55	22.6	40 - 140	30	
4-Chlorophenyl phenyl ether	ND	230	61	58	5.0	66	57	14.6	40 - 140	30	
4-Nitroaniline	ND	230	71	68	4.3	75	66	12.8	40 - 140	30	
4-Nitrophenol	ND	230	90	82	9.3	94	81	14.9	30 - 130	30	
Acenaphthene	ND	230	60	55	8.7	62	54	13.8	30 - 130	30	
Acenaphthylene	ND	130	54	50	7.7	56	49	13.3	40 - 140	30	
Acetophenone	ND	230	50	48	4.1	53	50	5.8	40 - 140	30	
Aniline	ND	330	50	48	4.1	33	28	16.4	40 - 140	30	m
Anthracene	ND	230	65	62	4.7	69	60	14.0	40 - 140	30	
Benzidine	ND	330	17	52	101.4	<10	<10	NC	40 - 140	30	l,m,r
Benzo(a)anthracene	ND	230	67	62	7.8	71	61	15.2	40 - 140	30	
Benzo(a)pyrene	ND	130	66	62	6.3	69	61	12.3	40 - 140	30	
Benzo(b)fluoranthene	ND	160	65	62	4.7	69	60	14.0	40 - 140	30	
Benzo(ghi)perylene	ND	230	62	60	3.3	66	59	11.2	40 - 140	30	
Benzo(k)fluoranthene	ND	230	65	61	6.3	68	60	12.5	40 - 140	30	
Benzoic Acid	ND	670	81	75	7.7	82	72	13.0	30 - 130	30	
Benzyl butyl phthalate	ND	230	76	72	5.4	83	71	15.6	40 - 140	30	
Bis(2-chloroethoxy)methane	ND	230	54	49	9.7	55	50	9.5	40 - 140	30	
Bis(2-chloroethyl)ether	ND	130	44	41	7.1	45	43	4.5	40 - 140	30	
Bis(2-ethylhexyl)phthalate	ND	230	79	73	7.9	85	72	16.6	40 - 140	30	
Carbazole	ND	230	67	64	4.6	71	61	15.2	40 - 140	30	
Chrysene	ND	230	64	61	4.8	69	59	15.6	40 - 140	30	
Dibenz(a,h)anthracene	ND	130	66	63	4.7	71	62	13.5	40 - 140	30	
Dibenzofuran	ND	230	61	57	6.8	64	56	13.3	40 - 140	30	
Diethyl phthalate	ND	230	68	63	7.6	71	62	13.5	40 - 140	30	
Dimethylphthalate	ND	230	66	61	7.9	69	60	14.0	40 - 140	30	
Di-n-butylphthalate	ND	670	72	68	5.7	75	65	14.3	40 - 140	30	
Di-n-octylphthalate	ND	230	85	80	6.1	92	79	15.2	40 - 140	30	
Fluoranthene	ND	230	65	63	3.1	71	60	16.8	40 - 140	30	
Fluorene	ND	230	64	60	6.5	67	58	14.4	40 - 140	30	
Hexachlorobenzene	ND	130	65	61	6.3	68	58	15.9	40 - 140	30	
Hexachlorobutadiene	ND	230	46	44	4.4	49	47	4.2	40 - 140	30	
Hexachlorocyclopentadiene	ND	230	36	34	5.7	38	36	5.4	40 - 140	30	l,m
Hexachloroethane	ND	130	41	42	2.4	46	45	2.2	40 - 140	30	
Indeno(1,2,3-cd)pyrene	ND	230	66	64	3.1	70	63	10.5	40 - 140	30	
Isophorone	ND	130	51	48	6.1	51	46	10.3	40 - 140	30	
Naphthalene	ND	230	49	46	6.3	50	47	6.2	40 - 140	30	
Nitrobenzene	ND	130	51	48	6.1	53	50	5.8	40 - 140	30	
N-Nitrosodimethylamine	ND	230	32	32	0.0	34	32	6.1	40 - 140	30	l,m
N-Nitrosodi-n-propylamine	ND	130	53	49	7.8	54	49	9.7	40 - 140	30	
N-Nitrosodiphenylamine	ND	130	60	56	6.9	60	52	14.3	40 - 140	30	
Pentachloronitrobenzene	ND	230	72	71	1.4	77	67	13.9	40 - 140	30	
Pentachlorophenol	ND	230	60	60	0.0	65	58	11.4	30 - 130	30	
Phenanthrene	ND	130	64	61	4.8	67	58	14.4	40 - 140	30	
Phenol	ND	230	58	51	12.8	58	50	14.8	30 - 130	30	
Pyrene	ND	230	64	61	4.8	69	59	15.6	30 - 130	30	
Pyridine	ND	230	27	26	3.8	20	20	0.0	40 - 140	30	l,m

Parameter	Blank	Blk RL		LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
% 2,4,6-Tribromophenol	95	%		74	69	7.0	75	65	14.3	30 - 130	30	
% 2-Fluorobiphenyl	70	%		56	51	9.3	57	50	13.1	30 - 130	30	
% 2-Fluorophenol	69	%		47	47	0.0	49	47	4.2	30 - 130	30	
% Nitrobenzene-d5	67	%		51	48	6.1	51	49	4.0	30 - 130	30	
% Phenol-d5	73	%		56	52	7.4	56	52	7.4	30 - 130	30	
% Terphenyl-d14	75	%		61	59	3.3	65	56	14.9	30 - 130	30	

Comment:

Additional 8270 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)

QA/QC Batch 837273 (ug/kg), QC Sample No: CV72670 (CV72670)

Polynuclear Aromatic HC - Soil

1,4-dioxane	ND	67		50	51	2.0	49	47	4.2	30 - 130	30	
% 2-Fluorobiphenyl	56	%		69	57	19.0	59	59	0.0	30 - 130	30	
% Nitrobenzene-d5	58	%		70	60	15.4	59	61	3.3	30 - 130	30	
% Terphenyl-d14	70	%		89	71	22.5	71	71	0.0	30 - 130	30	

Comment:

Additional 8270 criteria:20% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)

QA/QC Batch 835715 (ug/kg), QC Sample No: CV72815 (CV72673)

Volatiles - Soil (Low Level)

1,1,1,2-Tetrachloroethane	ND	5.0		101	102	1.0	103	105	1.9	70 - 130	20	
1,1,1-Trichloroethane	ND	5.0		105	107	1.9	107	104	2.8	70 - 130	20	
1,1,2,2-Tetrachloroethane	ND	3.0		93	96	3.2	96	95	1.0	70 - 130	20	
1,1,2-Trichloroethane	ND	5.0		99	101	2.0	97	98	1.0	70 - 130	20	
1,1-Dichloroethane	ND	5.0		96	98	2.1	97	94	3.1	70 - 130	20	
1,1-Dichloroethene	ND	5.0		113	117	3.5	120	119	0.8	70 - 130	20	
1,1-Dichloropropene	ND	5.0		100	100	0.0	95	92	3.2	70 - 130	20	
1,2,3-Trichlorobenzene	ND	5.0		104	98	5.9	93	90	3.3	70 - 130	20	
1,2,3-Trichloropropane	ND	5.0		91	92	1.1	64	66	3.1	70 - 130	20	m
1,2,4-Trichlorobenzene	ND	5.0		100	96	4.1	90	87	3.4	70 - 130	20	
1,2,4-Trimethylbenzene	ND	1.0		101	101	0.0	101	99	2.0	70 - 130	20	
1,2-Dibromo-3-chloropropane	ND	5.0		105	104	1.0	95	93	2.1	70 - 130	20	
1,2-Dibromoethane	ND	5.0		100	100	0.0	93	95	2.1	70 - 130	20	
1,2-Dichlorobenzene	ND	5.0		99	100	1.0	97	97	0.0	70 - 130	20	
1,2-Dichloroethane	ND	5.0		102	106	3.8	103	102	1.0	70 - 130	20	
1,2-Dichloropropane	ND	5.0		98	100	2.0	95	95	0.0	70 - 130	20	
1,3,5-Trimethylbenzene	ND	1.0		103	103	0.0	104	102	1.9	70 - 130	20	
1,3-Dichlorobenzene	ND	5.0		98	98	0.0	94	93	1.1	70 - 130	20	
1,3-Dichloropropane	ND	5.0		98	100	2.0	96	96	0.0	70 - 130	20	
1,4-Dichlorobenzene	ND	5.0		99	97	2.0	94	93	1.1	70 - 130	20	
1,4-dioxane	ND	100		90	94	4.3	94	96	2.1	70 - 130	20	
2,2-Dichloropropane	ND	5.0		105	107	1.9	101	97	4.0	70 - 130	20	
2-Chlorotoluene	ND	5.0		99	99	0.0	98	96	2.1	70 - 130	20	
2-Hexanone	ND	25		96	93	3.2	82	83	1.2	70 - 130	20	
2-Isopropyltoluene	ND	5.0		105	107	1.9	106	104	1.9	70 - 130	20	
4-Chlorotoluene	ND	5.0		99	96	3.1	93	92	1.1	70 - 130	20	
4-Methyl-2-pentanone	ND	25		105	104	1.0	95	92	3.2	70 - 130	20	
Acetone	ND	10		94	92	2.2	96	89	7.6	70 - 130	20	
Acrylonitrile	ND	5.0		97	92	5.3	78	82	5.0	70 - 130	20	
Benzene	ND	1.0		101	103	2.0	100	98	2.0	70 - 130	20	
Bromobenzene	ND	5.0		103	103	0.0	101	100	1.0	70 - 130	20	
Bromochloromethane	ND	5.0		98	100	2.0	100	100	0.0	70 - 130	20	

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
Bromodichloromethane	ND	5.0	101	103	2.0	100	99	1.0	70 - 130	20	
Bromoform	ND	5.0	96	99	3.1	96	96	0.0	70 - 130	20	
Bromomethane	ND	5.0	114	118	3.4	121	119	1.7	70 - 130	20	
Carbon Disulfide	ND	5.0	112	113	0.9	117	114	2.6	70 - 130	20	
Carbon tetrachloride	ND	5.0	104	105	1.0	106	102	3.8	70 - 130	20	
Chlorobenzene	ND	5.0	99	99	0.0	98	98	0.0	70 - 130	20	
Chloroethane	ND	5.0	126	129	2.4	138	135	2.2	70 - 130	20	m
Chloroform	ND	5.0	96	96	0.0	97	95	2.1	70 - 130	20	
Chloromethane	ND	5.0	95	95	0.0	85	80	6.1	70 - 130	20	
cis-1,2-Dichloroethene	ND	5.0	103	104	1.0	103	100	3.0	70 - 130	20	
cis-1,3-Dichloropropene	ND	5.0	106	109	2.8	101	99	2.0	70 - 130	20	
Dibromochloromethane	ND	3.0	97	98	1.0	97	98	1.0	70 - 130	20	
Dibromomethane	ND	5.0	104	104	0.0	99	99	0.0	70 - 130	20	
Dichlorodifluoromethane	ND	5.0	109	108	0.9	89	84	5.8	70 - 130	20	
Diethyl ether	ND	5.0	105	110	4.7	120	116	3.4	70 - 130	20	
Ethyl tert-butyl ether	ND	5.0	104	106	1.9	102	100	2.0	70 - 130	20	
Ethylbenzene	ND	1.0	101	102	1.0	103	102	1.0	70 - 130	20	
Hexachlorobutadiene	ND	5.0	106	100	5.8	100	96	4.1	70 - 130	20	
Isopropylbenzene	ND	1.0	106	105	0.9	105	102	2.9	70 - 130	20	
m&p-Xylene	ND	2.0	101	100	1.0	101	101	0.0	70 - 130	20	
Methyl ethyl ketone	ND	5.0	92	90	2.2	82	80	2.5	70 - 130	20	
Methyl t-butyl ether (MTBE)	ND	1.0	100	104	3.9	98	97	1.0	70 - 130	20	
Methylene chloride	ND	5.0	99	102	3.0	133	130	2.3	70 - 130	20	m
Naphthalene	ND	5.0	110	108	1.8	96	97	1.0	70 - 130	20	
n-Butylbenzene	ND	1.0	106	102	3.8	103	100	3.0	70 - 130	20	
n-Propylbenzene	ND	1.0	104	101	2.9	103	100	3.0	70 - 130	20	
o-Xylene	ND	2.0	102	101	1.0	102	101	1.0	70 - 130	20	
p-Isopropyltoluene	ND	1.0	105	104	1.0	104	102	1.9	70 - 130	20	
sec-Butylbenzene	ND	1.0	103	101	2.0	102	100	2.0	70 - 130	20	
Styrene	ND	5.0	99	99	0.0	97	97	0.0	70 - 130	20	
tert-amyl methyl ether	ND	5.0	108	110	1.8	105	107	1.9	70 - 130	20	
tert-Butylbenzene	ND	1.0	106	107	0.9	107	105	1.9	70 - 130	20	
Tetrachloroethene	ND	5.0	104	102	1.9	102	99	3.0	70 - 130	20	
Tetrahydrofuran (THF)	ND	5.0	91	91	0.0	89	90	1.1	70 - 130	20	
Toluene	ND	1.0	104	105	1.0	103	101	2.0	70 - 130	20	
trans-1,2-Dichloroethene	ND	5.0	113	114	0.9	119	117	1.7	70 - 130	20	
trans-1,3-Dichloropropene	ND	5.0	111	112	0.9	102	102	0.0	70 - 130	20	
trans-1,4-dichloro-2-butene	ND	5.0	106	105	0.9	92	93	1.1	70 - 130	20	
Trichloroethene	ND	5.0	106	105	0.9	103	100	3.0	70 - 130	20	
Trichlorofluoromethane	ND	5.0	115	117	1.7	125	122	2.4	70 - 130	20	
Trichlorotrifluoroethane	ND	5.0	126	125	0.8	137	131	4.5	70 - 130	20	m
Vinyl chloride	ND	5.0	116	118	1.7	117	117	0.0	70 - 130	20	
% 1,2-dichlorobenzene-d4	94	%	104	103	1.0	101	103	2.0	70 - 130	20	
% Bromofluorobenzene	101	%	97	99	2.0	95	97	2.1	70 - 130	20	
% Dibromofluoromethane	97	%	96	96	0.0	97	96	1.0	70 - 130	20	
% Toluene-d8	95	%	101	102	1.0	101	101	0.0	70 - 130	20	

Comment:

Additional 8260 criteria: 10% of LCS/LCSD compounds can be outside of acceptance criteria as long as recovery is 40-160%.

l = This parameter is outside laboratory LCS/LCSD specified recovery limits.
m = This parameter is outside laboratory MS/MSD specified recovery limits.
r = This parameter is outside laboratory RPD specified recovery limits.

QA/QC Data

SDG I.D.: GCV72670

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference
(ISO) - Isotope Dilution

Phyllis Shiller, Laboratory Director
May 13, 2026

Wednesday, May 13, 2026

Criteria: CT: GAM, RC

State: CT

Sample Criteria Exceedances Report

GCV72670 - EAGLEENV

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units

*** No Data to Display ***

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Bureau of Water Protection and Land Reuse
Remediation Division

REASONABLE CONFIDENCE PROTOCOL
ABORATORY ANALYSIS QA/QC CERTIFICATION FORM

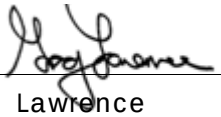
Laboratory Name Phoenix Environmental Labs, Inc.	Client Name Eagle Environmental Inc.
Project Location QA+M EDGEWOOD SCHOOL PRE-CHARACTERIZATIO	Project No.
Sampling Date(s) 4/10/2026	Laboratory Sample ID(s): CV72670,

LIST RCP METHODS USED (e.g., 8260,8270, 6010, 7470/7471, 8081, 8082, 8151, 8260, 8270, ETPH

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the CT DEEP method-specific	☑ Yes ☐ No
1A	Were the method-specified preservation and holding time requirements met?	☑ Yes ☐ No
1B	VPH and EPH methods onl Was the VPH or EPH method conducted without significant modifications (see respective RCPs)	☐ Yes ☐ No ☑ NA
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	☑ Yes ☐ No
3	Were samples received at an appropriate temperature (≤6° C)? *If samples were received by the laboratory on the same day of collection and were stored and transported to the laboratory on ice, cooler temperatures above 6ºC are*	☑ Yes ☐ No ☐ NA
4	Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents acheived? See Sections: ETPH Narration, Herbicide Narration, SVOA	☐ Yes ☑ No
5	Were reporting limits / limits of quantitation specified or referenced on the chain-of-custo	☑ Yes ☐ No
5a	Were these reporting limits / limits of quantitation met?	☑ Yes ☐ No
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the	☑ Yes ☐ No
7	Are project-specific matrix spikes and laboratory duplicates included in this data set for applicable RCPs?	☑ Yes ☐ No

Notes: For all questions to which the response was “No” (with the exception of question #7), additional information must be
provided in an attached narrative. If the answer to question #1, #1A, or #1B is “No”, the data package does not meet

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete.

Authorized Signature:  Position: Assistant Lab Director

Printed Name: Greg Lawrence Date: Wednesday, May 13, 2026

Name of Laboratory Phoenix Environmental Laboratory, Inc.

This certification form is to be used for RCP methods only.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

RCP Certification Report

May 13, 2026

SDG I.D.: GCV72670

Cyanide Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? Yes.

Instrument:

LACHAT 04/22/26-1 Nicholas Pappas, Greg Danielewski, Chemist 04/22/26

CV72670

The samples were distilled in accordance with the method.
The initial calibration met criteria.
The calibration check standards (ICV,CCV) met criteria.
The initial and continuing calibration blanks (ICB,CCB) met criteria.

The method blank, laboratory control sample (LCS), and matrix spike (MS) were distilled with the samples.

QC (Batch Specific):

Batch 836632 (CV72589)

CV72670

All LCS recoveries were within 80 - 120 with the following exceptions: None.
Additional: MS acceptance range is 75-125%.

ETPH Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? No.

QC Batch 836524 (Samples: CV72670): -----

The MSD recovery for one surrogate is below the lower range. (% Tricosane(C23))

Instrument:

AU-FID1 04/22/26-1 Jeff Bucko, Chemist 04/22/26

CV72670 (1X)

The initial calibration (ET_319I) RSD for the compound list was less than 30% except for the following compounds: None.
As per section 7.2.3, a discrimination check standard was run (422A003_1) and contained the following outliers: None.
The continuing calibration %D for the compound list was less than 30% except for the following compounds:None.

QC (Site Specific):

Batch 836524 (CV72670)

CV72670

All LCS recoveries were within 60 - 120 with the following exceptions: None.
All LCSD recoveries were within 60 - 120 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
All MS recoveries were within 50 - 150 with the following exceptions: None.
All MSD recoveries were within 50 - 150 with the following exceptions: None.
All MS/MSD RPDs were less than 30% with the following exceptions: None.
Additional surrogate criteria: LCS acceptance range is 60-120% Sur. acceptance range 50-150%.

Herbicide Narration

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NY # 11301

RCP Certification Report

May 13, 2026

SDG I.D.: GCV72670

Herbicide Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? No.

QC Batch 836030 (Samples: CV72670): -----

The LCS/LCSD RPD exceeds the method criteria for one analyte, but this analyte was not reported in the sample(s) so no variability is suspected. (2,4-D)

Instrument:

AU-ECD2 04/20/26-1 Jeff Bucko, Chemist 04/20/26

CV72670 (10X)

The initial calibration (HRBD05AI) RSD for the compound list was less than 20% except for the following compounds: None.
The initial calibration (HRBD05BI) RSD for the compound list was less than 20% except for the following compounds: None.
The continuing calibration %D for the compound list was less than 15% except for the following compounds:
Samples: CV72670
Preceding CC 420B039 - Dicamba (4) -21%L (20%)
Succeeding CC 420B050 - Dinoseb 24%H (20%)

QC (Batch Specific):

Batch 836030 (CV72577)

CV72670

All LCS recoveries were within 40 - 140 with the following exceptions: None.
All LCSD recoveries were within 40 - 140 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: 2,4-D(31.8%)
8151 additional criteria: (LCS/LCSD)10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. LCS acceptance range is 40-140% MS acceptance range 30-150%.

ICP Metals Narration

Were all QA/QC performance criteria specified in the analytical method achieved? Yes.

Instrument:

ARCOS-3 04/16/26 10:51 Cindy Pearce, Chemist 04/16/26

CV72670

TThe initial calibration met criteria and the linear range is defined daily by the calibration range.
The Low-Level Calibration Verification (LLCV) met criteria.
The following Initial Calibration Verification (ICV) compounds did not meet criteria: None.
The following Initial Calibration Blank (ICB) compounds did not meet criteria: None.
The following Spectral Interference Check compounds did not meet criteria: None.
The following Continuing Calibration Verification (CCV) compounds did not meet criteria: None.
The following Continuing Calibration Blank (CCB) compounds did not meet criteria: None.

ARCOS-3 05/12/26 12:50 Tina Hall, Chemist 05/12/26

CV72671, CV72672, CV72674, CV72675, CV72676, CV72677, CV72678, CV72679, CV72680, CV72681, CV72682, CV72683, CV72684, CV72685

TThe initial calibration met criteria and the linear range is defined daily by the calibration range.
The Low-Level Calibration Verification (LLCV) met criteria.
The following Initial Calibration Verification (ICV) compounds did not meet criteria: None.
The following Initial Calibration Blank (ICB) compounds did not meet criteria: None.

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Certification Report

May 13, 2026

SDG I.D.: GCV72670

ICP Metals Narration

The following Spectral Interference Check compounds did not meet criteria: None.
The following Continuing Calibration Verification (CCV) compounds did not meet criteria: None.
The following Continuing Calibration Blank (CCB) compounds did not meet criteria: None.

QC (Batch Specific):

Batch 835277 (CV73052)

CV72670

All LCS recoveries were within 75 - 125 with the following exceptions: None.
All LCSD recoveries were within 75 - 125 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
Additional Criteria: LCS acceptance range is 80-120% for aqueous and for soils the acceptance range is set by vendor limits. MS acceptance range 75-125%.

QC (Site Specific):

Batch 840212 (CV72671)

CV72671, CV72672, CV72674, CV72675, CV72676, CV72677, CV72678, CV72679, CV72680, CV72681, CV72682, CV72683, CV72684, CV72685

All LCS recoveries were within 75 - 125 with the following exceptions: None.
All LCSD recoveries were within 75 - 125 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
All MS recoveries were within 75 - 125 with the following exceptions: None.
Additional Criteria: LCS acceptance range is 80-120% for aqueous and for soils the acceptance range is set by vendor limits. MS acceptance range 75-125%.

PCB Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? Yes.

Instrument:

AU-ECD5 04/23/26-1 Saadia Chudary, Chemist 04/23/26

CV72670 (10X)

The initial calibration (PC0420AI) RSD for the compound list was less than 20% except for the following compounds: None.
The initial calibration (PC0420BI) RSD for the compound list was less than 20% except for the following compounds: None.
The continuing calibration %D for the compound list was less than 20% except for the following compounds:None.

QC (Batch Specific):

Batch 836634 (CV72577)

CV72670

All LCS recoveries were within 40 - 140 with the following exceptions: None.
All LCSD recoveries were within 40 - 140 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.

PEST Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? Yes.

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RCP Certification Report

May 13, 2026

SDG I.D.: GCV72670

PEST Narration

Instrument:

AU-ECD4 04/23/26-1 Adam Werner, Chemist 04/23/26

CV72670 (2X)

The initial calibration (PS310AI) RSD for the compound list was less than 20% except for the following compounds: None.
The initial calibration (PS310BI) RSD for the compound list was less than 20% except for the following compounds: None.
The Endrin and DDT breakdown does not exceed 15% except for the following compounds:None.
The Endrin and DDT breakdown does not exceed the maximum of 20% except for the following compounds:None.
The continuing calibration %D for the compound list was less than 20% except for the following compounds:None.

QC (Batch Specific):

Batch 836635 (CV72577)

CV72670

All LCS recoveries were within 40 - 140 with the following exceptions: None.
All LCSD recoveries were within 40 - 140 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
8081 additional criteria: (LCS/LCSD)10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. LCS acceptance range is 40-140% MS acceptance range 30-150%.

SVOA Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? No.

QC Batch 836637 (Samples: CV72670): -----

The LCS is below the lower range. A low bias for this analyte is possible. (Benzidine)

The LCS/LCSD One or more analytes is below the lower range. A low bias for these analytes is possible. (1,3-Dichlorobenzene, 2,2''-Oxybis(1-Chloropropane))

The LCS/LCSD RPD exceeds the method criteria for one analyte, but this analyte was not reported in the sample(s) so no variability is suspected. (Benzidine)

The QC recoveries for one or more analytes is below the lower range. A low bias for these analyte is possible. (Hexachlorocyclopentadiene, N-Nitrosodimethylamine, Pyridine)

Instrument:

CHEM22 04/22/26-2 Robert Looney, Chemist 04/22/26

CV72670 (1X)

Initial Calibration Evaluation (CHEM22/x22_0414_SV):
100% of target compounds met criteria.
The following compounds had %RSDs >20%: None.
The following compounds did not meet recommended response factors: 2-Nitrophenol 0.065 (0.1), Hexachlorobenzene 0.094 (0.1)

Continuing Calibration Verification (CHEM22/0422_33-x22_0414_SV):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
95% of target compounds met criteria.

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NY # 11301

RCP Certification Report

May 13, 2026

SDG I.D.: GCV72670

SVOA Narration

The following compounds did not meet % deviation criteria: 2-Nitrophenol 22%H (20%), Di-n-octylphthalate 25%H (20%), N-Nitrosodimethylamine 27%L (20%), Pyridine 26%L (20%)
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: 2-Nitrophenol 0.079 (0.1), Hexachlorobenzene 0.089 (0.1)

QC (Batch Specific):

Batch 836637 (CV72593)

CV72670

All LCS recoveries were within 40 - 140 with the following exceptions: 1,3-Dichlorobenzene(39%), 2,2'-Oxybis(1-Chloropropane)(39%), Benzidine(17%), Hexachlorocyclopentadiene(36%), N-Nitrosodimethylamine(32%), Pyridine(27%)
All LCSD recoveries were within 40 - 140 with the following exceptions: 1,3-Dichlorobenzene(39%), 2,2'-Oxybis(1-Chloropropane)(38%), Hexachlorocyclopentadiene(34%), N-Nitrosodimethylamine(32%), Pyridine(26%)
All LCS/LCSD RPDs were less than 30% with the following exceptions: Benzidine(101.4%)
Additional 8270 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)

QC (Site Specific):

Batch 837273 (CV72670)

CV72670

All LCS recoveries were within 30 - 130 with the following exceptions: None.
All LCSD recoveries were within 30 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
All MS recoveries were within 30 - 130 with the following exceptions: None.
All MSD recoveries were within 30 - 130 with the following exceptions: None.
All MS/MSD RPDs were less than 30% with the following exceptions: None.
Additional 8270 criteria:20% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)
Additional 8270 criteria: 10% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)

SVOASIM Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? Yes.

Instrument:

CHEM33 04/27/26-2 Matt Richard, Chemist 04/27/26

CV72670 (1X, 1000X)

Initial Calibration Evaluation (CHEM33/33_0308_diox):
100% of target compounds met criteria.
The following compounds had %RSDs >20%: None.
The following compounds did not meet recommended response factors: None.

Continuing Calibration Verification (CHEM33/0427_33-33_0308_diox):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
100% of target compounds met criteria.
The following compounds did not meet % deviation criteria: None.

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Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

RCP Certification Report

May 13, 2026

SDG I.D.: GCV72670

SVOASIM Narration

The following compounds did not meet maximum % deviations: None.
The following compounds did not meet recommended response factors: None.

QC (Batch Specific):

Batch 836637 (CV72593)

CV72670

All LCS recoveries were within 40 - 140 with the following exceptions: 1,3-Dichlorobenzene(39%), 2,2'-Oxybis(1-Chloropropane)(39%), Benzidine(17%), Hexachlorocyclopentadiene(36%), N-Nitrosodimethylamine(32%), Pyridine(27%)
All LCSD recoveries were within 40 - 140 with the following exceptions: 1,3-Dichlorobenzene(39%), 2,2'-Oxybis(1-Chloropropane)(38%), Hexachlorocyclopentadiene(34%), N-Nitrosodimethylamine(32%), Pyridine(26%)
All LCS/LCSD RPDs were less than 30% with the following exceptions: Benzidine(101.4%)
Additional 8270 criteria:20% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)

QC (Site Specific):

Batch 837273 (CV72670)

CV72670

All LCS recoveries were within 30 - 130 with the following exceptions: None.
All LCSD recoveries were within 30 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 30% with the following exceptions: None.
All MS recoveries were within 30 - 130 with the following exceptions: None.
All MSD recoveries were within 30 - 130 with the following exceptions: None.
All MS/MSD RPDs were less than 30% with the following exceptions: None.
Additional 8270 criteria:20% of compounds can be outside of acceptance criteria as long as recovery is at least 10%. (Acid surrogates acceptance range for aqueous samples: 15-110%, for soils 30-130%)

VOA Narration

Were all QA/QC performance criteria specified in the Reasonable Confidence Protocol documents achieved? Yes.

Instrument:

CHEM18 04/15/26-1 Jane Li, Chemist 04/15/26

CV72673 (1X)

Initial Calibration Evaluation (CHEM18/8260_040826):
99% of target compounds met criteria.
The following compounds had %RSDs >20%: Acetone 27% (20%)
The following compounds did not meet Table 4 recommended minimum response factors: None.

Continuing Calibration Verification (CHEM18/0415_01-8260_040826):
Internal standard areas were within 50 to 200% of the initial calibration with the following exceptions: None.
100% of target compounds met criteria.
The following compounds did not meet % deviation criteria: None.
The following compounds did not meet maximum % deviations: None.
The following compounds did not meet Table 4 recommended minimum response factors: None.

QC (Batch Specific):

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Tel. (860) 645-1102 Fax (860) 645-0823

NY # 11301

RCP Certification Report

May 13, 2026

SDG I.D.: GCV72670

VOA Narration

Batch 835715 (CV72815) CHEM18 4/15/2026-1

CV72673(1X)

All LCS recoveries were within 70 - 130 with the following exceptions: None.
All LCSD recoveries were within 70 - 130 with the following exceptions: None.
All LCS/LCSD RPDs were less than 20% with the following exceptions: None.
Additional 8260 criteria: 10% of LCS/LCSD compounds can be outside of acceptance criteria as long as recovery is 40-160%.

Temperature Narration

The samples were received at 1.5C with cooling initiated.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Temp 1.5 Cooler: Yes ☑ No ☐ Coolant: IPK ☑ ICE ☐ No ☐

PHOENIX
Environmental Laboratories, Inc.

CT/MA/RI CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: makrina@phoenixlabs.com
Client Services (860) 645-1102

Pg of

Data Delivery/Contact Options:
Phone:
Email(s): rdryfoos@eagleenviro.com

Customer: EAGLE ENVIRONMENTAL, INC.
Address: 150 MAIN STREET, SUITE B
BRISTOL, CT
06010

Project: QA+M- Edgewood school - Pre-Characterization
Report to (name): Rodd Dryfoos
Invoice to: Eagle Environmental, Inc.
Quote #

Project P.O: 26-108.10T

This section MUST be completed with Bottle Quantities.

Sampler's Signature: Gabrielle Rolin Date: 4/10/2026

Client Sample - Information - Identification

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water STW = Storm Water
WW=Waste Water RW=Raw Water SE=Sediment SL=Sludge S=Soil C=Concrete
CLK=Caulk W=Wipe O=Oil B=Bulk L=Liquid X = Other_____ **(Must define)**

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrixx	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	VOCs via EPA 8260	SVOCs via EPA 8270	PCBs via EPA 8082	pesticides via EPA 8081	herbicides via EPA 8151	RSRIS metals	CT ETPH	reactivity/cyanide/sulfide	pH, conductivity, ignitability	1,4-dioxane via EPA 8270	GL Amber ( ) oz. [ ] H_2PO_4 [ ] NAHSO4 [ ] NH4Cl	Soil VOA Vials (1) [ ] methanol (2) H_2O	GL Soil container (8) oz	GL Soil container (4) oz	40 ml VOA Vial [ ] As is [ ] HCl [ ] Na_2SO_3	GL Amber 1000ml [ ] As is [ ] HCL [ ] H_2SO_4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H_2SO_4 [ ] 250ml [ ] 500ml [ ] 1000ml	PL HNO_3 [ ] 250ml [ ] 500ml [ ] 1000ml	PL NaOH 250ml	Bacteria Bottle w/thio	Bacteria Bottle as is
72670	COMP-1	S	4/10/26	11:20AM	X	X	X	X	X	X	X	X	X	X			2	1									
72671	HA-1(0.0-0.5)	↓	↓	10:00AM													1										
72672	HA-1(0.5-1.0)			10:00AM													1										
72673	HA-1(2.0-2.5)			10:00AM	X											3											
72674	HA-2(0.0-0.5)			9:35AM													1										
72675	HA-2(0.5-1.0)			9:35AM													1										
72676	HA-3(0.0-0.5)			9:20AM													1										
72677	HA-3(0.5-1.0)			9:20AM													1										
72678	HA-4(0.0-0.5)			9:00AM													1										
72679	HA-4(0.5-1.0)			9:00AM													1										
72680	HA-5(0.0-0.5)			8:50AM													1										
72681	HA-5(0.5-1.0)			8:50AM													1										

Relinquished by:	Accepted by:	Date:	Time:
Gabrielle Rolin		4/10/26	1:15PM
		4/11/26	14:23
	15:28		

Comments, Special Requirements or Regulations:
HOLD "○" PENDING ANALYTICAL RESULTS

Turnaround Time:
☐ 1 Day* ☐ 2 Days* ☐ 3 Days* ☐ 4 Days* ☐ 5 Days*
☒ Standard ☐ Other _____

RI
☐ RES DEC
☐ I/C DEC
☐ GA Leachability
☐ GB Leachability
☐ GA -GW Objectives
☐ GB -GW Objectives
☐ Other

CT
☒ RCP Cert
☐ GWPC
☐ SWPC
☒ GA PMC
☐ GB PMC
☐ _____
RES ☐ DEC ☐ VC
I/C ☐ DEC ☐ VC

MA
☐ MCP Certification
☐ GW-1 ☐ RCS-1 / RCGW-1
☐ GW-2 ☐ RCS-2 / RCGW-2
☐ GW-3 ☐ S-1 Calc.
☐ S-1
☐ S-2
☐ S-3 ☐ _____
☐ SW Protection

Data Format
☒ Excel
☒ PDF
☐ GIS/Key
☐ EQuIS
☐ Other

Data Package
☐ Tier II Checklist*
☐ Full Data Package*
☒ Phoenix Std
☐ MAT-212 Form

*MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

* SURCHARGES MAY APPLY

State where samples were collected: CT

* SURCHARGE APPLIES

Temp 15° Coolant: IPK ☑ ICE ☐ Cooler: Yes ☑ No ☐ No ☐

Pg of

CT/MA/RI CHAIN OF CUSTODY RECORD

PHOENIX *Environmental Laboratories, Inc.*

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: makrina@phoenixlabs.com
Client Services (860) 645-1102

Data Delivery/Contact Options:
Phone:
Email(s): rdryfoos@eagleenviro.com

Customer: EAGLE ENVIRONMENTAL, INC.
Address: 150 MAIN STREET, SUITE B
BRISTOL, CT
06010

Project: QA+M - Edgewood School - Pre-characterization Project P.O: 26-10B.10T
Report to (name): Rodd Dryfoos
Invoice to: Eagle.Environmental, Inc
Quote #

This section MUST be completed with Bottle Quantities.

Sampler's Signature: Gabrielle Kolb Date: 04/10/2026

Client Sample - Information - Identification

Analysis Request

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **STW** = Storm Water
WW=Waste Water **RW**=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **C**=Concrete
CLK=Caulk **W**=Wipe **O**=Oil **B**=Bulk **L**=Liquid **X** = Other_____ **(Must define)**

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled
72682	HA-6 (0.0-0.5)	S	4/10/26	11:10AM
72683	HA-6 (0.5-1.0)	↓	↓	11:10AM
72684	HA-7 (0.0-0.5)			10:45AM
72685	HA-7 (0.5-1.0)	↓	↓	10:45AM

*MS/MSD (May be billable at analysis unit rate)
VOCs via EPA 8260
SVOCs via EPA 8270
PCBs via EPA 8082
pesticides via EPA 8081
herbicides via EPA 8151
RCRA 8 metals
CT ETPH
reactivity+cyanide+sulfide
pH+ignitability+corrosivity
1,4-dioxane via EPA 8270
GL Amber ( ) oz. [ ] H_3PO_4 [ ] $NAHSO_4$ [ ] NH_4Cl
Soil VOA Vials [ ] methanol [ ] H_2O
GL Soil container ( ) oz
GL Soil container ( ) oz
40 ml VOA Vial [ ] As is [ ] HCl [ ] Na_2SO_3
GL Amber 1000ml [ ] As is [ ] HCl [ ] H_2SO_4
PL As is [ ] 250ml [ ] 500ml [ ] 1000ml
PL H_2SO_4 [ ] 250ml [ ] 500ml [ ] 1000ml
PL HNO_3 [ ] 250ml [ ] 500ml
PL NaOH 250ml
Bacteria Bottle w/thio
Bacteria Bottle as is

Relinquished by:	Accepted by:	Date:	Time:
Gabrielle Kolb		4/10/26	1:15PM
		4/13/26	14:23
		4/13/26	15:28

Comments, Special Requirements or Regulations:
HOLD " " PENDING ANALYTICAL RESULTS

Turnaround Time:
☐ 1 Day* ☐ 2 Days* ☐ 3 Days* ☐ 4 Days* ☐ 5 Days*
☒ Standard ☐ Other _____

RI
☐ RES DEC
☐ I/C DEC
☐ GA Leachability
☐ GB Leachability
☐ GA -GW Objectives
☐ GB -GW Objectives
☐ Other

CT
☒ RCP Cert
☐ GWPC
☐ SWPC
☒ GA PMC
☐ GB PMC
☐ SWPC
RES ☐ DEC ☐ VC
I/C ☐ DEC ☐ VC

MA
☐ MCP Certification
☐ GW-1 ☐ RCS-1 / RCGW-1
☐ GW-2 ☐ RCS-2 / RCGW-2
☐ GW-3 ☐ S-1 Calc.
☐ S-1
☐ S-2 ☐ _____
☐ S-3
☐ SW Protection

Data Format
☒ Excel
☒ PDF
☐ GIS/Key
☐ EQuIS
☐ Other

Data Package
☐ Tier II Checklist*
☐ Full Data Package*
☒ Phoenix Std
☐ MAT-212 Form

***MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.**

*** SURCHARGES MAY APPLY**

State where samples were collected: CT

*** SURCHARGE APPLIES**

Sarah Bell

From: Gabrielle Rohn <grohn@eagleenviro.com>
Sent: Tuesday, May 12, 2026 1:43 PM
To: Sarah Bell; Rodd Dryfoos
Cc: Peter Folino
Subject: Re: Copper

Hi Sarah,

This is GCV72670. Also, can we please have Rodd set up with a Phoenix login.

Thank you,

Gabrielle Rohn

Get Outlook for iOS

From: Sarah Bell <sarah@phoenixlabs.com>
Sent: Tuesday, May 12, 2026 1:33:56 PM
To: Rodd Dryfoos <rdryfoos@eagleenviro.com>
Cc: Peter Folino <pfolino@eagleenviro.com>; Gabrielle Rohn <grohn@eagleenviro.com>
Subject: RE: Copper

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

I have to check for these they came in on 5/10 we might have disposed of this weekend, Do you have the GCV group numbers? These chains are blank as far as what numbers we gave

Sarah Bell
Project Manager
Phoenix Environmental Laboratories
587 East Middle Turnpike | Manchester, CT 06040
Direct Line: 860-812-0270
Website: www.phoenixlabs.com

From: Rodd Dryfoos <rdryfoos@eagleenviro.com>
Sent: Tuesday, May 12, 2026 1:13 PM
To: Sarah Bell <sarah@phoenixlabs.com>
Cc: Peter Folino <pfolino@eagleenviro.com>; Gabrielle Rohn <grohn@eagleenviro.com>
Subject: Copper

Sarah,
Please run the held samples on the attached COC for total copper. My understanding is that today is the last day you will hold the samples, so hopefully this request isn't too late. Please let me know if you need additional information.
Thank you,
Rodd

Rodd A. Dryfoos,LEP
Senior Manager- Environmental Services
Eagle Environmental, Inc.
150 Main Street, Suite B
Bristol, CT 06010
Tel: (860) 589-8257 Ext.128
Direct: (475)-400-0315
Cell: (203) 215-6604
Fax: (860) 585-7034
Email: rdryfoos@eagleenviro.com

QA+M architecture

PROJECT MANUAL & SPECIFICATIONS

Renovations to
EDGEWOOD PRE-K ACADEMY

345 Mix Street
Bristol, CT

State Project No. 017-0090 RNV

Board of Education: _____ Signature: _____

School Building Committee:_____ Signature:_____

Project Architect:_____ Signature:_____

Superintendent:_____ Signature:_____

Health Inspector:_____ Signature:_____

Building Official:_____ Signature:_____

Fire Marshal:_____ Signature:_____

Section 504 Official:_____ Signature:_____

Construction Documents
June 5, 2026

QuisenberryArcariMalik

195 Scott Swamp Road Farmington, CT 06032 + (860) 677-4594 + qamarch.com

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SECTION 000103 - PROJECT DIRECTORY

PROJECT TEAM

Architect of Record:

QA+M Architecture
195 Scott Swamp Road
Farmington, CT 06032
Phone: 000-000-0000

Civil Engineering:

Benesch
200 Glastonbury Boulevard, Suite 201
Glastonbury, CT 06033
Phone: 860-633-8341

Structural Engineering:

RZ-Design Associates, A GM2 Company
750 Old Main Street #202
Rocky Hill, CT 06067
Phone: 860-436-4336

MEP Engineering:

RZ-Design Associates, A GM2 Company
750 Old Main Street #202
Rocky Hill, CT 06067
Phone: 860-436-4336

Specifications Consultant:

Amy Baker Architect
1012 Owana Avenue
Royal Oak, MI 48067
Phone: 248-931-3055

END OF PROJECT DIRECTORY

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SECTION 00 01 10 - TABLE OF CONTENTS

Written Contract Documents and Specification Sections identified below are grouped and identified as "Bid Packages" and are numbered and dated as such. The intent of these groups of Documents is to convey sufficient information to allow a designated portion of the Work to be bid upon and constructed. All previously issued Contract Documents and Specifications apply to each successive "Bid Package" and, if not printed and bound herewith, are available from the Construction Manager.

Changes made to prior issues (additions, deletions, and changes) are highlighted in **bold** and ~~strikethrough~~ text within each section, and the Issue date is changed herein to reflect the most current issue. The Contractor is responsible for evaluating all Documents issued, both current and previous issues, and dividing and assigning work to the various trades and subcontractors.

PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

DIVISION 00 -- PROCUREMENT AND CONTRACTING REQUIREMENTS

INTRODUCTORY INFORMATION

NUMBER	TITLE	ISSUE ID	DATE
00 01 03	Project Directory		06-05-2026
00 01 10	Table of Contents		06-05-2026
00 31 00	Available Project Information		06-05-2026
00 60 00	Project Forms		06-05-2026
00 63 13	RFI Form		06-05-2026
00 63 25	Substitution Request Form (During Construction)		06-05-2026

PROCUREMENT AND CONTRACTING REQUIREMENTS – TO BE INCLUDED WITH FUTURE ISSUE

In the absence of forms provided by the Architect or Construction Manager, the following forms shall be used to administer the project.

AIA forms and pre-printed documents listed below are not included in this Project Manual and are hereby made a part of the Contract Documents. AIA forms and pre-printed documents may be obtained from distributors listed at https://www.aiacontracts.org/purchase.

CSI forms and pre-printed documents listed below are not included in this Project Manual and are hereby made a part of the Contract Documents. CSI forms and pre-printed documents may be obtained from www.csiresources.org.

ADDITIONAL PROCUREMENT AND CONTRACTING REQUIREMENTS

Additional Subcontract Procurement and Contracting Documents prepared by the Contractor are bound separately and are not enumerated herein.

SPECIFICATIONS GROUP

NUMBER	TITLE	ISSUE ID	DATE
DIVISION 01 -- GENERAL REQUIREMENTS			
01 10 00	Summary		06-05-2026
01 10 01	Hazardous Materials General Conditions		06-05-2026
01 16 00	Hazardous Materials Scheduling and Phasing		06-05-2026
01 20 13	Price and Payment Procedures		06-05-2026
01 21 00	Allowances		06-05-2026

01 22 00 ..... Hazardous Materials Unit Prices 06-05-2026
01 22 00.1 ..... Unit Prices 06-05-2026
01 23 00 ..... Alternates 06-05-2026
01 25 00 ..... Substitution Procedures 06-05-2026
01 30 00 ..... Administrative Requirements 06-05-2026
01 32 16 ..... Construction Progress Schedule 06-05-2026
01 35 53 ..... Security Procedures 06-05-2026
01 40 00 ..... Quality Requirements 06-05-2026
01 41 00 ..... Regulatory Requirements 06-05-2026
01 42 16 ..... Definitions 06-05-2026
01 42 19 ..... Reference Standards 06-05-2026
01 45 33 ..... Code-Required Special Inspections and Procedures 06-05-2026
01 50 13 ..... Temporary Facilities and Controls 06-05-2026
01 56 39 ..... Temporary Tree and Plant Protection 06-05-2026
01 57 05 ..... Environmental Protection 06-05-2026
01 57 13 ..... Temporary Erosion and Sediment Controls 06-05-2026
01 57 14 ..... Temporary Dust Control 06-05-2026
01 57 23 ..... Temporary Stormwater Pollution Control 06-05-2026
01 60 00 ..... Product Requirements 06-05-2026
01 61 16 ..... Volatile Organic Compound (VOC) Content Restrictions 06-05-2026
01 61 17 ..... Accessory Material VOC Content Certification Form 06-05-2026
01 70 00 ..... Execution and Closeout Requirements 06-05-2026
01 71 23 ..... Field Engineering 06-05-2026
01 74 19 ..... Construction Waste Management and Disposal 06-05-2026
01 77 01 ..... Hazardous Materials Contract Close-Out 06-05-2026
01 78 00 ..... Closeout Submittals 06-05-2026
01 79 00 ..... Demonstration and Training 06-05-2026
01 81 13 ..... Sustainable Design Requirements - CTHPB 06-05-2026

DIVISION 02 -- EXISTING CONDITIONS

02 07 50 ..... Selective Demolition for Hazardous Materials Abatement 06-05-2026
02 08 00 ..... Asbestos Abatement 06-05-2026
02 08 20 ..... Universal Waste Reclamation 06-05-2026
02 09 00 ..... Lead Paint Awareness 06-05-2026
02 11 00 ..... PCB Remediation 06-05-2026
02 32 19 ..... Exploratory Excavations 06-05-2026
02 41 19 ..... Selective Demolition 06-05-2026
02 41 23 ..... Site Demolition 06-05-2026
02 61 23 ..... Handling, Transport, and Disposal of Excavated Soil 06-05-2026

DIVISION 03 -- CONCRETE

03 10 00 ..... Concrete Forming and Accessories 06-05-2026
03 20 00 ..... Concrete Reinforcing 06-05-2026
03 30 00 ..... Cast-In-Place Concrete 06-05-2026
03 32 00 ..... Site Cast-In-Place Concrete 06-05-2026
03 35 11 ..... Concrete Floor Finishes 06-05-2026

DIVISION 04 – MASONRY

04 01 00 ..... Masonry Restoration and Cleaning 06-05-2026
04 20 00 ..... Unit Masonry 06-05-2026

DIVISION 05 -- METALS

05 05 13. 1 ..... Shop Applied Coatings for Metal (Site/Civil) 06-05-2026
05 12 00 ..... Structural Steel Framing 06-05-2026
05 31 00 ..... Steel Decking 06-05-2026
05 40 00 ..... Cold-Formed Metal Framing 06-05-2026
05 50 00 ..... Metal Fabrications 06-05-2026
05 51 00 ..... Metal Stairs 06-05-2026
05 52 13 ..... Pipe and Tube Railings 06-05-2026

DIVISION 06 -- WOOD, PLASTICS, AND COMPOSITES

06 10 00 ..... Rough Carpentry 06-05-2026
06 16 00 ..... Sheathing 06-05-2026
06 22 00 ..... Flexible Wood Tambour Panels 06-05-2026
06 40 00 ..... Architectural Woodwork 06-05-2026
06 64 20 ..... Decorative Architectural Panels 06-05-2026
06 83 16 ..... Fiberglass Reinforced Paneling 06-05-2026

DIVISION 07 -- THERMAL AND MOISTURE PROTECTION

07 05 53 ..... Fire and Smoke Assembly Identification 06-05-2026
07 21 00 ..... Thermal Insulation 06-05-2026
07 21 19 ..... Foamed-In-Place Insulation 06-05-2026
07 27 26 ..... Fluid-Applied Air Barriers 06-05-2026
07 42 13.19 ..... Insulated Metal Wall Panels 06-05-2026
07 42 93 ..... Metal Soffit Panels 06-05-2026
07 53 23 ..... Ethylene-Propylene-Diene-Monomer Roofing (EPDM) 06-05-2026
07 62 00 ..... Sheet Metal Flashing and Trim 06-05-2026
07 71 00 ..... Roof Specialties 06-05-2026
07 72 00 ..... Roof Accessories 06-05-2026
07 84 00 ..... Firestopping 06-05-2026
07 84 01 ..... Firestopping Schedule 06-05-2026
07 84 02 ..... Firestopping Schedule Form 06-05-2026
07 92 00 ..... Joint Sealants 06-05-2026
07 95 13 ..... Expansion Joint Cover Assemblies 06-05-2026

DIVISION 08 -- OPENINGS

08 11 13 ..... Hollow Metal Doors and Frames 06-05-2026
08 14 16 ..... Flush Wood Doors 06-05-2026
08 16 13 ..... Fiberglass Doors and Frames 06-05-2026
08 31 00 ..... Access Doors and Panels 06-05-2026
08 41 13 ..... Aluminum-Framed Entrances and Storefronts 06-05-2026
08 56 53 ..... Security Windows 06-05-2026
08 80 00 ..... Glazing 06-05-2026
08 83 00 ..... Mirrors 06-05-2026
08 88 13 ..... Fire-Rated Glazing 06-05-2026
08 91 00 ..... Louvers 06-05-2026

DIVISION 09 -- FINISHES

09 00 00 ..... Finish Schedule 06-05-2026
09 05 61 ..... Common Work Results for Flooring Preparation 06-05-2026
09 22 16 ..... Non-Structural Metal Framing 06-05-2026
09 29 00 ..... Gypsum Board 06-05-2026
09 30 00 ..... Tiling 06-05-2026
09 51 13 ..... Acoustical Panel Ceilings 06-05-2026
09 65 00 ..... Resilient Flooring 06-05-2026
09 65 13 ..... Resilient Wall Base and Accessories 06-05-2026
09 67 00 ..... Fluid-Applied Flooring 06-05-2026
09 68 13 ..... Tile Carpeting 06-05-2026
09 72 00 ..... Wall Coverings 06-05-2026
09 84 30 ..... Sound-Absorbing Wall and Ceiling Units 06-05-2026
09 91 13 ..... Exterior Painting 06-05-2026
09 91 13.1 ..... Exterior Painting (Site/Civil) 06-05-2026
09 91 23 ..... Interior Painting 06-05-2026
09 96 00 ..... High-Performance Coatings 06-05-2026

DIVISION 10 -- SPECIALTIES

10 11 00 ..... Visual Display Units 06-05-2026
10 14 00 ..... Signage 06-05-2026
10 14 16 ..... Post and Panel Signage 06-05-2026
10 21 23 ..... Cubicle Curtains 06-05-2026
10 26 00 ..... Wall and Door Protection 06-05-2026
10 28 00 ..... Washroom Accessories 06-05-2026
10 41 16 ..... Emergency Key Boxes 06-05-2026
10 44 00 ..... Fire Protection Specialties 06-05-2026
10 51 16 ..... Wood Lockers 06-05-2026
10 75 16 ..... Ground-Set Flagpoles 06-05-2026
10 82 10 ..... Equipment Screens 06-05-2026

DIVISION 11 – EQUIPMENT

11 30 13 ..... Residential Appliances 06-05-2026
11 40 00 ..... Foodservice Equipment 06-05-2026

DIVISION 12 -- FURNISHINGS

12 23 00 ..... Vinyl Shutters 06-05-2026
12 24 00 ..... Window Shades 06-05-2026
12 36 00 ..... Countertops 06-05-2026
12 48 13 ..... Entrance Floor Mats and Frames 06-05-2026
12 93 13 ..... Bicycle Racks 06-05-2026

DIVISION 13 – SPECIAL CONSTRUCTION (NOT USED)

DIVISION 14 – CONVEYING EQUIPMENT (NOT USED)

DIVISION 20 -- RESERVED
DIVISION 21 -- FIRE SUPPRESSION

21 05 00 ..... Fire Protection Basic Materials and Methods 06-05-2026
21 13 00 ..... Fire Suppression Sprinklers 06-05-2026

DIVISION 22 -- PLUMBING

22 05 00 ..... Plumbing General Conditions 06-05-2026
22 05 05 ..... Plumbing Demolition 06-05-2026
22 05 13 ..... Common Motor Requirements for Plumbing Equipment 06-05-2026
22 05 16 ..... Expansion Fittings and Loops for Plumbing Piping 06-05-2026
22 05 17 ..... Sleeves and Sleeve Seals for Plumbing Piping 06-05-2026
22 05 19 ..... Meters and Gauges for Plumbing Piping 06-05-2026
22 05 23 ..... General-Duty Valves for Plumbing Piping 06-05-2026
22 05 29 ..... Hangers and Supports for Plumbing Piping and Equipment 06-05-2026
22 05 33 ..... Heat Tracing for Plumbing Piping 06-05-2026
22 05 53 ..... Identification for Plumbing Piping and Equipment 06-05-2026
22 07 19 ..... Plumbing Piping Insulation 06-05-2026
22 10 05 ..... Plumbing Piping 06-05-2026
22 10 06 ..... Plumbing Piping Specialties 06-05-2026
22 12 50 ..... Natural Gas Piping 06-05-2026
22 13 29 ..... Sanitary Sewage Pumps 06-05-2026
22 30 00 ..... Plumbing Equipment 06-05-2026
22 40 00 ..... Plumbing Fixtures 06-05-2026

DIVISION 23 -- HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 05 00 ..... Mechanical General Conditions 06-05-2026
23 05 05 ..... Mechanical Demolition 06-05-2026
23 05 16 ..... Expansion Fittings and Loops for HVAC Piping 06-05-2026
23 05 17 ..... Sleeves and Sleeve Seals for HVAC Piping 06-05-2026
23 05 19 ..... Meters and Gauges for HVAC Piping 06-05-2026
23 05 23 ..... General-Duty Valves for HVAC Piping 06-05-2026
23 05 29 ..... Hangers and Supports for HVAC Piping and Equipment 06-05-2026
23 05 48 ..... Vibration and Seismic Controls for HVAC 06-05-2026
23 05 53 ..... Identification for HVAC Piping and Equipment 06-05-2026
23 05 93 ..... Testing, Adjusting, and Balancing for HVAC 06-05-2026
23 07 13 ..... Duct Insulation 06-05-2026
23 07 16 ..... HVAC Equipment Insulation 06-05-2026
23 07 19 ..... HVAC Piping Insulation 06-05-2026
23 09 13 ..... Instrumentation and Control Devices for HVAC 06-05-2026
23 09 23 ..... Direct-Digital Control System for HVAC 06-05-2026
23 09 93 ..... Sequence of Operations for HVAC Controls 06-05-2026
23 21 13 ..... Hydronic Piping 06-05-2026
23 21 14 ..... Hydronic Specialties 06-05-2026
23 21 23 ..... Hydronic Pumps 06-05-2026
23 23 00 ..... Refrigerant Piping 06-05-2026
23 25 00 ..... HVAC Water Treatment 06-05-2026
23 31 00 ..... HVAC Ducts and Casings 06-05-2026
23 33 00 ..... Air Duct Accessories 06-05-2026
23 33 19 ..... Duct Silencers 06-05-2026
23 34 13 ..... Axial HVAC Fans 06-05-2026
23 34 23 ..... HVAC Power Ventilators 06-05-2026
23 37 00 ..... Air Outlets and Inlets 06-05-2026

23 51 00 ..... Breechings, Chimneys, and Stacks 06-05-2026
23 52 16 ..... Condensing Boilers 06-05-2026
23 74 16 ..... Packaged Rooftop Air-Conditioning Units 06-05-2026
23 81 26 ..... Small-Capacity Split-System Air Conditioners 06-05-2026
23 81 29 ..... Variable Refrigerant Flow HVAC Systems 06-05-2026
23 82 00 ..... Convection Heating and Cooling Units 06-05-2026

DIVISION 25 – INTEGRATED AUTOMATION (NOT USED)

DIVISION 26 -- ELECTRICAL

26 05 00 ..... Electrical General Conditions 06-05-2026
26 05 05 ..... Selective Demolition for Electrical 06-05-2026
26 05 19 ..... Low-Voltage Electrical Power Conductors and Cables 06-05-2026
26 05 26 ..... Grounding and Bonding for Electrical Systems 06-05-2026
26 05 29 ..... Hangers and Supports for Electrical Systems 06-05-2026
26 05 33.13 ..... Conduit for Electrical Systems 06-05-2026
26 05 33.16 ..... Boxes for Electrical Systems 06-05-2026
26 05 53 ..... Identification for Electrical Systems 06-05-2026
26 05 73 ..... Power System Studies 06-05-2026
26 09 23 ..... Lighting Control Devices 06-05-2026
26 21 00 ..... Low-Voltage Electrical Service Entrance 06-05-2026
26 24 13 ..... Switchboards 06-05-2026
26 24 16 ..... Panelboards 06-05-2026
26 26 53 ..... Electric Vehicle Charging Equipment 06-05-2026
26 27 13 ..... Electricity Metering 06-05-2026
26 27 26 ..... Wiring Devices 06-05-2026
26 28 16.16 ..... Enclosed Switches 06-05-2026
26 32 13 ..... Engine Generators 06-05-2026
26 36 00 ..... Transfer Switches 06-05-2026
26 43 00 ..... Surge Protective Devices 06-05-2026
26 51 00 ..... Interior Lighting 06-05-2026
26 56 00 ..... Exterior Lighting 06-05-2026

DIVISION 27 -- COMMUNICATIONS

27 10 00 ..... Structured Cabling 06-05-2026
27 41 00 ..... Audio Video Systems 06-05-2026
27 41 00.16 ..... Classroom Av Systems 06-05-2026
27 51 16 ..... Public Address System 06-05-2026
27 51 29.17 ..... Two-Way Radio Communication Enhancement Systems 06-05-2026
27 53 13 ..... Clock System 06-05-2026

DIVISION 28 -- ELECTRONIC SAFETY AND SECURITY

28 05 00 ..... Security Conductor Cables 06-05-2026
28 05 28 ..... Pathways for Security Systems 06-05-2026
28 13 00 ..... Access Control System 06-05-2026
28 16 00 ..... Intrusion Detection 06-05-2026
28 23 00 ..... Video Surveillance System 06-05-2026
28 46 00 ..... Fire Detection and Alarm 06-05-2026
28 46 14 ..... Single and Multiple Station Alarms 06-05-2026

DIVISION 31 – EARTHWORK

31 11 00 ..... Clearing and Grubbing 06-05-2026
31 23 10 ..... Earthwork 06-05-2026
31 23 19 ..... Dewatering 06-05-2026
31 25 43 ..... Geotextiles 06-05-2026
31 41 43 ..... Sheeting and Staybracing 06-05-2026

DIVISION 32 -- EXTERIOR IMPROVEMENTS

32 12 16 ..... Bituminous Concrete Pavement 06-05-2026
32 13 13 ..... Decorative Concrete Paving 06-05-2026
32 13 73 ..... Concrete Paving Joint Sealants 06-05-2026
32 16 23 ..... Curbing 06-05-2026
32 17 23 ..... Pavement Markings 06-05-2026
32 17 26 ..... Tactile Warning Surfacing 06-05-2026
32 18 16.13 ..... Playground Protective Surfacing 06-05-2026
32 31 13 ..... Chain Link Fences and Gates 06-05-2026
32 33 00 ..... Bollards 06-05-2026
32 91 19.13 ..... Topsoil Placement and Grading 06-05-2026
32 92 19 ..... Seeding 06-05-2026
32 92 23 ..... Sodding 06-05-2026
32 93 00 ..... Plants 06-05-2026
32 97 05 ..... Site furnishings 06-05-2026

DIVISION 33 -- UTILITIES

33 19 00 ..... Water Supply System 06-05-2026
33 31 00 ..... Sanitary Sewers 06-05-2026
33 40 00 ..... Storm Drainage System 06-05-2026

DIVISION 34 -- TRANSPORTATION

34 71 23 ..... Maintenance and Protection of Traffic 06-05-2026

APPENDICES

Appendix A ..... Pre-Construction Environmental Soils Report 06-05-2026
Appendix B ..... Stormwater Pollution Control Plan 06-05-2026
Appendix C ..... CTHPB Compliance Manual 06-05-2026
Appendix D ..... Environmental Materials Reporting Form 06-05-2026
Appendix E ..... CTHPB Compliance Checklist - Schools 06-05-2026
Appendix F ..... Kitchen Equipment Cutsheets 06-05-2026

END OF SECTION 00 01 10

BUILDING OFFICIAL: (SIGNATURE) (DATE)	**BUILDING COMMITTEE:** (SIGNATURE) (DATE)
FIRE MARSHAL: (SIGNATURE) (DATE)	**HEALTH INSPECTOR:** (SIGNATURE) (DATE)
SECTION 504 OFFICIAL: (SIGNATURE) (DATE)	**SUPERINTENDENT** (SIGNATURE) (DATE)
BOARD OF EDUCATION: (SIGNATURE) (DATE)	(SIGNATURE) (DATE)

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SECTION 003100 - AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.1 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to Contractor, but are not part of the Contract Documents, as follows:

B. Pre-Construction Environmental Soils Report:

1. A copy is included with this document.
2. Contractor is urged to examine data provided.
3. Contractor should visit the site and become acquainted with existing conditions.
4. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to Owner.
5. Interpretation: This report is provided only for information and convenience. Owner and Architect disclaim responsibility for accuracy, true location and extent of soil conditions that have been evaluated by others. Owner and Architect further disclaim responsibility for interpretation of the report data by the Contractor; including but not limited to projecting soil bearing values, rock profiles, soil stability, and presence, level, and extent of underground water.
6. Applicable Requirements: Specific and variable recommendations contained in this document are subject to acceptance by Owner for incorporation in the Contract Documents prepared by Architect. Comply with requirements specified in the Contract Documents for earthwork and other applicable work scope items.

1.2 SUSTAINABILITY CERTIFICATION INFORMATION

A. Sustainability Compliance Manual and Checklist:

1. A copy of the CTHPB Compliance Manual is included with this document.
2. A copy of the CTHPB Checklist with targeted points identified by Owner and Architect is included with this document.
3. Contractor is required to examine documents provided, and comply with referenced requirements as may be specified in the Contract Documents.
4. See Section 018113 - Sustainable Design Requirements - CTHPB for sustainable design requirements.

1.3 ENVIRONMENTAL INFORMATION

A. Stormwater Pollution Control Plan:

1. A copy of the Plan will be included witth this document.

2. Contractor is required to examine documents provided, and comply with referenced requirements as may be specified in the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 006000 - PROJECT FORMS

PART 1 GENERAL

1.1 SUMMARY

A. Procedures for use of administrative forms.

B. Administrative forms.

1.2 PROCEDURES

A. Use of forms in this Section is required.

1. Use of Contractor's alternative forms is acceptable subject to approval of Architect, and provided that content of alternative forms is substantially equivalent to forms provided in this Section.

B. Complete applicable information on form. Indicate date transmitted and date of required response, as applicable. Attach supporting documentation and additional descriptive information as necessary to fully describe the request.

C. Use a single form for each separate request. Closely related items may be included in a single request only if acceptance of one item requires acceptance of all items in the request.

D. Comply with the requirements of Section 016000 for requests for substitution after execution of the Contract.

1.3 ARCHITECT'S ACTION

A. When requests are made within the time allowed for Architect's review, Architect will make reasonable effort to respond in a timely manner, but no claim for delay by Contractor will be allowed.

B. Substitution Requests: Architect's review is for general conformance with the Contract Documents only and does not relieve Contractor from full compliance with the Contract Documents and Contractor's representations specified in Section 016000.

1.4 FORMS

A. Request for Information: Number consecutively; include Architect's project number; clearly specify the document reference by specification Section number, article, paragraph, Drawing number, and detail numbers as applicable. Architect will complete the lower portion of the form as the written response.

1. RFI Form: Contractor's standard form from Procore or similiar tracking system.

B. Substitution Request: Number consecutively; complete all required information on the form; indicate applicable cost savings and time affect, if any. Architect will complete the lower portion of the form as the written response, and will attach further written response as necessary to explain the decision, if required. Forms submitted without all required information as indicated on the form may be returned for completion before review by Architect.

1. Substitution Request Form (During Construction): 006325 - Substitution Request Form - During Construction.

C. Forms are on pages immediately following the end of this Section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

REQUEST FOR INFORMATION FORM

PROJECT:		RFI NUMBER:	
FROM:		DATE:	
RE:		CONTRACT FOR:	

SECTION NUMBER:		TITLE:	
PAGE:		ARTICLE/PARAGRAPH:	
DRAWING NUMBER:		DETAIL REFERENCE:	

Contractor's Request:

☐ Attachments

SIGNED BY: _____ DATE: _____

Architect's Response:

☐ Attachments

RESPONSE FROM:		REC'D:	
TO:		RETURNED:	
SIGNED BY:		DATE:	

END OF FORM

QA+M architecture

EQUAL OR SUBSTITUTION REQUEST

Note: This form is to be filled out by the Contractor in its entirety and submitted to the Architect for review with any product information attached.

Request Phase: **Pre-Bid** ☐ **Post Bid** ☐

(If Pre-bid only) Current Bid Due Date:

Request No.:

Dated:

To: **QA+M Architecture**
195 Scott Swamp Road
Farmington, CT 06032

State Project No.:

Project Name / Location:

References: Specification(s): Section(s): Paragraph(s):

Drawing(s): Drawing(s) No(s): Detail(s) No(s):

Contractually Specified Product:

Contractor Proposed Product:

Proposed Product is: Equal: ☐ Substitute: ☐ Model No.:

IMPORTANT:

See Attached Data For Both Specified Basis of Design And Proposed Product(s)

Please highlight and mark up product information to clearly identify conformance or differences with the basis of design product specifications.

Data attached: Drawings: ☐ Product Data: ☐ Reports: ☐ Samples: ☐

Tests: ☐ Other:

Reason(s) for not providing the Specified Product:

Similar Installation:

Project Name:

Architect's Name:

Project Location:

Owner's Name:

Date Installed:

Will proposed substitution impact other parts of the Work? **No** ☐ **Yes** ☐ ***If Yes Attach An Explanation.***

Will proposed substitution increase Contract Time? **No** ☐ **Yes** ☐ ***By Number Of Calendar Days***

Anticipated Dollar Savings to the if substitution is accepted: **$**

The Undersigned Certifies:

That The Proposed Request For An Equal Or Substitute Product Conforms To All Of The Requirements Of Division 01 General Requirements, Section 01 25 00 Substitution Procedures.

Request Submitted By General Contractor / CMR: _____

(Firm's Typed Name)

By: _____ _____ _____ _____

(Typed Name) *(Title)* *(Signature)* *(Date)*

Contractor / CMR Send copies to : **Architect PM:** ☐ **CA:** ☐

(Below to be filled out by the Architect)

Consultant's Request Received on (Date): _____

Consultant's Review – This Substitution Request is:

☐	**Approved:**	***(Submittal(s) in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)***
☐	**Approved as Noted:**	***(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)***
☐	**Rejected:**	**Use Specified Materials.**
☐	**Rejected:**	**Request Not Received Within Specified Time Period - Use Specified Materials.**

Reviewed Issued By:

Name: _____

(Typed Name)

Title: _____

Signature: _____ _____

(Signature) *(Date)*

SECTION 011000 - SUMMARY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 "The General Conditions of the Contract for Construction," and Division 01 General Requirements, are a part of this Section and shall be binding on the Contractor and all Subcontractors who perform this work.

1.2 PROJECT

A. Project Name: EDGEWOOD PRE-K ACADEMY.

B. Owner's Name: City of Bristol.

C. Architect's Name: Quisenberry Arcari Malik, LLC.

1.3 PROJECT DESCRIPTION

A. This is the second phase of the renovation to Edgewood Pre-K Academy.

B. The scope consists of three major components:

1. Abatement and Demolition:

    a. Exploratory excavation activity.

    b. Selective demolition of existing site elements.

    c. Backfilling of voids and excavations left from site demolition activities.

    d. Selective demolition for hazardous materials abatement.

    e. Selective demolition of non-structural interior building elements.

    f. Selective demolition of building envelope elements, including structural elements.

2. Site/ Utility Infrastructure: The existing site layout will remain largely the same with the existing independent parent and bus circulation paths on the site remaining.

    a. Sidewalks, playscapes and play areas will be redesigned.

    b. New electrical, water and sewer lines will be brought to the building.

3. Renovations to Existing Edgewood Pre-K Academy: The existing part of the school will have a Renovate-As-New classification and be fully renovated.

    a. The scope of the work includes cutting, capping of existing utilities within the school, and make ready for new utility services to be provided.

b. Additional structural bracing will be provided at select building elements identified in the contract documents to reinforce the existing facility structure.

c. The Mechanical, Electrical, Plumbing, Technology, Audio/ Visual, and Security systems will be demolished in the existing building and new systems will be provided throughout the facility.

d. A fully addressable Fire Suppression system will be installed within the existing facility and new construction to bring the facility up to current Building Code requirements.

e. All existing flat roofs will be replaced with a new single-ply membrane roofing on all existing building, as required to obtain the required 20 year warranty certification.

f. Buildiing envelope work includes all new, windows and doors, cleaning and restoration of existing masonry, new metal panels, and masonry accent courses

g. The interior construction will be a combination of metal stud and masonry walls. Finishes will include gypsum soffits, acoustical ceiling tile, VET and Ceramic flooring.

h. The interior scope includes millwork, interior doors and frames, clear story windows, tile wainscot in the bathrooms. The public toilet rooms will have full-height ceramic wall tile and ceramic flooring.

1.4 CONTRACT DESCRIPTION

A. Contract Type: Multiple trade contracts under the CM at Risk based on a Guaranteed Maximum Price (GMP) as described in the contract for construction.

B. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

1.5 DIVISION 01 SPECIFICATIONS

A. Division 01 General Requirements expand on the broad provisions of the Conditions of the Contract, and govern the execution of the work of all Sections of the specifications. Division 01 General Requirements specify administrative and procedural requirements relating to execution of the Work, and temporary facilities for use during the construction period.

B. If Construction Manager provides additional Division 01 sections and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for direction before proceeding.

1.6 BID PACKAGES AT EDGEWOOD PRE-K DESCRIPTION

A. The work of this Bid Package is defined by the Construction Manager.

1.7 PROJECT WARRANTY

A. Refer to General Conditions for warranty provisions applicable to this Contract.

1. Project warranty period is governed by the codes and statues within the State in which the Project is located, and other provisions of the Contract.

B. Guarantee of Materials and Workmanship:

1. Guarantee in writing to Owner that all work performed and all materials and equipment furnished under this Contract are new and in accordance with the Contract Documents, are free from defects in equipment, materials or design furnished, or workmanship performed by Contractor or any of his subcontractors or suppliers at any tier. Such guarantee shall continue for a period not less than one (1) year from the date of Substantial Completion of the Work, or as otherwise required by the codes and statutes within the State in which the Project is located or other provisions of the Contract.

2. Under this guarantee, Contractor agrees to remedy at his own expense any inferior or defective equipment, materials, workmanship, or design that should develop during the guarantee period, or in restoring any other work damaged in fulfilling the terms of the guarantee.

3. Do not perform any work that shall void any manufacturer guarantee or warranty.

C. Manufacturer's Guarantee and Warranty:

1. As identified in other Sections of the specifications, provide written manufacturer's guarantees and warranties for specific materials, products, and equipment furnished and installed under this Contract.

2. Guarantees and Warranties Period: Valid for the period of time stated in each applicable specification Section from the date of Substantial Completion of the Work, but not less than twelve (12) months.

D. Extended Warranties:

1. As identified in other Sections of the specifications, provide written manufacturer's guarantees and warranties for specific materials, products, and equipment furnished and installed under this Contract.

2. Guarantees and Warranties Period: Valid for the stated extended period beyond twelve (12) months from the date of Substantial Completion of the Work.

E. Exclusions:

1. Warranty requirements contained in the specifications take precedence. These exclusions are superseded by warranty coverage requirements of the specifications.

2. Notify Architect of design conditions which cannot be fully warranted. Submit notice in writing prior to purchase of the affected product or system.

3. Failure to provide such notice will not be grounds for waiver of warranty requirements contained in the specifications.

4. Upon receipt of such notice, Architect will consider modifications necessary to assure that final construction is warrantable to the full extent of Contract requirements.

1.8 WORK BY OWNER

A. Items noted in Drawings as NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion.

1.9 OWNER OCCUPANCY

A. Owner will not occupy the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.10 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas designated by the Construction Manager.

B. Arrange use of site and premises to allow:

1. Work by Others.
2. Work by Owner.
3. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered. Review exiting plans with the fire marshal and building officials.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing building spaces may not be used for storage.

E. Time Restrictions:

1. Limit conduct of especially noisy work to the hours of 8am to 5pm.

F. Utility Outages and Shutdown:

1. Limit disruption of utility services to hours the building is unoccupied.
2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
3. Prevent accidental disruption of utility services to other facilities.

G. Special School District Restrictions:

1. Contractor and associated personnel and subcontractors are not permitted to use existing and new toilet facilities and service sinks in the building for personal use, for cleaning tools, or for disposing of construction waste materials.
2. No construction waste materials may be disposed of in Owner's dumpsters or other Owner containers.

3. Control smoke, dust, dirt, odors and other objectionable effects, and limit to the immediate area of construction. Contractor is responsible for cleaning other areas affected by noncompliance with this requirement, including contents of affected areas.
4. Clean work areas of debris, and "broom clean" no less frequently than at the end of each work day. Remove all debris from exterior site areas which could be wind blown. See Section 017000 for additional requirements.

H. Special Restriction: All Contractor's personnel, including but not limited to subcontractors, suppliers, inspectors, laborers, and any personnel under contract to or in the direct employ of the Contractor are not permitted to interact with students of the existing school facility in any manner.

1.11 DELEGATED DESIGN WORK

A. See Section 014000 - Quality Requirements, for delegated design requirements.

B. Design of products and systems, or components of products and systems, specified to be provided by Contractor are as identified in specification Sections.

C. Contractor's Responsibilities:
1. Comply with specified design requirements for each applicable product or system.
2. Coordinate design and space requirements with other affected work and Architect.
3. Review applicable submittals and coordinate selections with Architect.
4. Receive and unload products and systems at the site; inspect for completeness and for damage.
5. Handle, store, install, and finish products and systems.
6. Repair or replace damaged, defective, or missing items.
7. Arrange for manufacturer's warranties, inspections, and service.
8. Comply with applicable provisions of Division 01 - General Requirements, specifically including administrative requirements, coordination, quality, regulatory, and product requirements.

1.12 SCHEDULE

A. General: The schedule for the base bid is as follows:
1. The abatement and demolition work must be completed by August 15, 2026.
2. The remaining renovation work must be completed prior to the start of the 2027-2028 school year.

1.13 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI/CSC's "Master Format" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

1.14 CODES, STANDARDS AND PERMITS

A. All work under this contract shall conform to all codes and standards in effect as of the date of receipt of Bids which are applicable to this Project. All work shall also conform to specific requirements and interpretations of local authorities having jurisdiction over the Project. These Codes, standards, and authorities are referred to collectively as “the governing codes and authorities” and similar terms throughout the Specifications. Determination of applicable codes and standards and requirements of the authorities having jurisdiction shall be the responsibility of the Contractor; as shall be the analysis of all such codes and standards in regard to their applicability to the Project for the purposes of determining necessary construction to conform to such code requirements, for securing all approvals and permits necessary to proceed with construction, and to obtain all permits necessary for the Owner to occupy the facility for their intended use. In the case of conflicts between the requirements of different codes and standards, the most restrictive or stringent requirements shall be met.

B. The codes that were used in the design of this Project are as follows:

1. Refer to Sheet R-1 of the construction document drawings set.

C. Code Enforcement and Approvals: The owner has Secured and paid for the general building permit for the work and conform to all conditions and requirements of the permit and code enforcement authorities.

D. Identify all permits (other than general building permits) required from authorities having jurisdiction over the Project for the construction and occupancy of the work. Prepare the necessary applications and submit required plans and documents to obtain such permits in a timely manner. Permit fees to be paid by the Subcontractor.

1. Display all permit cards as required by the authorities and deliver legible photocopies of all permits to the Architect and Owner promptly upon their receipt.

2. Arrange for all inspections, testing and approvals required for all permits. Notify the Owner, and Architect at least three business days in advance, so they may arrange to observe.

3. Comply with all conditions and provide all notices required by all permits.

4. Perform and/or arrange for and pay for all testing and inspections required by the governing codes and authorities, other than those provided by the Owner, and notify the Owner, and Architect of such inspections at least three business days in advance, so they may arrange to observe.

5. Where inspecting authorities require corrective work in conjunction with applicable codes and authorities promptly comply with such requirements, except in cases where such requirements clearly exceed the requirements of the Contract Documents, in which case proceed in accordance with the procedures for modifications to the Work established in the Contract Documents

1.15 OCCUPATIONAL SAFETY AND HEALTH ACT

A. The Contractor and each Subcontractor shall comply with the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the Governmental Authorities which administer such Acts. Said requirements, standards and regulations are incorporated herein by reference.

1. In accordance with Connecticut General Statutes Sec. 31-53b, all employees on the Project site must show proof of completing and maintaining the OSHA 10-hour certification requirements in accordance with federal OSHA Training Institute standards.

B. The Contractor and each Subcontractor shall comply with said regulations, requirements and standards and require and be directly responsible for compliance therewith on the part of his agents, employee’s material men and Subcontractors; and shall directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of his agents, employees, material men or Subcontractors failing to so comply.

1.16 GENERAL AND FINAL CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. The contractor must maintain a clean and safe site. The contractor is responsible for weekly cleaning in the construction and surrounding area impacted by construction. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Construction dumpsters are to be located in a secured fenced area. Comply with manufacturer's written instructions.
3. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 011001 – HAZARDOUS MATERIALS GENERAL CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. Section includes the qualifications for Contractors who will be performing hazardous materials abatement work, Site restrictions, project phasing and additional general requirements.

B. Related Sections:
1. Section 011600: Hazardous Materials Scheduling and Phasing
2. Section 012200: Hazardous Materials Unit Prices
3. Section 017701: Hazardous Materials Contract Closeout
4. Section 020750: Selective Demolition for Hazardous Materials Abatement
5. Section 020800: Asbestos Abatement
6. Section 020820: Universal Waste Reclamation
7. Section 020900: Lead Paint Awareness
8. Section 021100: PCB Remediation

1.3 HAZARDOUS MATERIALS ABATEMENT CONTRACTOR (HMAC) QUALIFICATIONS

A. All bidders shall submit a record of prior experience in asbestos and lead demolition projects, listing no less than three (3) completed jobs in the past year, with all projects of similar size and scope. The Hazardous Materials Abatement Contractor (HMAC) shall list the experience and training of the site supervisor and all on-site workers. The information that shall be included is as follows:
1. Project Name and Address
2. Owner's Name and Address
3. Architect/Consultant/Construction Manager
4. Contract Amount
5. Date of Completion
6. Extras and Change Orders

B. The HMAC selected must appear on the State of Connecticut Department of Public Health (CT DPH) list of licensed Asbestos Abatement Contractors.

C. Contractors performing work that disturb painted surfaces beyond that described in Section 020900 Lead Paint Awareness shall comply with the OSHA Lead in Construction Standard 29 CFR 1926.62.

D. Submit a written statement regarding whether the HMAC has ever been found out-of-compliance with federal or state asbestos and/or lead regulations pertaining to worker protection, removal, transport, or disposal.

E. Award of this Contract may not necessarily be based solely on the submitted lowest Base Bid amount. The Owner reserves the right to award this Contract to the Bidder who best meets all HMAC qualifications.

1.4 HMAC USE OF SITE AND PREMISES

A. Limit use of Site and premises as follows:
   1. Owner occupancy.
   2. Work by Owner.
   3. Use of Site and premises by the public.

B. Coordinate use of the premises under the direction of the Owner. The school will be vacant during the work of this project.

C. Assume full responsibility for protection and safekeeping of products under this Contract.

D. The HMAC shall not interfere with general Site operations. The HMAC shall coordinate parking for employees with the Owner.

E. The HMAC shall coordinate location of waste container(s) with Owner operations.

1.5 WORK PHASING

A. Work under this project shall be performed in phases to accommodate Owner, Architect, and Construction Manager requirements and remaining construction phases. Coordinate abatement schedule and operations with the Construction Manager and Owner's Consultant and other trades.

B. The HMAC shall become familiar with the phasing of this work and shall include the required mobilization and re-mobilization as necessary to support the work phasing.

1.6 OWNER'S OPERATIONS

A. School will be vacant at the time of the asbestos abatement activities but adjacent buildings will be occupied. The HMAC and their work force shall stay within the confines of the construction area at all times throughout the project.

B. Maintain means of egress. Do not block corridors, pathways, exits, means of egress form the building, roadways, loading areas, parking areas or other areas of the Site used for Owner operations.

C. Coordinate Work with the Owner, the Architect, and the Owner's Consultant.

D. Maintain the fire alarm, fire detection system, and sprinkler system active at all times during abatement.

E. Maintain permanent means of egress during abatement. Provide and maintain temporary means of egress as required by Fire Marshall.

1.7 CLOSEOUT AND PUNCH LIST

A. The HMAC shall carefully check his/her own work and that of any Subcontractor as the work is being performed. Unsatisfactory work shall be corrected immediately.

B. When the HMAC determines that they are substantially complete, that is, has less than one percent of his Contract remaining to be completed, they shall prepare for submission to the Owner's Consultant, a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the HMAC to complete all work in accordance with the Contract Documents.

C. Upon receipt of the HMAC's list of items to be completed or corrected, the Owner's Consultant will promptly make a thorough inspection and prepare a "punch list" setting forth in accurate detail any items on the HMAC's list and any additional items that are not acceptable.

D. When the "punch list" has been prepared, the Owner's Consultant will arrange a meeting with the HMAC to identify and explain all punch list items and answer questions on the work that must be completed before final acceptance.

E. The HMAC shall correct all "punch list" items or shall cause the correction of the "punch list" items within a time frame to be established when the "punch list" is made. The time frame for the completion of the "punch list" shall not exceed the completion date of the Contract. Should the "punch list" not be completed within the specified time frame, the Owner may invoke the rights given under the General Conditions.

F. The Owner's Consultant shall not be expected to inspect any area more than once for the preparation of the "punch list" items. If, during an inspection, the Owner's Consultant discovers five (5) or more deficient conditions, then the area shall be declared "Not Ready" for Inspection.

G. All inspections and sampling required for hazardous materials abatement compliance will be performed by the Owner's Consultant.

1.8 CLEANING

A. Throughout the construction period, the HMAC shall maintain the building and the site free of rubbish, debris, surplus materials, and other items not required for the Work. Remove such material from the site daily to prevent accumulations. Remove all construction debris from work areas, and remove all hazardous waste and asbestos waste as required by the most current federal, state, and local regulations and the requirements of the specifications.

B. The HMAC shall perform wet cleaning of floors daily on the outside of each asbestos abatement work area. Cleaning shall be performed to a minimum distance of five feet from the work area.

1.9 ADDITIONAL GENERAL REQUIREMENTS

A. The HMAC shall employ a competent and English-speaking Asbestos Abatement Supervisor with at least three (3) years of experience on projects of similar scope and magnitude. The Supervisor shall be responsible for all work involving hazardous materials abatement as described in the specifications and defined in the applicable regulations, and have full time daily supervision of the same. The Supervisor shall be the "Competent Person" as defined by OSHA regulations.

B. The HMAC shall allow the work of this contract to be inspected, if required, by local, state, federal, and any other authorities having jurisdiction over such work. The HMAC shall immediately notify the Owner and Owner's Consultant and shall maintain written evidence of such inspection for review by the Owner and Owner's Consultant.

C. The HMAC shall incur the cost of all fines resulting from regulatory non-compliance as issued by federal, state, and local agencies. The HMAC shall incur the cost of all work requirements mandated by federal, state, and local agencies as a result of regulatory non-compliance or negligence.

D. The HMAC shall immediately notify the Owner and Owner's Consultant of the delivery of all

permits, licenses, certificates of inspection, of approval or occupancy, etc., and any other such instruments required under codes by authorities having jurisdiction, regardless to who issued, and shall cause them to be displayed to the Owner and Owner's Consultant for verification and recording.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011001

SECTION 011600 – HAZARDOUS MATERIALS SCHEDULING AND PHASING

PART - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. Section includes the requirements for the hazardous materials abatement schedule submittal and completion of work.

B. Related Sections:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 012200:	Hazardous Materials Unit Prices
3.	Section 017701:	Hazardous Materials Contract Closeout
4.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
5.	Section 020800:	Asbestos Abatement
6.	Section 020820:	Universal Waste Reclamation
7.	Section 020900:	Lead Paint Awareness
8.	Section 021100:	PCB Remediation

1.3 GENERAL REQUIREMENTS

A. The abatement work for this project will be conducted over the course of several phases. The Hazardous Materials Abatement Contractor (HMAC) shall complete all hazardous materials abatement work included within each of the phases. The HMAC shall include the costs of all required remobilizations in their price.

B. The HMAC shall review and become familiar with the overall phasing plan established by the Construction Manager. The HMAC shall perform the required abatement work within each phase of work as determined by the Construction Manager.

C. The work of this project shall begin upon receipt of the "Notice to Proceed" from the Construction Manager. A Pre-Construction Meeting shall be scheduled by the Construction Manager and must be attended by the Hazardous Materials Abatement Contractor (HMAC) and any Sub-Contractors. The assigned Site Supervisor(s) must also attend this meeting.

D. A working schedule for each phase of work shall be established by the Construction Manager and shall be maintained by the HMAC. Variations, amendments, and corrections to the presented schedule will be discussed and the Construction Manager will inform the HMAC of additions or changes in the scheduling requirements for the project.

E. The HMAC shall refer to other Sections of the Owner's Consultant specifications and Architect specifications to determine any other work affecting the hazardous materials abatement. The HMAC shall consider the work of all other trades in their schedule and performance.

F. Refer to all other applicable sections of the specification for coordination with other trades. The abatement HMAC shall coordinate work with all other activities associated with the project.

G. The work of this project shall be completed while school is vacant and no children under the

age of 18 are present within the building. Coordinate abatement schedule with the Construction Manager and the Owner's Consultant.

1.4 TIME FOR COMPLETION AND WORKING HOURS

A. Upon award of contract from the Owner, the HMAC shall immediately submit state and federal notifications for asbestos abatement, order materials, supplies, and components for the work of this project.

B. The HMAC shall begin the work immediately upon receipt of the written "Notice to Proceed" from the Owner. The date of the commencement of the work is termed the "Construction Start Date." The HMAC will be required to complete all work of this Contract within the time period stipulated in the finalized schedule. The last day in the schedule is termed as "Contract Completion Date."

C. If conditions arise that are beyond the control of the HMAC and force delays in the performance of the Work, the Owner and Construction Manager shall be immediately notified. The HMAC shall state the reason for the delay and shall estimate the expected duration of the delay. Any application for an extension of the Contract completion date shall be made under proper change order procedures. The acceptance of the cause for delay and change order is subject to the Owner's review and approval.

D. Work hours will be established in coordination with the Owner, Owner's Consultant, and Construction Manager.

E. Any extra hours or days per week worked by the HMAC or Sub-Contractors shall be at no extra cost to the Owner. Denial of extra hours or days per week by the Owner shall not be grounds for extra time allotted to the overall Contract time. The HMAC shall be responsible for all overtime payment to cover Owner's Consultant overtime fees for work performed above and beyond normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011600

SECTION 012013 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Modification procedures.

D. Correlation of Contractor submittals based on Contract modifications.

E. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

A. Section 012100 - Allowances: Payment procedures relating to allowances.

B. Section 012200 - Hazardous Materials Unit Prices.

C. Section 012200.1 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

D. Section 017800 - Closeout Submittals: Project record documents.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Application for Payment forms with Continuation Sheets.

b. Submittals Schedule.

c. Contractor's Construction Schedule.

2. Submit the Schedule of Values to the Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section. For major trades with line item values greater than $25,000, provide a separate line item for units of work within each trade with a value not exceeding $25,000.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.

b. Name of Construction Manager.

c. Name of Architect.

d. Architect's project number.

e. Contractor's name and address.

f. Date of submittal.

2. Submit draft of AIA Document G702 and AIA Document G703 Continuation Sheets.

3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Related Specification Section or Division.

b. Description of the Work.

c. Name of subcontractor.

d. Name of manufacturer or fabricator.

e. Name of supplier.

f. Change Orders (numbers) that affect value.

g. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

b. Include the following mandatory line items:

1) Mobilization.

2) Demobilization.

3) Builders Risk Insurance.

4) Bonds.

5) Coordination Drawings.

6) Scheduling.

7) Commissioning.

8) Project record documents.

9) Operation and Maintenance manuals.

10) Field Engineering.

11) Daily Building Cleanup.

12) Safety Program.

13) Full-Time Project Manager.

14) Full-Time Project Superintendent.

15) Field Offices.

16) Dumpsters.

17) Cold Weather Protection.

18) Temporary Heat.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in- place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

   1. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:

1. Item Number.
2. Description of work.
3. Scheduled Values.
4. Previous Applications.
5. Work in Place and Stored Materials under this Application.
6. Authorized Change Orders.
7. Total Completed and Stored to Date of Application.
8. Percentage of Completion.
9. Balance to Finish.
10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one electronic and three hard-copies of each Application for Payment.

I. Include the following with the application:

1. Transmittal letter as specified for submittals in Section 013000.
2. Construction progress schedule, revised and current as specified in Section 013216.
3. Current construction photographs specified in Section 013000.
4. Conditional release of liens from each Subcontractor and vendor for the current month's payment application, and unconditional release of liens from each Subcontractor and vendor for the previous month's payment application.
5. Project record documents as specified in Section 017800, for review by Owner which will be returned to the Contractor.
6. Affidavits attesting to off-site stored products.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive modification documents and who will be responsible for informing others in Contractor's employ or subcontractors of modifications to the Contract Documents.

B. Project Modification Forms: Forms for use primarily by Contractor are identified in Table of Contents. Use of Contractor's typical forms will be considered, subject to approval of Architect.

C. Establish and maintain a construction cost log, including the status of all pending and executed Change Orders (accepted, declined, pending, etc.), status of requests for information, supplemental instructions, other modification documents, and the status of allowances, including Owner's contingency allowance.

D. Supplemental Instructions: For minor modifications not involving an adjustment to the Contract Sum or Contract Time; Architect will issue instructions directly to Contractor.

1. Architect's issuance of supplemental instructions may constitute a modification of the Contract Documents involving an adjustment to the Contract Sum or Contract Time. If Architect's supplemental instructions require such a modification of the Contract Documents, prepare a request for change order or other modification according to applicable modification procedures specified in this Section.

E. Construction Change Directive: For other required modifications, Architect will issue a document signed by Architect and Owner instructing Contractor to proceed with the modification, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.

2. Promptly execute the change.

F. Proposal Request: For modifications for which advance pricing is desired, Architect will issue a document which includes a detailed description of a proposed modification with supplementary or revised drawings and specifications. Contractor shall prepare and submit a fixed price quotation within 10 days, estimating any changes to Contract Sum and Contract Time for executing the modification. Contractor's quotation shall stipulate any overtime work required and the period of time during which the requested price will be considered valid.

G. Contractor may propose a change by submitting a request for change order or modification to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.

1. Document any requested substitutions in accordance with Section 016000.

H. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.

3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.

4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

I. Substantiation of Costs: Provide full information required for evaluation.

1. Provide the following data:

a. Quantities of products, labor, and equipment.

b. Taxes, insurance, and bonds.

c. Overhead and profit.

d. Justification for any change in Contract Time.

e. Credit for deletions from Contract, similarly documented.

2. Support each claim for additional costs with additional information:

a. Origin and date of claim.

b. Dates and times work was performed, and by whom.

c. Time records and wage rates paid.

d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

J. Execution of Change Orders: Contractor will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

K. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

L. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

M. Promptly enter changes in Project Record Documents.

1.6 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 017000.
2. Receipt of unconditional release of liens from Contractor and each Subcontractor and vendor for the previous month's payment application.
3. Receipt of final Certificate of Occupancy from jurisdictional authority.
4. Acceptance of Work by Owner and Architect.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 012100 - ALLOWANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quantity allowances.

B. Payment and modification procedures relating to allowances.

1.2 RELATED REQUIREMENTS

A. Section 012013 - Price and Payment Procedures: Additional payment and modification procedures.

B. Section 012200.1 - Unit Prices.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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Section 012200 - HAZARDOUS MATERIALS UNIT PRICING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the project Scope of Work is altered.

B. Unit prices shall include costs of all materials, all direct or indirect expenses of the Contractor or Sub-Contractors, profit, insurance, bonding, and any applicable taxes. For deleted work, the net credit to the contract shall be 0% less.

C. Unit prices shall be used for work outside of the base bid and to quantify the actual value of quantity allowances.

D. Section Includes the following:

1. Unit Price Schedule

E. Related Sections:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 011600:	Hazardous Materials Scheduling and Phasing
3.	Section 015705:	Environmental Protection
4.	Section 017701:	Hazardous Materials Contract Closeout
5.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
6.	Section 020800:	Asbestos Abatement
7.	Section 020820:	Universal Waste Reclamation
8.	Section 020900:	Lead Paint Awareness
9.	Section 021100:	PCB Remediation
10.	Section 026123:	Handling, Transport and Disposal of Excavated Soil

F. Related Documents:

1. Hazardous Materials Abatement Plans HM-1 through HM-3

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 UNIT PRICE SCHEDULE

A. Unit Prices in accordance with the following schedule will apply to this Contract. Unit prices include labor, disposal, and all necessary fees.

Item No. 1 – ASBESTOS CONTAINING FLOORING MATERIALS (All Layers to Substrate), REMOVAL AND DISPOSAL AS ASBESTOS AND PCB WASTE >50 PPM.

$_____ per square foot.

Item No. 2 – ASBESTOS CONTAINING INTERIOR CAULKS, REMOVAL AND DISPOSAL AS ASBESTOS AND PCB WASTE >50 PPM.

$_____ per linear foot.

Item No. 3 – ASBESTOS CONTAINING MUDDED PIPE FITTING INSULATION/ROOF DRAIN FITTING, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ each.

Item No. 4 – ASBESTOS CONTAINING MUDDED PIPE FITTING INSULATION WITHIN MASONRY WALLS, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ each.

Item No. 5 - ASBESTOS CONTAINING THERMAL SYSTEM INSULATION, REMOVAL AND DISPOSAL AS FRIABLE ASBESTOS WASTE.

$_____ per linear foot.

Item No. 6 – ASBESTOS CONTAINING INTERIOR PARTITION/TRANSOM WINDOW SASH, REMOVAL AND DISPOSAL AS ASBESTOS AND PCB WASTE >50 PPM.

$_____ per sash.

Item No. 7 – DOORS WITH ASBESTOS CONTAINING CORE INSULATION, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ each.

Item No. 8 – DOORS WITH ASBESTOS CONTAINING WINDOW GLAZING COMPOUND, REMOVAL AND DISPOSAL AS ASBESTOS AND PCB WASTE >50 PPM.

$_____ each.

Item No. 9 – ASBESTOS CONTAINING DUCT FLANGE SEALANT, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ linear foot.

Item No. 10 – ASBESTOS CONTAINING VALVE PACKING, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ each.

Item No. 11 – ASBESTOS CONTAINING GASKETS AT BOLTED CONNECTIONS, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ each.

Item No. 12 – ASBESTOS CONTAINING EXTERIOR CAULKS, REMOVAL AND DISPOSAL AS ASBESTOS AND PCB WASTE >50 PPM.

$_____ per linear foot.

Item No. 13 – ASBESTOS CONTAINING CEMENT BOARD PANEL (EXTERIOR), REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ per square foot.

Item No. 14 – ASBESTOS CONTAINING ROOF FLASHING CEMENT (ALL LAYERS), REMOVAL AND DISPOSAL AS ASBESTOS AND PCB WASTE >50 PPM.

$_____ per square foot.

Item No. 15 – ASBESTOS CONTAINING SILVER PAINT, REMOVAL AND DISPOSAL AS ASBESTOS WASTE.

$_____ per square foot.

Item No. 16 – SPOT REPAIR UTILIZING OSHA GLOVE BAG REMOVAL METHOD FOR LESS THAN 3 SQUARE FEET/LINEAR FEET OF ACM.

$_____ per glove bag.

Item No. 17 – PREPARATION OF A SMALL CONTAINMENT (for abating asbestos >3 SF/3 LF but <260 LF/160 SF) WITH DECONTAMINATION UNIT (including remobilization, if necessary).

$_____ per containment.

Item No. 18 – PREPARATION OF A LARGE CONTAINMENT (for abating asbestos >260 LF/160 SF) WITH DECONTAMINATION UNIT (including remobilization, if necessary).

$_____ per containment

Item No. 19– DISPOSAL OF ASBESTOS AND PCB WASTE >50 PPM.

$_____ per ton.

Item No. 20 – DISPOSAL OF PCB WASTE >50 PPM.

$_____ per ton.

Item No. 21 – DISPOSAL OF HAZARDOUS LEAD WASTE.

$_____ per ton.

Item No. 22 – DISPOSAL OF HAZARDOUS LEAD WASTE.

$_____ per T-Pak.

Item No. 23 – REMOVAL AND DISPOSAL OF PCB/DEHP CONTAINING LIGHT BALLASTS.

$_____ each.

Item No. 24 – REMOVAL AND DISPOSAL/RECYCLING OF LEAD ACID BATTERIES.

$_____ each.

Item No. 25 – REMOVAL AND RECYCLING OF MERCURY VAPOR LIGHT TUBE.

$_____ per four-foot tube.

Item No. 26 – REMOVAL AND RECYCLING OF MERCURY VAPOR LIGHT TUBE.

$_____ per eight-foot tube.

Item No. 27 – REMOVAL AND RECYCLING OF MERCURY VAPOR LIGHT TUBE.

$_____ per round or u-shape tube.

Item No. 28 – REMOVAL AND RECYCLING OF REFRIGERANT.

$_____ per fixture.

3.2 SOIL REMEDIATION UNIT PRICE SCHEDULE

Item No. 29 – POLLUTED AND CONTAMINATED- RCS-1 RECLAMATION FACILITY

$_____ per ton.

Item No. 30 – POLLUTED AND CONTAMINATED- RCS-2 RECLAMATION FACILITY

$_____ per ton.

Item No. 31 – POLLUTED AND CONTAMINATED - PERMITTED CT DEEP AUTHORIZED BENEFICIAL RE-USE FACILITY

$_____ per ton.

Item No. 32 – POLLUTED AND CONTAMINATED - NON-RCRA IN-STATE LANDFILL

$_____ per ton.

Item No. 33 – POLLUTED AND CONTAMINATED - NON-RCRA OUT-OF-STATE UNLINED LANDFILL

$_____ per ton.

Item No. 34 – POLLUTED AND CONTAMINATED - NON-RCRA OUT-OF-STATE LINED LANDFILL

$_____ per ton.

Item No. 35 – POLLUTED AND CONTAMINATED - THERMAL DESORPTION FACILITY

$_____ per ton.

Item No. 36 – RCRA HAZARDOUS WASTE LANDFILL FACILITY

$_____ per ton.

END OF SECTION 012200

SECTION 012200.1 - UNIT PRICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.2 RELATED REQUIREMENTS

A. Section 012013 - Price and Payment Procedures: Additional payment and modification procedures.

B. Section 012100 - Allowances: Allowance amount to be determined by Contractor based on Unit Pricing.

C. Section 012200 - Hazardous Materials Unit Prices.

1.3 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.4 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the drawings or specifications are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.5 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification Sections complement the criteria of this Section. In the event of conflict, the requirements of the individual specification Section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

1.6 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.7 SCHEDULE OF UNIT PRICES

A. Masonry Restoration and Cleaning:

1. Provide a single, all-inclusive composite unit price per square foot to perform the combined scope of masonry cleaning, repointing, and brick replacement in accordance with Section 040100 - Masonry Restoration and Cleaning.
2. Itemized Breakdown Requirement: Provide an itemized cost breakdown for each of the three separate portions of work listed below. The sum of these three items must equal the total Composite Unit Price. Each itemized price shall be utilized independently for adjustments during construction as field conditions dictate:

a. Brick Replacement: Price by square foot of wall area.

b. Repointing: Price by square foot of wall area.

c. Brick Cleaning: Price by square foot wall area.

3. Coordinate this composite unit price and its itemized components with the allowance requirements of Section 01 21 00 - Allowances.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description of Alternates.

B. Documentation of changes to Contract Sum and Contract Time.

1.2 GENERAL ALTERNATE REQUIREMENTS

A. The description of each Alternate is recognized to be incomplete and abbreviated, but requires that each change must be complete for the scope or work affected. Refer to applicable specification Sections and applicable Drawings for the specific requirements of work.

B. Base Bid: Include work associated with described deductive alternates and exclude described additive alternates. Failure to submit proposals for all alternates may result in rejection of bid.

1.3 DESCRIPTION OF ALTERNATE REQUIREMENTS

A. Alternates are defined as alternative products, materials, equipment, systems, methods, units of work, or major elements of construction which may, at Owner's option, be selected for the work in place of corresponding requirements of the Contract Documents. Selection may occur prior to the Contract date, or may be deferred for possible selection at a subsequent date.

B. Include as part of each Alternate, miscellaneous devices, appurtenances, differences in utility or power requirements, and similar items incidental to or required for complete and functioning installation, whether or not specifically mentioned as part of the alternate description.

C. Immediately following award of the Contract, prepare and distribute to each entity involved, notification of the status of each Alternate. Indicate whether alternates have been accepted, rejected, or deferred for consideration at a later date. Indicate a complete description of negotiated modifications to described scope of Alternates, if any.

1.4 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.5 SCHEDULE OF ALTERNATES

A. Alternate No. 01: Roof Screens.

1. Base Bid: No roof.

2. Alternate: Include roof screens in accordance with Section 08 45 00 in locations shown on drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.2 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures, coordination.

B. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling, and substitution limitations.

1.3 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.

a. Unavailability.

b. Regulatory changes.

c. Other limitations specified in Section 016000.

2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.

2. Agrees to provide the same warranty for the substitution as for the specified product.

3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
5. Waives claims for additional costs or time extension that may subsequently become apparent.
6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
1. Note explicitly any non-compliant characteristics.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
3. Architect will notify Contractor in writing of decision to accept or reject request.

D. Substitution Request Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

E. Limit each request to a single proposed substitution item.
1. Submit an electronic document, combining the request form with supporting data into single document.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

B. Substitution Request Form (before award of contract):
1. Submit substitution requests by completing the form in Section 004000; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

C. Owner will consider requests for substitutions only if submitted at least 7 days prior to the date for receipt of bids.

3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Substitution Request Form (after award of contract):
1. Submit substitution requests by completing the form in Section 006000; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Architect will consider requests for substitution only within 60 days after date of commencement of Work, unless otherwise determined by Architect to be acceptable under extenuating circumstances.

1. Substitutions will also be considered when a Product, through no fault of Contractor, becomes unavailable or unsuitable due to regulatory change.

C. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

D. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:

a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

b. Other construction by Owner.

c. Other unanticipated project considerations.

E. Substitutions will not be considered under one or more of the following circumstances:

1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.5 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Include completed and approved Substitution Request Forms as part of the Project record.

END OF SECTION

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Project closeout meeting.

F. Contractor's daily reports.

G. Progress and documentation photographs.

H. Use of Architect's digital Drawing files.

I. Submittals for review, information, and project closeout.

J. Number of copies of submittals.

K. Requests for Information (RFI) procedures.

L. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: General product requirements.

B. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:

1. Requests for Interpretation (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.

4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.
12. Other specified submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.
4. Other invited participants.

C. Minimum Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Submission of initial Submittal schedule.
6. Designation of personnel representing the parties to Contract, including Contractor, Owner, and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.2 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.
7. Other invited participants.

C. Minimum Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute electronically within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.3 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at weekly intervals, unless otherwise agreed upon and approved by Owner.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.

4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.

D. Minimum Agenda:

1. Review minutes of previous meetings.
2. Review and discussion of Weekly Progress Report.
3. Review of work progress.
4. Field observations, problems, and decisions.
5. Identification of problems that impede, or will impede, planned progress.
6. Review of submittals schedule and status of submittals.
7. Review of RFIs log and status of responses.
8. Modification (Change Order) status.
9. Review of off-site fabrication and delivery schedules.
10. Maintenance of progress schedule.
11. Corrective measures to regain projected schedules.
12. Planned progress during succeeding work period.
13. Coordination of projected progress.
14. Maintenance of quality and work standards.
15. Effect of proposed changes on progress schedule and coordination.
16. Other business relating to work.

E. Record minutes and distribute electronically within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.4 PROJECT CLOSEOUT MEETING

A. Schedule and administer a Project closeout meeting minimum 3 months before scheduled Date of Substantial Completion, at location mutually agreed upon by Owner, Contractor, and Architect.

B. Attendance Required: Owner, Contractor, job superintendent, and Architect.

C. Minimum Agenda:

1. Review specified closeout process, tasks required of respective participants, task scheduling, and deadline dates for each critical path task in the closeout process.
2. Review closeout submittals required and submittal procedures for each.
3. Review maintenance materials requirements and Owner's requirements for delivery and storage.
4. Review final inspection requirements of AHJ and coordination of same.
5. Review status of record documentation, and discuss process for completing and distributing record documentation to Owner and Architect.

D. Record minutes and distribute electronically within two days after meeting to participants and those affected by decisions made.

3.5 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:

1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. List of separate contractors at Project site.
5. Approximate count of personnel at Project site.
    a. Include a breakdown for supervisors, laborers, journeymen, equipment operators, and helpers.
6. Major equipment at Project site.
7. Material deliveries.
8. Safety, environmental, or industrial relations incidents.
9. Meetings and significant decisions.
10. Unusual events (submit a separate special report).
11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
15. Change Orders received and implemented.
16. Testing and/or inspections performed.
17. List of verbal instruction given by Owner and/or Architect.
18. Signature of Contractor's authorized representative.

3.6 PROGRESS PHOTOGRAPHS AND DOCUMENTATION

A. Document existing conditions in the work area prior to start of demolition. Take initial photographs in quantity and at locations required to fully document existing conditions which may become concealed as the result of new Work.

B. Submit initial photographs to Owner and Architect, and discuss existing conditions that are a concern of Contractor in relation to proposed new Work.

C. Take additional photographs as Work progresses, at same locations and from same viewing angles as initial photographs.

D. Establish system for storing photographs electronically throughout the progress of construction; provide access to photographs to Owner and Architect via web interface.

E. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

F. Submit new photographs at least once a month, within 3 days after being taken.

G. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.

H. Photography Type: Digital; electronic files.

I. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

J. In addition to periodic, recurring views, take photographs of each of the following events:

1. Completion of site clearing.
2. Excavations in progress.
3. Foundations in progress and upon completion.
4. Structural framing in progress and upon completion.
5. Enclosure of building, upon completion.
6. Final completion, minimum of ten (10) photos.

K. Views:

1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
2. Consult with Architect for instructions on views required.
3. Provide factual presentation.
4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

L. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.

1. File Naming: Include project identification, date and time of view, and view identification.
2. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.

3.7 DIGITAL DRAWING FILES

A. Architect's Digital Files: Upon request by Contractor, a digital copy of Architectural and Structural Project Building Information Model (BIM) and MEP CADD drawing files will be provided as a courtesy for Contractor's limited use. Such information is not considered to be a part of the Contract Documents.

1. Use of this information is at Contractor's sole risk.

2. Report to Architect discrepancies, if any, between published Contract Documents and information provided according to General Conditions and other administrative requirements of the Contract.
3. Prior to receiving digital files, execute data licensing agreement; Architect's standard form.
4. The following files will be furnished free of charge, if requested:
    a. Building floor plans.
    b. Reflected ceiling plans.
5. Architect is not responsible for updating or maintaining currency of digital drawing files after initially provided to Contractor.
6. Additional digital files will be provided, upon request, at a cost of $200.00 for each file; cost will be deducted from the Contract Sum, and Architect will recover corresponding cost from Owner.
7. Submittals prepared using any of these files as the primary submittal content without the inclusion of substantial additional content generated by Contractor according to specified requirements for applicable submittals will not be accepted or reviewed by Architect.

3.8 REQUESTS FOR INFORMATION (RFI)

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
    a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare using an electronic version of the form included in Section 00 63 13.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.

2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::

    a. Approval of submittals (use procedures specified elsewhere in this section).

    b. Approval of substitutions (see Section - 016000 - Product Requirements)

    c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).

    d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

    a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.

1. Official Project name and number, and any additional required identifiers established in Contract Documents.

2. Owner's, Architect's, and Contractor's names.

3. Discrete and consecutive RFI number, and descriptive subject/title.

4. Issue date, and requested reply date; "ASAP", "As Soon as Possible", or "Immediately" not acceptable as reply date.

5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).

6. Annotations: Field dimensions and/or description of conditions which have engendered the request.

7. Contractor's Suggested Resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

1. Indicate current status of every RFI. Update log promptly and on a regular basis.

2. Note dates of when each request is made, and when a response is received.

3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 3 calendar days. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.
5. If the Contractor submits an RFI on an activity with seven (7) days or less of float on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Architect to respond to the request provided that the Architect responds within the seven (7) days set forth above.

3.9 SUBMITTAL SCHEDULE

A. After development and review by the Owner and Architect acceptance of the Contractor's Construction or CPM schedule prepare a complete schedule of submittals. Submit the schedule to the Construction Administrator within thirty (30) days of Contract Award.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor’s Construction or CPM Schedule.
2. Prepare the schedule in chronological order. Provide the following information:

a. Schedule date for the initial submittal.

b. Related section number.

c. Submittal category (Shop Drawings, Product Data, or Samples).

d. Name of Subcontractor.

e. Description of the part of Work covered.

f. Scheduled date for resubmittal.

g. Scheduled date for the Architect's final release of approval.

B. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's CPM Schedule.

2. Initial Submittal: Submit concurrently with start-up construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each specification section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3.10 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.

2. Design data.

3. Shop drawings.

4. Samples for selection.

5. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Sustainability design submittals and reports.
   2. Certificates.
   3. Test data, test reports, and evaluation reports.
   4. Inspection reports.
   5. Qualification statements.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Sample Warranties.
   9. Surveys.
   10. Approvals of authorities having jurisdiction.
   11. Quality control submittals, including field test reports and inspections.
   12. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual Sections, submit them at project closeout in conformance to requirements of Section 017800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Demonstration and Training Videos.
   6. Other types specified.

D. Final Property Survey.

E. Submit for Owner's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents - Submittals for Review and Information: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Submittals for Review: Submit electronically.

C. Submittals for Information: Submit electronically.

D. Samples: Submit the number specified in individual specification Sections; one of which will be retained by Architect.

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES - GENERAL

A. General Requirements:

1. Use a single transmittal for related items.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Transmit using approved form.
    a. Use Contractor's form, subject to prior approval by Architect.
4. Sequentially identify each item. For revised submittals use original number and a sequential combination numberical and alphabetical suffix.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Include form provided in Section 016117 - Accessory Material VOC Content Certification Form .
7. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
    a. Submittals not bearing Contractor's review stamp, indicating both review and approval, will not be reviewed and be returned for required review.
    b. Submittals from sources other than Contractor will not be acknowledged, reviewed, or returned.
8. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Send submittals in electronic format via email to Architect.
9. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 15 calendar days excluding delivery time to and from the Contractor.
    b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 calendar days.
    c. For the purpose of establishing the start of the mandated review period, submittals received after 12:00 noon will be considered as having been received on the following regular working day.
    d. Mass Submittals:

1) Definition: Six (6) or more submittals in one (1) day or twenty (20) or more submittals in one (1) week.

2) Procedure: When Mass Submittals are received, Architect's review time stated above may be extended as necessary to perform proper review. Architect will review Mass Submittals based upon priority determined by Architect after consultation with Owner and Contractor.

10. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
11. Provide space for Contractor and Architect review stamps.
12. When revised for resubmission, identify all changes made since previous submission.
13. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
14. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
15. Submittals not reviewed by Contractor will be rejected, and will not be reviewed by Architect. Claims for delay as the result of submittals not reviewed by Contractor will not be allowed.
16. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:

1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.
5. Manufacturer's Catalog Submittals: If manufacturer's published catalog information is used as part of a submittal, include only those pages from catalog that are specifically applicable to the proposed products for this Project.

a. Clearly identify in the submittal those specific products and components for which review and action is requested.

b. Submittals received that do not clearly identify specific applicable products, or that include more pages than those specifically applicable to the subject submittal, will be returned as "not reviewed" and the time for submittal review will not commence until a properly scoped submittal is received by Architect.

C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce the Contract Documents to create shop drawings, unless otherwise permitted.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:

1. Transmit related items together as single package to Architect's office, unless otherwise specified.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action. See below for actions to be taken.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:

1. Authorizing purchasing, fabrication, delivery, and installation:

a. "No Exception Taken", or language with same legal meaning.

b. "Make Corrections Noted", or language with same legal meaning.

1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.

c. "Revise and Resubmit", or language with same legal meaning.

1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.

2) Non-responsive resubmittals may be rejected.

2. Not Authorizing fabrication, delivery, and installation:

a. "Revise and Resubmit".

1) Resubmit revised item, with review notations acknowledged and incorporated.

2) Non-responsive resubmittals may be rejected.

b. "Rejected".

1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:

1. Items for which no action was taken:

a. "Received" - to notify the Contractor that the submittal has been received for record only.

2. Items for which action was taken:

a. "Reviewed" - no further action is required from Contractor.

b. "Rejected" - Submit item complying with requirements of Contract Documents.

F. Architect's Actions:

1. Architect will review each submittal, mark it with appropriate "action," and return it to Contractor within specified time allowance; except when it must be held for coordination, and Contractor is so advised.

2. Where submittals include materials, products, systems, or manufacturers not specified, approved by Addendum prior to execution of the Contract, or approved in writing in conjunction with the proposed products list submittal specified in Section 016000, Architect reserves the right to exceed the specified time allowance to allow sufficient time to determine the acceptability of such items, and no claim for delay by Contractor will be allowed.

3. Where submittals include a material, product, system, or manufacturer substitution which has not been previously accepted or approved in writing, Architect reserves the right to reject such submittal and require a compliant submittal, or may direct that other action be taken by Contractor to achieve compliance with Contract Documents, and no claim for delay by Contractor will be allowed.

4. Architect's review is for general conformance only and does not relieve Contractor from full compliance with the Contract Documents.

3.16 SUBMITTAL PROCEDURES - ELECTRONIC

A. Project Submittals: All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.

2. It is Contractor's responsibility to submit documents in PDF format.

3. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the contract sum.

C. Submittal Service: Use one of the following:

1. Architect's approved internet-based service.

2. Substitutions: Permitted, subject to approval of Architect.

D. Distribute electronic copies of each fully reviewed submittal to all Subcontractors involved with or having coordination responsibility for the submittal. Instruct parties to promptly report any inability to comply with requirements.

END OF SECTION

SECTION 013216 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.2 RELATED SECTIONS

A. Section 011600 - Hazardous Materials Scheduling and Phasing: Special requirements for abatement and hazardous material removal work.

1.3 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule.

B. If preliminary schedule requires revision after review, submit revised schedule within 5 days.

C. Within 10 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 5 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit under transmittal letter form specified in Section 013000 - Administrative Requirements.

1.4 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with two years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: Two years minimum experience in using and monitoring CPM schedules on comparable projects.

1.5 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 22 x 17 inches.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.2 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify work of separate stages and other logically grouped activities.

D. Include conferences and meetings in schedule.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

G. Coordinate content with schedule of values specified in Section 012013 - Price and Payment Procedures.

H. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.4 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.6 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

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SECTION 013553 - SECURITY PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security measures including formal security program, entry control, personnel identification, and miscellaneous restrictions.

1.2 RELATED REQUIREMENTS

A. Section 011000 - Summary: Use of premises and occupancy.

1.3 SECURITY PROGRAM

A. Protect Work and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program at project mobilization.

C. Maintain program throughout construction period until Owner occupancy.

1.4 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site .

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to Owner on request.

1.5 PERSONNEL IDENTIFICATION

A. Provide identification badge to each person authorized to enter premises.

B. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.

C. Require return of badges at expiration of their employment on the Work.

1.6 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. Testing and inspection agencies and services.

D. Contractor's construction-related professional design services.

E. Contractor's design-related professional design services.

F. Control of installation.

G. Mock-ups.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

K. Basis of design specifications.

1.2 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

B. Section 014216 - Definitions.

C. Section 014339 - Stand-Alone Exterior Mockup: Additional mock-up requirements.

D. Section 016000 - Product Requirements: Requirements for material and product quality.

E. Individual Specification Sections: Special inspections and tests required, and standards for special inspections and tests.

1.3 DEFINITIONS

A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:

a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.

b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.4 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary falsework for support of spanning or arched structures.
5. Temporary foundation underpinning.
6. Temporary stairs or steps required for construction access only.
7. Temporary hoist(s) and rigging.
8. Investigation of soil conditions to support construction equipment.

1.5 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:

1. Structural Design of Steel Connections: As described in Section 051200 - Structural Steel Framing.
2. Structural Design of Metal Framing: As described in Section 054000 - Cold-Formed Metal Framing.
3. Structural Design of Metal Fabrications: As described in Section 055000 - Metal Fabrications.
4. Structural Design of Stairs: As described in Section 055100 - Metal Stairs.

5. Structural Design of Railings: As described in Section 055213 - Pipe and Tube Railings.
6. Structural Design of Flagpole Asssemblies, Foundations, and Supports: As described in Section 107516 - Ground-Set Flagpoles.
7. Sprinkler Layout: Coordinate with ceiling installation, detailed pipe layout, and hydraulic calculations as described in Section 211300 - Fire-Suppression Sprinkler Systems.
8. System Design: As described in Section 230913 - Instrumentation and Control Devices for HVAC.
9. System Design: As described in Section 230923 - Direct-Digital Control System for HVAC.
10. Power System Studies, Assessments, and Selection Criteria: As described in Section 260573 - Power System Studies.
11. Emergency Responder Communication Enhancement System Design: As described in Section 275129.17 - Two-way Radio Communication Enhancement Systems.
12. Fire Alarm Systems Design: As described in Section 284600-Fire Detection and Alarm.
13. Delegated engineering design services specified in individual Sections.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.

a. Full name.

b. Professional licensure information.

c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
5. Provide additional copies of design data for Architect's design consultants, including but not limited to structural engineer, mechanical engineer, plumbing engineer, and electrical engineer; transmit to each design consultant's address concurrently, if requested by Architect.

D. Test Reports: After each test or inspection, testing agency will promptly submit electronic copies of report to Architect and to Contractor.

1. Transmit one copy of each report to Owner, if requested.

2. Provide additional copies of each test/inspection report for Architect's design consultants, including but not limited to structural engineer, mechanical engineer, plumbing engineer, electrical engineer, and specialty consultant; transmit to each design consultant's address concurrently, if requested by Architect.

3. Include in content of reports:

a. Date issued.

b. Project title and number.

c. Name of inspector.

d. Date and time of sampling or inspection.

e. Identification of product and specifications Section.

f. Location in the Project.

g. Type of test/inspection.

h. Date of test/inspection.

i. Results of test/inspection.

j. Compliance with Contract Documents.

k. When requested by Architect, provide interpretation of results.

4. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.

1. Submit report in duplicate within 30 days of observation to Architect for information.

2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.8 QUALITY CONTROL - GENERAL

A. Maintain quality control over subcontractors, suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality according to the requirements of the Contract Documents.

B. Special Testing and Inspection: It is recognized that specified special testing and inspection program is intended to assist Contractor, Owner, Architect, and jurisdictional authorities in nominal determination of probable compliance with specified requirements for certain elements of the Work. This program is not intended to limit Contractor's standard quality control program.

1.9 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

1.10 BASIS OF DESIGN SPECIFICATIONS

A. Individual specification Sections may include a Basis of Design Manufacturer or Product, which forms the basis of the specifications, Drawing details, and other requirements of the Contract Documents. Unless the specifications have identified that no substitutions will be permitted, the specified Basis of Design Manufacturer or Product is not intended to exclude other manufacturers, products, or systems which comply with the requirements of the Contract Documents, subject to the provisions and requirements specified in individual specification Sections.

1. See Section 016000 - Product Requirements for product selection options.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

1. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

C. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Have work performed by persons qualified to produce required and specified quality.

E. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 MOCK-UPS

A. Mock-ups, General: Full-size installation of physical assemblies consisting of multiple systems and products constructed on-site, or at designated off-site location, in advance of final work to allow the Architect an opportunity to view and approve qualities of materials and execution and establish the standard by which the Work will be judged. Mockups are not Samples.

B. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

C. Field Sample Panels: Assemble a composite panel separate from building for review.

1. Construct composite panel using each system's required components specified in individual Sections of the specifications, or as indicated on Drawings. Provide adequate supporting structure for mockup materials as necessary.
2. Refer to individual Sections for size requirements.
3. Once mock-up has been accepted by Architect, maintain mock-up in accepted condition for remaining duration of Contract Time. Remove mock-up and clear area immediately prior to Substantial Completion.

D. Integrated Interior Mock-ups: Construct integrated interior mock-up as indicated on Drawings. Coordinate installation of materials and products as required in individual Specification Sections.

1. Do not construct integrated interior mock-up until building is enclosed and weatherproof, and building's environmental control systems are operating and will maintain temperature and relative humidity at designed occupancy levels throughout the remainder of the construction period.
2. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work.

E. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

1. Include typical and unique transition conditions.
2. Construct mock-up in phased sequence matching sequencing of building construction, so that building envelope and drainage plane details can be observed on mock-up prior to installation on building, and also prior to installation of finish materials on mock-up.

F. Notify Architect seven (7) working days in advance of dates and times when mock-ups will be completed and ready for review and evaluation.

G. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

H. Assemble and erect specified items with specified backing materials, attachment and anchorage devices, weather barriers, flashings, sealants, applied coatings, surface treatments, and finishes.

I. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
2. Make corrections as necessary until Architect's approval is issued.

J. Accepted mock-ups shall be a comparison standard for the remaining Work.

K. Where mock-up has been accepted by Architect and is specified in product specification Sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

1. Comply with construction waste management requirements specified in Section 017419.

3.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.4 TESTING AND INSPECTION

A. See individual specification Sections and structural Drawings for testing and inspection required.

B. Testing Agency Duties:

1. Test samples of mixes submitted by Contractor.
2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
6. Perform additional tests and inspections required by Architect.
7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:

    a. To provide access to Work to be tested/inspected.

    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.

    c. To facilitate tests/inspections.

d. To provide storage and curing of test samples.

4. Re-testing: Performed by same agency if required because of non-conformance to specified requirements, on instructions from Architect.

a. Paid for by Contractor if required because of non-conformance with specified requirements.

3.5 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment,test, adjust and balance of equipment, and inspection of installed materials as applicable, and to initiate instructions when necessary.

1. Manufacturer's field representative will be required to submit daily reports as specified in this Section, when daily observations and inspections are specified in individual Sections.

B. Submit qualifications of observer to Architect minimum 30 days in advance of required observations.

1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.6 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment, with Owner's consent.

END OF SECTION

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SECTION 014100 - REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Obtain and pay for required permits, fees, licenses, and inspections as stipulated in the Agreement.

B. Arrange for required regulatory inspections and approvals.

C. Comply with applicable codes and regulations as stipulated in the Agreement.

1. Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

2. Contractor is required to promptly report to Architect any nonconformity discovered by or made known to Contractor as a Request for Information.

1.2 SUMMARY OF APPLICABLE CODES

A. See Drawings for additional information.

1.3 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements.

B. Section 018113 - Sustainable Design Requirements - CTHPB.

1.4 QUALITY ASSURANCE

A. Become familiar with applicable requirements of codes and regulations.

B. Verify that substituted materials and equipment used in the Work meet or exceed requirements of applicable codes and regulations.

C. Contractor's Designer Qualifications: Refer to Section - 014000 - Quality Requirements.

D. Comply with execution requirements of authority having jurisdiction.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 014216 - DEFINITIONS

A. This Section supplements the definitions contained in the General Conditions and other Contract Documents.

B. Other definitions are included in individual specification Sections.

1.2 SPECIFICATION EXPLANATIONS

A. General: Explanations are provided to assist in understanding format, language, implied requirements and conventions of specification content. None of these explanations will be interpreted to modify the substance of content requirements.

B. Division 01 General Requirements: Expand on the broad provisions of the Conditions of the Contract, and govern the execution of the work of all Sections of the specifications. Division 01 General Requirements specify administrative and procedural requirements relating to execution of the Work, and temporary facilities for use during the construction period.

C. Sections and Divisions: The basic unit of specification text is the "Section," each of which is named and numbered. These are organized into related families called "Divisions," which generally conform to the most current edition of "MasterFormat" as published by CSI. Any Section title is not intended to limit meaning or content of Section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of the text.

D. Imperative Language: Used generally in the Specifications. Except as otherwise specified, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe the responsibilities which must be fulfilled either indirectly by Contractor, or when so noted by others.

1.3 SPECIFICATION CONTENT CONVENTIONS

A. Overlapping Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping of those requirements also establishes different or conflicting minimums or levels of quality, the more stringent requirement will be enforced (which is generally the more costly level).

B. Refer apparently equal but different requirements and uncertainties as to which level of quality is required to Architect for interpretation or decision before proceeding.

C. Specification Minimum: In every instance, the specified requirement is the minimum to be performed or fulfilled. In complying with minimum requirements, the indicated numeric values are either minimums or maximums as noted or as appropriate for the context of the requirement. Refer instances of uncertainty to Architect for decision.

D. Abbreviations: The language of the Specifications and elsewhere in the Contract Documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of a self-explanatory nature have been included in the text.

E. Trade associations and general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular wherever applicable and wherever the full context of the requirements so indicate.

F. Specialists: In certain instances the Specification text may require that specific work be assigned to certain specialists or expert entities for the performance of those units of the Work. These are specified as requirements on which the Contractor has no choice or option.

G. Approve/Approved: Where used in conjunction with Architect's or Architect's consultant response to submittals, requests, applications, inquiries, reports, and claims by Contractor, the meaning of the term "approve" or "approved" will be held to the limitations of Architect's responsibilities and duties as specified in Section 013000 and stipulated in the General Conditions of the Contract. In no case will approval by Architect be interpreted as an assurance to Contractor that the requirements of the Contract Documents have been fulfilled.

H. By Others: Work performed by entities outside the Contract; interchangeable with "NIC" or "Not in Contract."

I. Contract Documents: Those documents defined in the Owner-Contractor Agreement (Contract) as applicable to the construction of the Project by Contractor.

1. Refer to General Conditions of the Contract for Construction for broader definition of this term.

J. Contractor's Option: Where materials, products, systems or methods are specified to be at Contractor's option, the choice of which material, method, product, or system will be used is solely Contractor's. There will be no change in Contract Sum or Time because of such choice.

K. Demolish (Demo): Dismantle a defined component of existing construction, remove it from the Site, and dispose of it either as specified or in lawful manner.

L. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect", "requested by Architect", etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.

M. Dispose: Remove from the Project Site in lawful manner.

N. Drawings: Capitalized term referring to the drawings prepared by Architect and its design consultants, and by any Owner consultants as applicable; bound and published as a sub-set of the Contract Documents as defined in Owner-Contractor Agreement (Contract). Non-capitalized term "drawings" used in the Contract Documents generally refers to other drawings not part of the Contract Documents, unless the context explicitly indicates otherwise.

O. Equipment: Defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including connections (wiring, piping, etc.).

P. Furnish: To supply, deliver, unload, and inspect for damage (by Contractor).

Q. General Requirements: Provisions or requirements of Division 01 specification Sections. General Requirements apply to the entire Work of the Contract and, where so indicated, to other elements of work which are included in the Project. See specification explanations in this Section.

R. Indicated: Cross reference to details, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar means of recording requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader accomplish the cross reference, and no limitation is intended except as specifically noted.

S. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use (by Contractor).

T. Installer: The entity (person or firm) engaged by Contractor or his Subcontractor or Sub-subcontractor for the performance of a particular unit of work at the project site, including installations, erection, application and similar required operations.

U. Material(s): Defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work.

V. Not in Contract (NIC): Work performed by entities outside the Contract; interchangeable with "By Others."

W. Product(s): Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

X. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the Specifications.

Y. Reinstall: Install a removed component of existing construction into new construction as indicated.

Z. Remove: Dismantle a defined component of existing construction in a manner which protects and preserves the component for future use/installation; definition includes lawful disposal, unless otherwise specifically indicated to be reinstalled, salvaged, or other described action.

AA. Salvage: Remove in a manner preserving the existing condition and integrity of the component, set aside, store and protect for future reinstallation.

BB. Work (the Work): Capitalized term referring to the entire scope of work of the Project as defined in the Contract Documents. Non-capitalized term "work" used in the Contract Documents generally refers to work by specific trades or other entities as components or phases of the Work, unless the context explicitly indicates otherwise.

1. Refer to General Conditions of the Contract for Construction for broader definition of this term.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 014219 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements relating to referenced standards.

1.2 QUALITY ASSURANCE

A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with the most current date of issue for each reference standard as of the Permit issue date listed on the Contract Documents, except where a different reference standard issue date is established by applicable code.

C. Obtain copies of standards when required by Contract Documents.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Date of Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect shall be altered by Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 014533 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Code-required special inspections and testing.

B. Testing services incidental to special inspections.

C. Submittals.

1.2 RELATED REQUIREMENTS

A. Individual Technical Specification Sections: Specific requirements for testing of materials and assemblies.

1.3 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authority having jurisdiction.

B. IAS: International Accreditation Service, Inc.

C. NIST: National Institute of Standards and Technology.

1.4 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

B. Special Inspection and Testing:

1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved contract documents and the referenced standards.
2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.5 REFERENCE STANDARDS

A. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

C. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Special Inspection and Testing Agency Qualifications: Prior to the start of work, Special Inspection Agency is required to:

1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3. Submit certification that Special Inspection Agency is acceptable to AHJ.

C. Special Inspection and Test Reports: After each special inspection, Special Inspector is required to promptly submit two copies of report; one to Architect and one to the AHJ.

1. Include:

a. Date issued.

b. Project title and number.

c. Name of Special Inspector.

d. Date and time of special inspection.

e. Identification of product and specifications Section.

f. Location in the Project.

g. Type of special inspection.

h. Date of special inspection.

i. Results of special inspection.

j. Compliance with Contract Documents.

2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

D. Fabricator Special Inspection Reports: After each special inspection of fabricated items at the Fabricator's facility, Special Inspector is required to promptly submit two copies of report; one to Architect and one to AHJ.

1. Include:

a. Date issued.

b. Project title and number.

c. Name of Special Inspector.

d. Date and time of special inspection.

e. Identification of fabricated item and specification Section.

f. Location in the Project.

g. Results of special inspection.

h. Verification of fabrication and quality control procedures.

i. Compliance with Contract Documents.

j. Compliance with referenced standard(s).

E. Certificates: When special inspection requirements are specified in individual specification Sections, Special Inspector is required to submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.

1.7 SPECIAL INSPECTION AND TESTING AGENCY

A. Owner will employ services of a Special Inspection and Testing Agency to perform inspections and associated testing and sampling required by the building code.

B. The Special Inspection and Testing Agency may employ and pay for services of an independent testing agency to perform testing and sampling associated with special inspections and required by the building code.

C. Owner's employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 SPECIAL INSPECTIONS AND TESTING - GENERAL

A. Frequency of Special Inspections and Testing: Special Inspections are indicated as continuous or periodic.

1. Continuous Special Inspection and Testing: Special Inspection Agency shall be present in the area where the work is being performed and observe the work at all times the work is in progress.

2. Periodic Special Inspection and Testing: Special Inspection Agency shall be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.2 STRUCTURAL SPECIAL INSPECTIONS

A. A schedule of required special inspections and testing for structural work is included in the Structural Drawings.

1. Additional special inspection and testing requirements are specified in this Section.

3.3 SPECIAL INSPECTIONS FOR SOILS

A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.

1. Design bearing capacity of material below shallow foundations; periodic.
2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.

B. Testing: Classify and test excavated material; periodic.

3.4 SPECIAL INSPECTION AND TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection and Testing Agency is required to:

1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified sampling and testing of products in accordance with specified reference standards.
4. Ascertain compliance of materials and products with requirements of Contract Documents.
5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
6. Perform additional tests and inspections required by Architect.
7. Submit reports of all tests or inspections specified.

B. Limits on Special Inspection and Testing Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

3.5 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities - General:

1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
    a. To provide access to work to be tested or inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
    c. To facilitate tests or inspections.
    d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
5. Re-testing: Performed by same agency if required because of non-conformance to specified requirements, on instructions from Architect.
    a. Paid by Contractor if required because of non-conformance to specified requirements.

END OF SECTION

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SECTION 015013 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dewatering.

B. Temporary utilities.

C. Temporary telecommunications services.

D. Temporary sanitary facilities.

E. Temporary Controls: Barriers, enclosures, and fencing.

F. Security requirements.

G. Vehicular access and parking.

H. Waste removal facilities and services.

I. Project identification sign.

J. Field offices.

1.2 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

B. Maintain temporary facilities in operable condition.

1.3 TEMPORARY UTILITIES

A. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.

B. New permanent facilities may not be used.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.4 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:

1. Windows-based personal computer or lap-top computer dedicated to project telecommunications, with necessary software and laser printer.
2. Telephone Land Lines: One line, minimum; one handset per line.
3. Internet Connections: Minimum of one; DSL modem or faster.
4. Email: Account/address reserved for project use.

1.5 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.6 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.7 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide minimum 6 foot high fence around construction site; equip with vehicularand pedestrian gates with locks.

1.8 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.9 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

F. Do not allow vehicle parking on existing pavement, unless authorized by Owner in writing.

1.10 WASTE REMOVAL

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 PROJECT IDENTIFICATION

A. Provide project identification sign of design, construction, and location approved by Owner. The project sign template is attached at the end of this Section.

B. No other signs are allowed without Owner permission except those required by law.

1.12 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 10 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015639 – TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.0 SECTION INCLUDES

A. General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: For limits placed on Contractor's use of the site.

B. Section 01 5000 - Temporary Facilities and Controls: For other temporary site fencing.

C. Section 31 1000 - Site Clearing: For removing existing trees and shrubs.

D. Section 31 2310 – Earthwork: Preparation of subsoil that may affect existing plants.

1.3 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape or the average of the smallest and largest diameters at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

    a. Tree-service firm's personnel and equipment needed to make progress and avoid delays.
    b. Arborist's responsibilities.
    c. Quality-control program.
    d. Coordination of Work and equipment movement with the locations of protection zones.
    e. Trenching by hand or with air spade within protection zones.
    f. Field quality control.

1.6 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.
3. Indicate extent of trenching by hand or with air spade within protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size samples of each size and text, ready for installation.

D. Qualification Data: For arborist and tree service firm.

E. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

F. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

G. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

H. Quality-control program.

1.7 QUALITY ASSURANCE

A. Arborist Qualifications: Licensed arborist in jurisdiction where project is located.

B. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this project and that will assign an experienced, qualified arborist to project site during execution of the Work.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

D. Root Pruning Operations: All root pruning operations shall be performed by the Contract Arborist and directed in the field by an ISA Certified Arborist with documented experience in similar SSAT excavation and root pruning.

1.8 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.

4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.0 MATERIALS

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Wood and bark chips.
2. Size Range: 3 inches (76 mm) maximum, 1/2-inch (13-mm) minimum.

B. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements: Previously used materials may be used when approved by Landscape Architect.

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches (2400 mm) apart.

a. Height: 48 inches (1200 mm).
b. Color: High-visibility orange, nonfading.

C. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:

1. Size and Text: 12 inch by 18-inch sign reading “NO ENTRY - TREE PROTECTION ZONE”.
2. Lettering: 3-inch (75-mm) high minimum, black characters on white background.

PART 3 - EXECUTION

3.0 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. All existing trees to remain to be evaluated by a licensed arborist for tree protection, pruning or removal, if necessary, for safety reasons.

C. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.1 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Flag each tree trunk at 54 inches (1372 mm) above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

C. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 4-inch (100-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.2 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Landscape Architect.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Landscape Architect. Install one sign spaced approximately every 50 feet (15 m) on protection-zone fencing, but no fewer than two signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete, and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.3 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible according to requirements in Section 31 2310 ~~31 2323~~.

B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches (300 mm) outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

C. Site Inspection: Arborist shall probe subsurface soil moisture condition more than 72 hours in advance of start of work. Using a tile probe or similar method, probe subsurface to a 2-to-3-foot depth to determine if sufficient soil moisture exists. If sufficient moisture is not found, immediate coordination with the Construction Manager shall be made to irrigate the proposed work areas. Methodology may be soaker hose, sprinklers, soaker cans with small, drilled holes to release water slowly or other methods. A second follow-up inspection shall be made to determine final sufficiency to begin.

D. Root Pruning at Utility Trenches: The Contractor shall reveal the structural roots on the side of the trees affected by trenching using compressed air or hand digging. The Contractor shall operate a diamond blade vibratory knife, vibratory plow or rock saw within 2 feet of the proposed trench line to cleanly cut any large structural roots without tearing the root bark. Hand work may be required in some locations. Unless otherwise instructed by the Engineer, root pruning shall be performed to a depth of 2.5 feet only in the vicinity of existing trees. Root pruning shall occur prior to protective fencing and clearing and grubbing.

3.4 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.5 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during

construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size.
2. Large Trees: Provide two new tree(s) of 6-inch (150-mm) caliper size for each tree being replaced that measures more than 6 inches (150 mm) in caliper size.

    a. Species: As selected by Landscape Architect.

3. Plant and maintain new trees as specified in Section 32 9300.

C. Soil Aeration: Where directed by Landscape Architect, aerate surface soil compacted during construction. Aerate 10 feet (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill 2-inch (50-mm) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

SECTION 015705 – ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes the following:
1. The work covered by this section consists of furnishing all labor, materials, tools, and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.
2. Prior to commencement of work, the Contractor shall meet with representatives of the Consultant to develop mutual understandings relative to compliance of the environmental protection program

B. Related Sections:
1. Section 02 61 23 Excavation, Handling, Transportation, and Disposal of Excavated Materials
2. Section 01 57 13 Temporary Erosion & Sedimentation Controls
3. Section 01 57 14 Temporary Dust Control
4. Section 31 23 10 Earthwork

C. Related Drawings
1. REM-1A and REM-1B

1.3 SUBMITALS

A. The Contractor shall submit for approval three sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities.

1.4 REFERENCES

A. All regulations cited and those of other governing agencies in their most recent version are applicable. This Section refers to requirements found in these references, but in no way is intended to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations and common practices. Other provisions contained in these references may from time to time during the execution of this Contract be enforced by the Owner’s Consultant. In the event of a conflict, the most stringent regulations shall govern. The following documents and/or publications are made part of this Section by reference herein:
1. Connecticut “Stormwater and Dewatering Wastewaters from Construction Activities” (DEEP-WPED-GP-015).
2. Connecticut “Contaminated Soil and/or Sediment Management (Staging and Transfer)” General Permit- expired September 19, 2018.
3. Connecticut Guidelines for Soil Erosion and Sediment Control, Connecticut Council, DEP Bulletin 34, ISBN 0-942085-10-8 on Soil and Water Conservation in cooperation with CTDEEP dated May 2002.
4. Local regulations governing dust control, soil handling, and health & safety (see Section 312500, Sedimentation and Erosion Controls).
5. Connecticut Air Pollution Regulations (22a-174-1 through 44 and 22a-174-200).
6. Connecticut “General Permit for the Discharge of Stormwater and Dewatering Wastewaters

from Construction Activities (construction stormwater general permit)" effective December 31, 2020.

7. Connecticut " National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater Associated with Industrial Activities Permit No. CTR050000 dated October 1, 2025.
8. Connecticut Water Pollution Control Regulation 22a-430 of Chapter 446k
9. Clean Water Act ("CWA"), Section 402(b) as amended, 33 USC 1251, et. seq., and pursuant to an approval dated September 26, 1973
10. Connecticut Hazardous Waste Management Regulations- Sections 22a-449(c)-100 through -119, incorporating 40 CFR 124 and 40 CFR 260 to 279 through January 1, 2001. Also includes RCSA Section 22a-449(c)-11 regarding hazardous waste transporter permits.
11. Connecticut "Dewatering and Remediation Wastewater to Surface Water and Groundwater (D2R GP) effective March 1, 2026
12. Connecticut " Application for an Emergency or Temporary Discharge Authorization" effective April 1, 2024 (DEEP-WPED-APP-202)
13. General Pretreatment Permit for Significant Industrial User, Dewatering, and Remediation Discharges (SIU GP) / Dewatering and Remediation Wastewater December 2025.
14. Connecticut Underground Storage Tank (UST) Regulations 22a-449(d) -101 through 114.
15. Connecticut Release Based Clean-up Regulations (22a134tt-1 to 22a-134tt-13) effective March 1, 2026
16. Connecticut Hazardous Waste Management Regulations (22a-149 (c) 100 through 119, and 22a-454-1)
17. Connecticut Regulations for Solid Waste Management (22a-208a-1(a), 22a -209-1, and 22a-209-3; 22a-209-18 and 22a-209d-1)
18. General Permit to Act as a Contractor to Contain or Remove or Otherwise Mitigate the Effects of Certain Releases (Registered Existing Release Response Contractor) Effective October 20, 2025, expires October 20, 2029
19. Waste Facility/ Environmental Spill Response Contractor Program CGS 22a-454
20. Release Reporting RCSA 22a-450-1 to 6

PART 2 - PRODUCTS

2.1 STRAW WADDLES

A. The straw wattles or equivalent shall be used along the perimeter of the work area and soil stockpiles. Erosion and sediment controls shall be maintained by the Contractor to assure they are working effectively in accordance with Connecticut's Erosion and Sediment Control Guidelines and local soil handling guidelines.

PART 3 - EXECUTION

3.1 NOTIFICATION AND STOPPAGE OF WORK

A. The Owners Consultant will notify the Contractor in writing of any non-compliance with the foregoing provisions. The Owners Consultant shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Consultant until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.2 AREA OF CONSTRUCTION ACTIVITY

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.3 NOTIFICATIONS

A. If soil impacts are identified under the Connecticut Release Based Clean-up Regulations (RBCRs) and the Site is tier classified. Contractor will not start work for remediation of soils until a public notice has been provided by the owner, as applicable, for the Site if tier classification has been completed, under the RBCRs.

END OF SECTION 015705

SECTION 015713 – TEMPORARY EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 Summary

A. Section Includes:

1. Installation of temporary erosion and sedimentation control measures
2. Maintenance of temporary erosion and sedimentation control measures.
3. Monitoring of site condition and installation of supplemental temporary erosion and sedimentation control measures.
4. Sediment removal and disposal
5. Temporary seeding or other surface stabilization measures.
6. Removal of temporary erosion and sedimentation control measures.
7. Monitoring, documentation, and recordkeeping.
8. Installation of permanent erosion control materials.
9. Final cleanup.

B. Erosion and sediment control techniques include, but are in no way limited to, silt fence, hay bales, drainage structure inserts/filters, mulching with hay/straw, netting/matting, grassing, stone dikes/berms/check-dams, compost blankets and berms, barriers, diversions, traps, basins, and appurtenances which will ensure that erosion and sediment pollution will be either eliminated or maintained within acceptable limits.

C. The measures specified herein are the minimum requirements which Contractor shall comply to control erosion and siltation throughout execution of the work. Contractor shall provide additional work if necessary to control erosion and siltation throughout the duration of the construction as conditions dictate, or as directed by Engineer.

D. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

E. Contractor is responsible for all health and safety.

1.3 SUBMITTALS

A. Submit material specifications and shop drawings for all materials furnished under this Section.

B. Prior to the start of the construction, submit schedule for the construction of required stormwater detention basins, temporary and permanent erosion and sedimentation control measures, clearing and grubbing, grading, structures at watercourses, construction, and paving.

C. During construction, submit to Engineer schedule changes that affect timing of construction.

D. Submit copies of all inspection and maintenance report forms.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Regulations of Connecticut State Agencies (RCSA)

1. 22a-315-10 through 19, Soil and Water Conservation

C. Connecticut Department of Energy and Environmental Protection (DEEP)

1. Connecticut Guidelines for Soil Erosion and Sediment Control, State of Connecticut Council on Soil and Water Conservation, 2023.

D. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819, 2024 and any supplements.

1.6 PERMIT CONDITIONS

A. Contractor and Subcontractors are bound to comply with any project-related permits obtained by Owner or Engineer for the work of the project. Such permits will affect performance of the work, and Contractor and Subcontractors are bound to comply with requirements of such permit and representations contained in permit application as though Contractor and Subcontractor were the Permittee/permit-holder. Requirements and conditions set forth in Owner or Engineer-obtained project-related permits and permit applications shall be binding on Contractor just as any Specification would be.

1.7 QUALITY CONTROL

A. Contractor shall be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the erosion of soil or movement of sediment from construction activities to off-site areas via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of Contractor.

B. Where additional erosion and sedimentation control measures are required beyond what is indicated on the Drawings or herein, comply with applicable sections of the Connecticut Guidelines for Soil Erosion and Sediment Control, State of Connecticut Council on Soil and Water Conservation and CT DEEP, 2023.

C. If applicable, comply with applicable provisions of the Connecticut Department of Energy and Environmental Protection (DEEP) General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, (DEEP-WPED-GP-015), latest revision thereof. Conditions of such General Permit, other conditions of approval or authorizations, and associated Stormwater Pollution Control Plan (SWPCP) shall become part of the Contract Documents.

D. Engineer has the authority to order immediate, additional, temporary control measures to prevent contamination of adjacent streams or other watercourses, or other areas of water impoundment and damage by erosion.

E. If Engineer observes construction procedures and operations that jeopardize erosion control provisions, Engineer will notify Contractor. If such construction procedures and operations are not corrected promptly, Engineer may suspend the performance of any or all construction until corrections have been made, and such suspension shall not be the basis of any claim by Contractor for additional compensation, nor for an extension of time to complete the Work.

F. Should construction materials be washed away or otherwise rendered ineffective in the opinion of Engineer during the progression of the Work, Contractor shall replace the installations at no additional cost to the Owner.

1.8 COORDINATION WITH PERMANENT EROSION CONTROL PROVISIONS

A. Coordinate temporary erosion and sedimentation control measures with permanent erosion control features to the extent practical to ensure economical, effective, and continuous erosion control throughout construction and post-construction periods.

PART 2 - PRODUCTS

2.1 Hay bales

A. Hay bales shall be made of cut hay with forty (40) pounds minimum weight and 120 pounds maximum weight. Bales shall be free of rotten or degraded hay, significant splits, or voids. Hay bales shall be held together with a minimum of two bands made of either wire or heavy twine.

B. Stakes to anchor the bales shall be a minimum of 36 inches long and made of hardwood with a minimum dimension of 1½-inch by 1½-inch normal size. Metal stakes may be used instead of wooden stakes. Metal stakes shall be round, “U,” “T,” “L,” or “C” shaped with a minimum weight of 0.5 pounds per foot.

C. Replace individual hay bales upon loss of 30% of original mass or volume, whichever is less.

D. Silt Fence

E. Woven Polypropylene geotextile having a minimum weight of 3.1 ounces per square yard conforming to the following:

1. Mechanical and Physical Properties of Silt Fence Geotextile

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
Weight	ASTM D 3776	oz/yd^2	5.6
Grab Tensile Strength	ASTM D 4632	Pounds	60
Grab Elongation (Max percent)	ASTM D 4632	Percent (%)	15–30
Trapezoidal Tear	ASTM D 4533	Pounds	30
Puncture	ASTM D 4833	Pounds	30
Mullen Burst	ASTM D 3786	psi	150–200
Permittivity	ASTM D 4491	Sec^{-1}	0.15
Flow Rate	ASTM D 4491	gal/min/ft2	15–20
Apparent Opening Size	ASTM D 4751	(U.S. Sieve)	30–35
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70

F. Silt fence shall be constructed of a minimum thirty-six (36) inch wide continuous woven geotextile. The material shall have a high sediment filtration capacity, high slurry flow, and minimum clogging characteristics. Edges of the fabric shall be finished to prevent the outer fibers from pulling away from the geotextile. Geotextile shall be free of defects or flaws that significantly affect its physical and/or filtering properties.

G. Fabric shall be securely fastened to stakes a minimum of 42 inches long and made of hardwood with a minimum dimension of 1½ inch by 1½ inch normal size such that a 6 to 8 inch length of fabric is unattached at the bottom for anchorage in soil. Metal stakes may be used instead of wooden stakes. Metal stakes shall be round, “U,” “T,” “L,” or “C” shaped with a minimum weight of 0.5 pounds per foot. Stakes shall be spaced not greater than ten feet apart. When required, wire or another type of support shall be constructed between the geotextile fabric and the posts to improve the load carrying capacity of the silt fence.

2.2 CATCH BASIN INSERT

A. Manufactured “bag type” catch basin insert of woven polypropylene geotextile with integral lifting loops or straps conforming to the following:

1. Mechanical and Physical Properties of Catch Basin Insert

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
Grab Tensile Strength	ASTM D 4632	Pounds	315
Grab Elongation (Max percent)	ASTM D 4632	Percent (%)	30
Trapezoidal Tear	ASTM D 4533	Pounds	40x50 (min)
Puncture	ASTM D 4833	Pounds	135 (min)
Mullen Burst	ASTM D 3786	psi	420 (min)
Permittivity	ASTM D 4491	gal/min/sq ft	0.7
Flow Rate	ASTM D 4491	gal/min/ft2	50-200
Apparent Opening Size	ASTM D 4751	(U.S. Sieve)	20-40
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	80 (min)

Note: Catch basin inserts for catch basins with curb openings shall be equipped with integral curb deflector.

2.3 STRAW MULCH

A. Straw mulch shall be comprised of threshold straw of oats, wheat, barely, or rye that is free from noxious weeds, mold, or other objectionable material. Straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an air-dry condition and suitable for placement with blower equipment. Straw mulch shall be utilized on all newly graded areas with slopes exceeding 5% to protect areas against washouts and erosion unless other erosion control measures are provided.

2.4 FILTER BERM COMPOST

A. Where establishing vegetation is not planned, compost shall be a decomposed, weed free organic matter source derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. Compost shall possess a moisture content of 30 to 60% and a organic matter content of 25 to 100%. The maximum particle length shall be 6″, and 100% passing a 3″, 90 to 100% passing a 1″, 70% to 100% passing a 3/4″, and 30% to 75% passing a 1/4″ screen. However, no more than 50% passing a 1/4″ screen in high rainfall/flow rate situations.

B. Where establishing vegetation is planned, compost shall be use a well decomposed, stable, weed free organic matter source derived from agricultural, food, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. Compost shall possess a moisture content of 30 to 60%, a pH of 6.0 to 8.5 and an organic matter content of 25 to 65%. The maximum particle length shall be 6″, and 100% passing a 3″, 90 to 100% passing a 1″, 70% to 100% passing a 3/4″, and 30% to 75% passing a 1/4″ screen. However, no more than 60% passing a 1/4″ in high rainfall/flow rate situations. It shall contain no substances

toxic to plants, shall possess no objectionable odors, and shall not resemble the raw material from which it was derived.

2.5 COMPOST SOIL BLANKET

A. Compost soil blankets may be utilized on slopes of up to 2:1.

B. Slightly scarify slopes and remove large clods, rocks, stumps, roots larger than 2 inches in diameter and debris on slopes, where vegetation is to be established. This soil preparation step may be eliminated where approved by the Landscape Architect/Designer, or where seeding or planting isn't planned. Track (compact) slope using a bulldozer before applying compost.

C. Apply compost at the following rates:

Compost Application Rates

Annual Rainfall/Flow Rate	Total Precipitation & Rainfall Erosivity Index	Application Rate for Slopes to be Vegetated (Note 1)	Application Rate for Slopes not being Unvegetated
Low	1″–25″ & 20–90	½″–¾ ″	1″–1½″
Average	26″–50″ & 91–200	¾″–1″	1½″–2″
High	51″ and above, & 201 and above	1″–2″	2″–4″

D. Lower application rates indicated for slopes to be vegetated should only be used in conjunction with seeding, and for compost blankets applied during the prescribed planting season for the particular region.

E. Compost shall be uniformly applied using an approved spreader unit, including bulldozers, side discharge manure spreaders, etc. Track (compact) the compost layer using a bulldozer or other appropriate equipment. (This step may be eliminated where impractical or where deemed unnecessary by the Landscape Architect/Designer.) Alternatively, apply compost using a pneumatic (blower) unit, or other unit that propels the product directly at the soil surface, thereby preventing water from moving between the soil-compost interface. Thorough watering may be used to improve settling of the compost. Apply compost layer approximately 3 feet (90 cm) over the top of the slope, or overlap it into existing vegetation.

F. On highly unstable soils, use compost in conjunction with appropriate structural measures.

G. Dry or hydraulic seeding may be completed following compost application, as required, or during the compost application itself, where a pneumatic unit is used to apply the compost.

2.6 STONE CHECK DAM

A. Stone shall be graded as follows:

Gradation of Stone for Check Dam (ConnDOT M.01.01 Grading No. 3)

Sieve	Percent Passing by Weight
2 1/2″	100
2″	90–100

Sieve	Percent Passing by Weight
1 1/2″	35–70
1	0–15
1/2″	0–5

Stone shall be sound, tough, durable, angular, not subject to disintegration, on exposure to water, or weathering, be chemically stable and shall be suitable in all other respects for the purpose intended.

B. Geotextile may be used under the stone to provide a stable foundation and to facilitate removal of the stone.

2.7 EROSION CONTROL SEED MIXTURE

Erosion Control Seed

Species (Note 1)	Application Rate, Pounds Per Acre	Application rate, Pounds Per 1,000 sf	Optimum Seed Depth, inches (Note 2)	Optimum Seeding Dates (Note 3)
Annual ryegrass Lolium multiflorum	40	1.00	0.5	3/1–6/15 and 8/1–10/15
Perennial ryegrass Lolium perenne	40	1.00	0.5	3/15–7/1 and 8/1–10/15
Winter Rye Secale cereale	120	3.00	1.00	4/5–7/1 and 8/15–10/15
Oats Avena sativa	86	2	1	3/1–6/15 and 8/1–9/15
Winter Wheat Triticum aestivum	120	3	1	4/15–7/1 and 8/15–10/15
Millet Echinochloa crusgalli	20	.5	1	5/15–7/15
Sudangrass Sorghum sudanese	30	.7	1	5/15–8/1
Buckwheat Fagopyrum esculentum	15	.4	1	4/1–9/15
Weeping lovegrass Eragostis curbula	5	.2	.25	6/1–7/1
ConnDOT All Purpose Mix	150	3.4	.5	3/1–6/15 and 8/1–10/15

Notes:

1 – Listed species may be used in combinations to obtain a broader time spectrum. If used in combinations, reduce each species planting rate by 20% of that listed

2 – Seed at twice the indicated depth for sandy soils.

3 – May be planted throughout summer if soil moisture is adequate or can be irrigated. Fall seeding may be extended 15 days in the coastal towns

2.8 EROSION CONTROL MATTING

A. Temporary Erosion Control Blanket shall be 1) Curlex® Excelsior Blanket, as manufactured by American Excelsior Company, 2) ERO-MAT® V75S(FD), as manufactured by Verdyol Plant Research, Ltd., or 3) Landlok® S2 RD, as manufactured by SI® Geosolutions, or 4) approved equal.

B. Degradable Erosion Control Fabric Netting shall be Landlok® 407 GR, as manufactured by 1) SI® Geosolutions, or 2) GeoJute® as manufactured by Belton Industries, Inc., or 3) BioNet® S150BN™ Double Net Straw Blanket, as manufactured by North American Green, or 4) approved equal.

C. Long-Term and Non-degradable Turf Reinforcement Mats shall be 1) Pyramat®, as manufactured by SI® Geosolutions, or 2) Recyclex® Turf Reinforcement Matting, as manufactured by American Excelsior Company, or 3) Vmax3 C350™, as manufactured by North American Green, or 4) approved equal.

D. Erosion control matting shall be secured with staples or an alternative attachment device such as geotextile pins or plastic pegs as recommended by the manufacturer. The Contractor shall submit a sample of the alternative attachment device for the Engineer’s approval prior to installation.

PART 3 - EXECUTION

3.1 GENERAL

A. Install erosion and sedimentation control measures as shown on the Drawings prior to any site disturbance.

B. No work shall be started until erosion control schedules and installation have been accepted by Engineer.

C. Engineer has the authority to control the surface area of each material exposed by construction operations and to direct Contractor to immediately provide permanent or temporary pollution control measures to prevent contamination of adjacent watercourses or other areas of water impoundment. Every effort shall be made by Contractor to prevent erosion on the site and abutting properties or areas.

D. Contractor shall construct all permanent erosion and sediment control features at the earliest practical time as outlined in the accepted schedule. Temporary erosion and sediment control measures shall be used to correct conditions that develop during construction, which were unforeseen, but are needed prior to installation of permanent control features, or that are needed temporarily to control erosion or sedimentation which develops during construction operations.

E. Contractor shall limit as necessary the surface area of the earth material exposed to sufficiently maintain and protect the slopes to prevent pollution. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled and performed so that grading operations and permanent erosion and sediment control features can follow immediately thereafter, if conditions permit; otherwise, temporary control measures will be required between successive construction stages.

F. Erosion control measures shall be maintained by Contractor, and he shall remove such installations only upon completion of the work and the site is stabilized or when authorized to do so by Engineer.

G. Contractor shall operate all equipment and perform all construction operations so as to minimize pollution. Contractor shall cease any of his operations, which will increase pollution during rainstorms.

H. Failure by Contractor to control erosion, pollution, and siltation shall be cause for the Engineer to employ outside assistance to provide the necessary corrective measures. The cost of such assistance, including engineering costs, will be charged to Contractor and appropriate deductions made to Contractor's payment.

3.2 HAY BALES

A. Hay bales shall be positioned as indicated on the Drawings and/or as necessary to prevent off site movement of sediment produced by, or as a result of, construction activities, or as direct by the Engineer.

B. Hay bales shall be utilized on all catch basins and drainage facilities on the Project Site to prevent the entry of sediments or other debris. Maintain such protection throughout execution of the work until such drainage facilities have been abandoned/removed.

C. Bales shall be placed lengthwise with ends of adjacent bales tightly abutting one another to form a continuous barrier. Bales shall be entrenched to a depth of 4 inches and backfilled, with the backfill placed toward the potential source of runoff and sediment. All bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms. Each bale shall be anchored with a minimum of two stakes, driving the first stake in each bale towards the previously laid bale to drive the bales together. Stakes must be driven a minimum of 18 inches into the ground. Loose hay shall be inserted between bales as required to prevent water from escaping between the bales.

3.3 GEOTEXTILE SILT FENCE

A. Install a filter fabric silt fence prior to construction and remove after full surface restoration has been achieved. Install silt fence as indicated on the Drawings and/or as necessary to prevent off site movement of sediment produced by, or as a result of, construction activities.

B. Install as follows:

1. Hand shovel excavate a small trench a minimum of six inches wide by six inches deep on the upslope side of the desired fence line location.
2. Unroll the siltation fence system, position the post in the back of the trench (downhill side), and hammer the post at least 12 inches into the original ground.
3. Fabric rolls shall be spliced at posts. The fabric shall be overlapped six inches, folded over, and securely fastened to posts.
4. Lay the bottom 6 inches of the fabric into the trench to prevent undermining by storm water run-off.
5. Backfill the trench and compact. Compaction is necessary to prevent the run-off from eroding the backfill.

6. For slope and swale installations, extend the ends of the trench sufficiently up slope such that the bottom end of the fence will be higher than the top of the lowest portion of the fence.

3.4 CATCH BASIN INLET SEDIMENT CONTROL

A. Install catch basin inlet sediment control devices in each exiting catch basin as long as it remains in use in accordance with manufacturer's guidelines at the locations shown on the Drawings.

B. A catch basin sediment filter shall be installed and changed/cleaned per the manufacturer's recommendations, or as directed by the Engineer, during construction.

C. New catch basins shall have a filter installed immediately upon completion of construction. In addition, a hay bale, or similar, barrier shall be installed around the new basin and maintained in place until binder is placed or disturbed areas draining to it are stabilized.

D. Catch basins with curb openings shall have filter fabric covering the opening and the edges of the fabric shall be secured. A filter boom shall also be placed over the opening.

3.5 TEMPORARY SEDIMENT BASINS

A. Temporary sedimentation basins shall be employed as required during construction. Sedimentation shall be periodically removed from the basins and from behind erosion and sedimentation control devices. The Contractor shall direct all possible site runoff to the temporary sedimentation basins.

B. The temporary sedimentation basins shall be maintained from the start of construction until construction of the permanent detention basins is completed and perimeter areas are stabilized.

3.6 TEMPORARY MULCHING

A. Apply temporary mulch to areas where rough grading has been completed but final grading is not anticipated to begin within 30 calendar days of the completion of rough grading or where final grading has been completed but seeding is not anticipated for 20 days.

1. Straw/Hay Mulch

    a. Exposure Period: 6 months

    b. Application Method: By hand or machine

    c. Application Rate: 110 lbs/1,000 square feet.

2. Bark Chips/Shredded Bark

    a. Exposure Period: Less than one year

    b. Application Method: By hand or machine

    c. Application Rate: 6 cubic yards /1,000 square feet.

3.7 TEMPORARY EROSION CONTROL MATS

A. Erosion control mats shall be furnished, installed, maintained, and later removed in ditches or swales, on embankment slopes, and excavation slopes at the locations shown on the Drawings in accordance with the manufacturer's recommendations.

B. All areas shall be smooth graded and compacted. Remove all rocks, dirt clods, vegetation, and other obstructions that may cause damage to the mats.

C. Unroll mats parallel to the direction of water flow and lay flat against the ground. Overlap roll ends 1–2 feet with upslope mat on the top to prevent uplift of mat end by water flow. Overlay adjacent edges of mat by six inches. Extend mat 2–3 feet above the crest of steep slopes and anchor by excavating a 6-inch-deep trench, and secure end of mat in trench, backfill and compact. Secure mat to the ground using staples or pins furnished by manufacturer of mat.

D. When no longer required, as determined by the Engineer, temporary erosion control mats shall become the property of the Contractor and be removed and properly disposed.

E. Ground disturbances, including holes and depressions caused by the installation and removal of the temporary erosion control blanket shall be backfilled and repaired.

3.8 INSPECTIONS AND MAINTENANCE

A. Contractor is responsible to maintain the sediment and erosion control features at all times throughout the project duration and until the completion certification and approval has been issued.

B. Regular erosion and sediment control system inspections shall be conducted by Contractor throughout the project duration. At a minimum, Contractor shall conduct daily inspections and maintain erosion control systems in good operating condition. Report the results of the inspection and the recommended maintenance and/or repair requirements to Engineer.

C. Additional inspections may be required and/or directed prior to, or immediately following, a storm event >0.1 inches. Repairs shall be made as necessary.

D. In the event that the sedimentation and erosion control measures employed by Contractor prove to be inadequate as determined by the Engineer, Contractor shall adjust operations to the extent necessary to prevent erosion and sediment transport.

E. Surface water shall be pumped to maintain excavations free of water. Comply with applicable requirements of the Connecticut Department of Environmental Protection, specifically those requirements related to the management of stormwater and dewatering wastewaters associated with construction activities.

F. Hay bales and/or silt fences.

1. Remove accumulated sediment once it builds up to one-half of the height of the bale or fabric.
2. Replace damaged or degraded bales as necessary or when directed by the Engineer.
3. Replace damaged fabric, or patch with a 2-ft minimum overlap. Overlaps may only be made at fence posts.
4. Make other repairs as necessary to ensure that the bales/fence is filtering all runoff.

G. Erosion Control Mats shall be inspected at least once a week. Areas where the mat has become dislodged from the soil surface or become torn shall be re-graded and re-seeded as necessary and the mat re-installed. When repetitive failures occur at the same location review conditions and modify erosion control measures to reduce failure rate. Temporary erosion control blanket damaged during the progress of work or resulting from the Contractor's vehicles, equipment, or operations shall be repaired or replaced at the expense of the Contractor.

H. Clean catch basin inlet sediment control devices in accordance with manufacturer's guidelines.

I. Any catch basins that collect sediment as a result of Contractor's work shall be thoroughly cleaned out by Contractor.

END OF SECTION 015713

SECTION 015714 – TEMPORARY DUST CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Furnishing and spreading water, calcium chloride, and/or mulch on the subgrade, or in other areas of a Project Site or associated off-site areas, for the purpose of controlling dust emissions.

B. The requirements set forth in this section of the specifications apply to all phases and areas of construction.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Regulations of Connecticut State Agencies (RCSA)

1. RCSA Section 22a-174-1 through 43, Abatement of Air Pollution.

C. ASTM International (ASTM)

1. ASTM D98, Standard Specification for Calcium Chloride.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material

manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Only water, calcium chloride, and mulch are approved for dust control. No asphalt or petroleum-based products may be utilized for dust control.

B. Water used shall be clean, non-polluted water obtained from sources approved by Engineer.

C. Calcium chloride, ASTM D98. Calcium chloride in pellet form and flake form shall be acceptable.

1. Calcium chloride shall be packaged in moisture proof bags or in airtight drums with the manufacturer, name of product, net weight, and percentage of calcium chloride guaranteed by the manufacturer legibly marked on each container.
2. Engineer may reject calcium chloride failing to meet the requirements of the aforementioned specifications or which has become caked or sticky in shipment.

D. Mulch

1. Straw mulch: Threshold straw of oats, wheat, barely, or rye that is free from noxious weeds, mold or other objectionable material. Straw mulch shall contain at least 50 percent by weight of material to be 10-in or longer.
2. Wood chips: Processed tree trimmings free of trash or other physical contaminants such as metal and plastic.

PART 3 - EXECUTION

3.1 GENERAL

A. Dust control shall be the responsibility of Contractor and dust control operations shall meet the requirements of the State of Connecticut Department of Environmental Protection.

B. Construction sequencing shall be organized and conducted in a manner to leave existing pavement or ground coverings in place until just prior to earth excavation for the purpose of minimizing the migration of dust beyond the Project Limits into the surrounding area.

C. Engineer reserves the right to conduct active dust monitoring using visual methods and may utilize particulate measurement equipment during the course of the work. If the amount of fugitive dust and/or particulate generated during the work is deemed unacceptable in the Engineer's judgment or exceeds baseline Project Site conditions at Engineer's monitoring locations, Engineer may require Contractor to stop work and implement corrective measures. No claim for delay will be considered for work stoppage based upon the results of Engineer's active dust monitoring results.

D. Stockpiled materials from which particle have the potential of becoming airborne shall be securely covered with a temporary waterproof covering made of polyethylene, polypropylene, hypalon, or approved equal. The covers must be in place at all times when work with the stockpiles is not occurring.

E. Subcontractor shall sweep all adjacent roads and neighboring parking lots and driveways that are impacted by the work. Whenever dirt is tracked from the site it shall be cleaned as necessary to prevent it from becoming a nuisance or hazard. At a minimum, adjacent streets shall be swept once per week.

3.2 WATER

A. The application of water shall be under the control of Engineer at all times. It shall be applied only at the locations, and at such times, and in the amount as may be directed by Engineer. Quantities of water wasted or applied without authorization will not be paid for.

B. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding or pollution.

C. Contractor shall have available and maintain in an operable condition at all times, sufficient equipment for the purpose of applying water for dust control.

D. Watering equipment shall consist of pipelines, tanks, tank trucks, distributors, pumps, meters, hose or other devices, approved by Engineer, which are capable of applying a uniform spread of water over the surface. A suitable device for a positive shut-off and for regulating the flow of water shall be located so as to permit positive operator control.

E. Applications of water for dust suppression include, but are not necessarily limited to, the following:

1. Demolition activities, material handling, material processing, and loading.
2. Earthwork.
3. Open excavation faces and dust-prone areas of the work.
4. Temporary access roads and roadway surfaces within and around the Project Site.

3.3 CALCIUM CHLORIDE

A. Calcium chloride shall be applied only at the locations, at such times and in the amount as may be directed by the Engineer and only in areas that will not be adversely affected by the application.

B. Calcium chloride shall be uniformly applied at the rate of one and one-half (1½) pounds per square yard (lb/yd2) or at any other rate as directed by Engineer. Application shall be by means of a mechanical spreader, or other approved methods. The number and frequency of applications shall be to Engineer's satisfaction.

3.4 MULCH FOR DUST CONTROL

A. Coordinate the use of mulch for dust control with erosion and sedimentation control measures.

B. Straw mulch shall be applied at a rate of 100 pounds per 1,000 square feet (100 lb/1,000 ft2).

C. Wood chips or wood mulch shall be applied at such a rate as to form a layer one (1) inch thick.

3.5 OTHER DUST CONTROL MEASURES

A. A temporary seed mixture may be spread in lieu of, or in addition to mulch over areas where the suspension of grading work in disturbed areas is expected to be more than 30 calendar days and as directed by Engineer.

END OF SECTION 015714

SECTION 015723 - TEMPORARY STORMWATER POLLUTION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.01A, entitled “Related Documents.”

1.02 SUMMARY

A. This Section includes:

1. Compliance with the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (DEEP-WPED-GP-015) (hereinafter “Stormwater General Permit”) including the Stormwater Pollution Control Plan (SWPCP).

1.03 PERMIT CONDITIONS

A. Contractor and Subcontractors are bound to comply with permits obtained for the project, whether such permits are obtained by Owner, Engineer, Contractor, or Subcontractor for the work of the project. Such permits will affect performance of the work, and Contractor and Subcontractors are bound to comply with requirements of such permit and representations contained in permit application as though Contractor and Subcontractor were the Permittee, permit-holder, or registrant. Requirements and conditions set forth in Owner or Engineer-obtained project-related permits and permit applications shall be binding on Contractor and Subcontractors just as any Specification would be.

1.04 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include

documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.05 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Regulations of Connecticut State Agencies (RCSA)

1. 22a-315-10 through 19, Soil and Water Conservation

C. Connecticut Department of Energy and Environmental Protection (DEEP)

1. General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (DEEP-WPED-GP-015).
2. Connecticut Guidelines for Soil Erosion and Sediment Control, DEP Bulletin 34, State of Connecticut Council on Soil and Water Conservation, 2002.

1.06 SUBMITTALS

A. General: Contractor shall maintain copies of all permit-related documents at the Project Site and shall make them available during construction, and provide copies to the Engineer.

B. Inspection reports: Provide copies of inspection reports to Owner and applicable Permittee.

C. Additional information as required by the DEEP deemed necessary to evaluate the consistency of the subject activity with the requirements for authorization under the Stormwater General Permit.

D. Documents or correspondences between Contractor and DEEP, local authorities, wetland agencies, etc. including notices of violation, enforcement actions, or proposed fines by regulatory agencies.

E. Notice of Termination forms prescribed and provided by DEEP.

1.07 QUALITY ASSURANCE

A. The conditions of the Stormwater General Permit, the SWPCP, and other conditions of approval or authorizations shall become part of the Contract Documents.

B. Use adequate personnel who are trained and experienced in the necessary protocols and techniques, and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section.

C. Use equipment of adequate size, capacity and quantity to accomplish the management of all wastewaters under this Section.

PART 2 - PRODUCTS– NOT USED

PART 3 - EXECUTION

3.01 GENERAL

A. Notify Permittee, Owner, and Engineer immediately upon request from any regulatory agency to enter, inspect, sample, monitor, or otherwise access the project site or Contractor's records pertaining to the General Permit, erosion and sedimentation control, or other water pollution control.

3.02 STORMWATER GENERAL PERMIT

A. Maintain compliance with the Stormwater General Permit at all times.

B. Comply with required provisions of the SWPCP at all times.

C. Cooperate with the Permittee, Owner, and Engineer during all inspections and monitoring. Take corrective action within required time-frames if deficiencies are noted.

D. Contractor shall maintain a rain gauge on the Project Site that meets the requirements of the Stormwater General Permit.

E. All work shall be conducted in compliance with all conditions of the General Permit, SWPCP, and Section 01 5713 – Temporary Erosion and Sedimentation Controls.

3.03 VIOLATIONS

A. Penalties: Contractor shall be responsible for penalties assessed on Contractor or the Owner as a result of Contractor's failure to comply with the requirements of the Stormwater General Permit, SWPCP, or with the applicable provisions of the Federal, State, and local regulations and requirements.

B. Penalties as used in this section shall include fines, penalties, and damages, whether proposed, assessed, or levied against the Contractor or the Owner, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred in settlement for alleged violations of applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, in mitigation or to remediate or correct violations.

END OF SECTION

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Section 011000 - Summary: Identification of Owner-supplied products.

B. Section 012500 - Substitution Procedures: Substitutions made after Contract award.

C. Section 014000 - Quality Requirements: Product quality monitoring.

D. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

E. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

F. Section 018113 - Sustainable Design Requirements - CTHPB: Requirements for CTHPB compliance.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1. Submit within 15 days after date of Notice to Proceed.
2. For products specified only by reference standards, list applicable reference standards.

C. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.4 SUSTAINABLE DESIGN SUBMITTALS

A. See Section 018113 for product requirements and procedures necessary for achievement of targeted sustainability certification.

B. Building Product Disclosure Requirements: Submit the following information:

1. Environmental Product Declaration: For each product, where available.
2. Health Product Declaration: For each product, where available.

PART 2 PRODUCTS

2.1 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. See Section 014000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:

1. Made using or containing CFC's or HCFC's.
2. Containing lead, cadmium, or asbestos.

D. Where all other criteria are met, give preference to products that:

1. Are extracted, harvested, and/or manufactured closer to the location of the project.
2. Have longer documented life span under normal use.
3. Result in less construction waste. See Section 017419
4. Are made of recycled materials.
5. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
6. Are Cradle-to-Cradle Certified.
7. Have a published Environmental Product Declaration (EPD).
8. Have a published Health Product Declaration (HPD).

2.2 PRODUCT SELECTIONS

A. General:

1. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements for comparable products to obtain approval for use of an unnamed product.
2. Submit additional documentation, when requested by Architect, to establish equivalency of proposed products. Evaluation of "comparable products" and "or equal" products are by the Architect, whose determination is final.

B. Definitions:

1. Basis-of-Design (BOD) Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "Basis of Design," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers.
2. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

C. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable products when the following conditions are satisfied. If the following conditions are not satisfied, Architect may either require a Substitution Request or return the comparable product request without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
4. Samples, if requested.
5. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Product Selection Options:

1. Products Specified by Reference Standards or by Description Only:
    a. Use any product meeting those standards or description.
2. Products Specified by Naming One or More Manufacturers without a Provision for Substitutions (closed spec):
    a. Use a product of one of the listed manufacturers and meeting specifications.

b. No comparable products or substitutions will be allowed (closed spec).

3. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions:

a. Use a product of one of the listed manufacturers and meeting specifications.

b. Submit a comparable product for consideration of an unnamed product.

c. Submit a request for substitution for an unnamed product that does not meet specifications or is not determined to be comparable.

4. Products Specified by Naming a Basis of Design with or without Other Named Manufacturers without a Provision for Substitutions (closed spec):

a. Use the Basis of Design product.

b. Use a product of one of the listed manufacturers, if applicable, and meeting specifications.

c. No comparable products or substitutions will be allowed (closed spec).

5. Products Specified by Naming a Basis of Design with a Provision for Substitutions:

a. Use the Basis of Design product.

b. Use a product of one of the listed manufacturers, if applicable, and meeting specifications.

c. Submit a comparable product for consideration of an unnamed product.

d. Submit a request for substitution for an unnamed product that does not meet specifications or is not determined to be comparable.

2.3 MAINTENANCE MATERIALS (ATTIC STOCK)

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification Sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures, for procedural requirements for proposed substitutions.

B. Architect may consider requests for substitutions when one or more of the following conditions exist, as determined by Architect. If one or more of the following conditions are determined not to exist, Architect may not consider request further, and may take no action except to record the request and its non-compliance. Consideration may be given if substitution request:

1. Offers Owner substantial advantage in cost, time, energy conservation, or other consideration, after deducting additional responsibilities Owner must assume as the result.
2. Does not require extensive modification of Contract Documents.
3. Is consistent with intent of Contract Documents, and will produce intended work results.
4. Is fully documented and properly submitted.
5. Will not adversely affect Contractor's construction schedule.
6. Resolves specified Product being unable to receive required approval by Authority Having Jurisdiction (AHJ), and substitution has received such approval prior to submission.
7. Resolves incompatibility of specified Product with other related Products, and substitution is compatible with related Products.
8. Resolves non-coordination of specified Product with other related Products, and substitution is coordinated with related Products.
9. Provides specified warranty when specified Product cannot be provided with specified warranty.
10. Is proposed for a Product that, through no fault of Contractor, becomes unavailable or unsuitable due to regulatory change.
11. Will be considered if a Product cannot be provided within the Contract Time; Architect will not consider substitution if Product cannot be provided as the result of Contractor's failure to schedule and coordinate the Work as required by Contract Documents.
12. Has been coordinated with and among all affected Subcontractors and other portions of the Work, and is acceptable to all affected Subcontractors.

3.2 OWNER-SUPPLIED PRODUCTS

A. See Section 011000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Designate submittals and delivery date for each product in progress schedule.
2. Review Owner reviewed shop drawings, product data, and samples.
3. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
4. Handle, store, install and finish products.
5. Provide installation inspections required by jurisdictional authorities.

6. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.

1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Prevent contact with material that may cause corrosion, discoloration, or staining.

O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

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SECTION 016116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.2 RELATED REQUIREMENTS

A. Section 018113 - Sustainable Design Requirements - CTHPB: Procedures for reporting emissions and VOC content data.

B. Section 016117 - Accessory Material VOC Content Certification Form: Form for reporting emissions and VOC content.

1.3 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Flooring.
4. Composite wood and solid wood flooring.
5. Wall coverings.
6. Acoustic ceiling tiles and wall panels.
7. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier or air barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

1. Stone.
2. Concrete.
3. Clay brick.
4. Metals that are plated, anodized, or powder-coated.
5. Glass.
6. Ceramics.
7. Solid wood flooring that is unfinished and untreated.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. See Section 018113 - Sustainable Design Requirements - CTHPB for sustainability submittal requirements.

C. See Section 016117 - Accessory Material VOC Content Certification Form: Form for reporting emissions and VOC content.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 016117 - ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

*** ATTACH THIS FORM TO EVERY SUBMITTAL ***

1.1 PROJECT NAME: _____

1.2 USE OF THIS FORM:

A. Because installers are permitted to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC content in excess of that permitted, especially where such materials have not been explicitly specified.

B. Contractor is required to obtain and submit this form from each installer of work on this project.

C. For each product category listed, circle the correct words in brackets: [HAS] or [HAS NOT].

D. Attach this form product data and MSDS sheet for each accessory material used.

1.3 VOC CONTENT RESTRICTIONS ARE SPECIFIED IN SECTION 016116.

1.4 PRODUCT CERTIFICATION

A. I certify that the installation work of my firm on this project:

1. [HAS] [HAS NOT] required the use of any ADHESIVES.
2. [HAS] [HAS NOT] required the use of any JOINT SEALANTS.
3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD or AGRIFIBER PRODUCTS.

B. Product data and MSDS sheets are attached.

1.5 CERTIFIED BY: (INSTALLER/MANUFACTURER/SUPPLIER FIRM)

A. Firm Name: _____

B. Print Name: _____

C. Signature: _____

D. Title: _____ (officer of company)

E. Date: _____

END OF SECTION

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SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.2 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures.

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

C. Section 017123 - Field Engineering: Additional requirements for field engineering and surveying work.

D. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

E. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

F. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

G. Section 078400 - Firestopping.

1.3 DEFINITIONS

A. Verify, Field Verify, or Drawing Abbreviation: Use on Drawings or in specifications is intended to alert Contractor that indicated measurement or description of work may not be fully determined without comparing verified dimension in larger context or other dependent measurements due to specific product, actual versus nominal dimensions, or measurements of existing conditions.

1. Notify Architect of discrepancies between dimensions shown and field layout or measurements.

1.4 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in Request:

a. Identification of Project.

b. Location and description of affected work.

c. Necessity for cutting or alteration.

d. Description of proposed work and products to be used.

e. Alternatives to cutting and patching.

f. Effect on work of Owner or separate Contractor, if applicable.

g. Written permission of affected separate Contractor, if applicable.

h. Date and time work will be executed.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.6 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.7 PROJECT CONDITIONS

A. Use of explosives is not permitted without written permission from Owner.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Perform dewatering activities, as required, for the duration of the project.

E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1. Minimize amount of bare soil exposed at one time.
2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1. Limit conduct of especially noisy work to the hours of 8 am to 5 pm.

I. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

J. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

K. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.8 COORDINATION

A. Coordinate scheduling, submittals, and work of the various Sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate Sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification Sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PRE-INSTALLATION MEETINGS

A. When required in individual specification Sections, convene a pre-installation meeting at the site prior to commencing work of the Section.

B. Require attendance of parties directly affecting, or affected by, work of the specific Section.

C. Notify Architect minimum 7 calendar days in advance of proposed meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of examination, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Locate and protect survey control and reference points.

D. Control datum for survey is that indicated on Drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.

B. Install products as specified in individual Sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:

1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials, resulting in clean and neat edges, using masonry saw or core drill. Cutting rigid materials using chisels, impact or pneumatic tools is not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

I. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification Sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

1. Keep waterproofed and roofed surfaces clean and free of debris that could cause damage to surfaces and membranes, particularly sharp objects including fasteners, wire cut-offs, and similar items.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

J. Failure to protect installed and existing work may result in withholding of payments to Contractor as determined by Architect. Damage resulting from failure to protect installed and existing work must be fully repaired or replaced as applicable to the satisfaction of Architect at no additional cost to Owner.

3.9 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 017900 - Demonstration and Training.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL & GENERAL CLEANING

A. General: Provide weekly and final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: The contractor must maintain a clean and safe site. The contractor is responsible for weekly cleaning in the construction and surrounding area impacted by construction. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice to provide safe access to building.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. HEPA vacuum all spaces prior to occupancy.

i. Vacuum carpet and similar soft surfaces with a HEPA vacuum, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

m. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

n. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

o. Replace parts subject to unusual operating conditions.

p. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

q. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

r. Clean ducts, blowers, and coils if units were operated without filters during construction.

s. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

t. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

1. Provide copies to Architect and Owner.

B. Notify Architect in writing when work is considered ready for Architect's Substantial Completion inspection.

1. Prerequisite for Substantial Completion: In addition to definition of Substantial Completion in the General Conditions or Agreement, Substantial Completion is not considered achieved until Certificate of Occupancy is issued by primary jurisdictional authority, allowing Owner to fully occupy or utilize building and associated facilities for intended use in all respects.

2. Submittals Prior to Substantial Completion: Submit Closeout Documents a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion.

a. Closeout Documents: As specified in Section 017800 - Closeout Submittals.

3. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

a. Advise Owner of pending insurance changeover requirements.

b. Complete startup and testing of systems and equipment.

c. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 - Demonstration and Training.

d. Advise Owner of changeover in heat and other utilities.

e. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

f. Complete final cleaning requirements, including touchup painting.

C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

D. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

F. Accompany Owner and Architect on Contractor's preliminary final inspection.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification Sections.

B. Maintenance Period: As indicated in specification Sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Owner.

END OF SECTION

SECTION 017123 - FIELD ENGINEERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field engineering services by Contractor.

1.2 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.

D. Having a skilled instrument person(s) available on short notice when necessary for laying out the work.

E. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.

F. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.

1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.

G. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.

1. Number employees at the Site for each of Contractor's subcontractors.
2. Major equipment and materials installed as part of the work.
3. Major construction equipment utilized.
4. Location of areas in which construction was performed.
5. Materials and equipment received.
6. Work performed, including field quality control measures and testing.
7. Weather conditions.
8. Safety.
9. Delays encountered, amount of delay incurred, and the reasons for the delay.
10. Instructions received from Architect or Owner, if any.

H. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Submit in addition to items required in Section 017000 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:

1. Field Engineering: Submit daily reports, with content as indicated in this section.

1.4 QUALITY ASSURANCE

A. Field Engineer's Qualifications: As established in Section 017000 - Execution and Closeout Requirements.

B. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Owner’s Representative and Architect of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

B. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.2 FIELD ENGINEERING

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and Owner of all discrepancies of which Contractor is aware.

E. Cooperate as required with Architect and Owner in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

G. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan and schedule for remedying the deviation. Do not proceed with remedial work without Owner’s concurrence of the remediation plan.

H. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, other materials and equipment for compliance with shop drawings and Contract Documents requirements.

I. Check all bracing and shoring for structural integrity and compliance with designs prepared by the Contractor.

3.3 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

3.4 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.

1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.
2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

END OF SECTION

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

1. The end-of-project recycling rate shall equal, at minimum, 50% (by weight) with a target of at least 75%, of the total waste from construction and miscellaneous demolition.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Clean Dimensional Wood: May be used as blocking or furring.
5. Concrete.
6. Concrete Masonry Units.
7. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
8. Glass.
9. Gypsum drywall and plaster products.
10. Plastic buckets.
11. Carpet, carpet cushion, carpet tile, and carpet remnants. Verify that specified carpet manufacturer conducts acceptable reclamation program.
12. Paint.
13. Plastics.
14. Rigid foam insulation.

E. Submit monthly (with payment application) Waste Disposal Reports in the form of individual haul tickets or tipping fee receipts; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Develop and follow a Waste Management Plan designed to implement these requirements.

G. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.
5. Incineration, either on- or off-site.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

B. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

C. Section 018113 - Sustainable Design Requirements - CTHPB: Procedures for tracking and reporting waste reduction progress.

D. Section 311000 - Site Clearing: Handling and disposal of land clearing debris.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

1. This definition also includes trash and waste generated by construction workers and Contractor's personnel while engaged in the work and on lunch and other breaks, including but not limited to items such as lunch bags, food wrappers, drinking cups, and similar trash and waste.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

C. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
    a. List each material proposed to be salvaged, reused, or recycled.
    b. List the local market for each material.
    c. State the estimated net cost, versus landfill disposal.
4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.

5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report and supporting weigh tickets with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Recycled and Salvaged Materials: Include the following information for each:
    a. Identification of material, including those retrieved by installer for use on other projects.
    b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
    c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
    e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
5. Material Reused on Project: Include the following information for each:
    a. Identification of material and how it was used in the project.
    b. Amount, in tons or cubic yards.
    c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Prebid meeting.
2. Preconstruction meeting.
3. Regular job-site meetings.
4. Job safety meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. As a minimum, provide:

a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.

b. Separate dumpsters for each category of recyclable, if required by recycling company.

c. Recycling bins at worker lunch area.

2. Provide containers as required.
3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
5. Locate enclosures out of the way of construction traffic.
6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 017701 – HAZARDOUS MATERIALS CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. Section includes the administrative and procedural requirements for hazardous materials contract close out documentation.

B. Related Sections:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 012200:	Hazardous Materials Unit Prices
3.	Section 011600:	Hazardous Materials Scheduling and Phasing
4.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
5.	Section 020800:	Asbestos Abatement
6.	Section 020820:	Universal Waste Reclamation
7.	Section 020900:	Lead Paint Awareness
8.	Section 021100:	PCB Remediation

1.3 FINAL CLEANING

A. Unless otherwise specified under Sections of this Specification, the Hazardous Materials Abatement Contractor (HMAC) shall perform final cleaning operations as herein specified prior to final inspection.

B. Maintain the project site free from accumulations of waste, debris and rubbish caused by operations. At the completion of the work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave the project clean and ready for work of other trades.

C. Cleaning shall include all surfaces, interior and exterior, in which the HMAC has had access.

D. Use only those materials that will not create hazards to health or property.

E. Patch or repair any damage created by the HMAC during the work to equal or better condition.

1.4 ABATEMENT CLOSEOUT DOCUMENTS

A. Submit to the Owner/Consultant, final completed hard copies, via mail, all asbestos Waste Shipment Records (WSR) signed by all transporters and the designated disposal site owner/operator. WSRs shall be submitted to the Owner's Consultant within thirty-five (35) calendar days from shipment of waste from Site.

B. Submit to the Owner/Consultant, final completed hard copies, via mail, Certificates of Recycling of all universal waste items, signed by all transporters and the designated disposal site owner/operator. Manifests shall be submitted to Owner's Consultant within thirty-five (35) calendar days from shipment of waste from Site.

C. Submit to the Owner/Consultant, final completed hard copies, via mail, Waste Manifest for all presumed PCB-containing materials, signed by all transporters and the designated disposal site owner/operator. Manifests shall be submitted to Owner's Consultant within thirty-five (35) calendar days from shipment of waste from Site.

D. Submit to the Owner/Consultant, final completed hard copies, via mail, all Hazardous Lead Waste Manifests for all lead-based paint waste, signed by all transporters and the designated disposal site owner/operator. Manifests shall be submitted to Owner's Consultant within thirty-five (35) calendar days from shipment of waste from Site.

E. Refer to each hazardous materials abatement section for specific post project submittal requirements. Provide one (1) legible hard copy submittal on white 8 ½" x 11" paper.

F. Final payment will be withheld until receipt of all the above documentations to Owner's/Consultant's satisfaction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017701

SECTION 017800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.2 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:

1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product Section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings:
   1. Legibly mark each item to record actual construction including:
      a. Measured depths of foundations in relation to finish first floor datum.
      b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
      c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
      d. Field changes of dimension and detail.
      e. Details not on original Contract Drawings.
   2. Format Requirements:
      a. Submit Record Drawings in physical and digital formats.
         1) Acceptable digital formats include marked up versions of the digital drawings, or scanned copies of hand-made mark ups on drawings.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

E. For Each Product, Applied Material, and Finish:

1. Product data, with catalog number, size, composition, and color and texture designations.
2. Information for re-ordering custom manufactured products, if any.

F. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

H. Additional information as specified in individual product specification sections.

3.3 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

B. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

C. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

D. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

E. Include test and balancing reports.

3.4 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into electronic files for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification Sections.

1. Where systems involve more than one specification Section, provide separate electronic bookmarked tab for each system.

B. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

E. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

F. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

H. Arrangement of Contents: Organize each volume in parts as follows:

1. Project Directory.
2. Table of Contents, of all volumes, and of this volume.
3. Operation and Maintenance Data: Arranged by system, then by product category.
    a. Source data.
    b. Product data, shop drawings, and other submittals.
    c. Operation and maintenance data.
    d. Field quality control data.
    e. Electronic scans warranties and bonds.
4. Design Data: To allow for addition of design data furnished by Architect or others, provide a bookmarked divider page labeled "Design Data" and allow for insertion of additional electronic data, if applicable.

3.5 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

1. Warranties must clearly state that warranty commences on Date of Substantial Completion, and the actual Date of Substantial Completion according to the Contract must be clearly stated on the warranty form.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification Sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Finishes, including flooring, wall finishes, ceiling finishes.
   2. Fixtures and fittings.
   3. Items specified in individual product Sections.

1.2 RELATED REQUIREMENTS

A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.

B. Individual Specification Sections: Additional requirements for demonstration and training.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit not less than four weeks prior to start of training.
   2. Revise and resubmit until acceptable.
   3. Provide an overall schedule showing all training sessions.
   4. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.

c. Name of firm and person conducting training; include qualifications.

d. Intended audience, such as job description.

e. Objectives of training and suggested methods of ensuring adequate training.

f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.

g. Media to be used, such as slides, hand-outs, etc.

h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.

1. Include applicable portion of O&M manuals.

2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.

3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:

1. Identification of each training session, date, time, and duration.

2. Sign-in sheet showing names and job titles of attendees.

3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.

1. Format: DVD Disc or accepted alternative media.

2. Label each disc and container with session identification and date.

1.4 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.

2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this Section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:

1. The location of the O&M manuals and procedures for use and preservation; backup copies.

2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.

3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:

1. Review the applicable O&M manuals.

2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.

3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 018113 - SUSTAINABLE DESIGN REQUIREMENTS - CTHPB

PART 1 GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with certain Connecticut High Performance Building Standard Guidelines (CTHPB) prerequisites and credits needed for Project to comply with the CTHPB standard.

1. The Owner requires the Contractor to implement practices and procedures to meet the Project's environmental goals, which include compliance with the CTHPB standard. Specific project goals which may impact this and the other sections of this specification include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; use of certified wood products; construction waste recycling; and the implementation of a construction indoor air quality management plan. The Contractor shall ensure that the requirements related to these goals, as defined in the sections below and in related sections of the contract documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated CTHPB Performance Criteria.
2. Other CTHPB prerequisites and credits needed to comply with the CTHPB Standard depend on material selections and may not be specifically identified as CTHPB requirements. Compliance with requirements needed to comply with CTHPB Standard prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
3. Additional CTHPB Standard prerequisites and credits needed to achieve CTHPB compliance depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
4. A copy of the CTHPB Standard checklist is attached at the end of this Section for information only.

1.2 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-FSC-accredited certification body.

B. CTHPB: Connecticut High Performance Building Standard.

C. Rapidly Renewable Materials: Materials made from plants that are typically harvested within a 10-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

D. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

E. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles from Project site.

F. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.

2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process.

a. Excluded is reutilization of materials, such as rework, regrind, or “home” scrap, generated in a process and capable of being reclaimed within the same process that generated it.

3. The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

G. Environmental Product Declarations (EPDs): Comprehensive standardized reports that quantify the environmental impact of a product and are developed after a product life cycle assessment (LCA) is conducted, which are based on applicable product category rules (PCRs). EPDs are created and verified per ISO 14025 and are based on LCAs compliant with ISO 14040 and ISO 14044.

1.3 PRECONSTRUCTION MEETINGS

A. Preconstruction Conference: Review CTHPB requirements and action plans for meeting requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect regarding CTHPB credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures.

B. Assign a Construction CTHPB Coordinator to review and process CTHPB submittals before sending them to Architect. This person shall be familiar with the CTHPB process and be familiar with what is required for supporting documentation in the CTHPB submittals.

1.5 SUBMITTALS

A. General: Submit additional sustainable design submittals required by other Specification Sections.

B. CTHPB submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CTHPB requirements.

C. Detailed Submittal Requirements: The items below define the information and documents to be provided for each type of CTHPB Submittal.

1. CTHPB Compliance Documentation: Information to be supplied for this form (blank copy provided as Attachment A to this Section) shall include some or all of the following items, as identified in each specification section:

a. Product name and manufacturer

b. Cost breakdowns for the materials included in the contractor or sub-contractor's scope of work. Cost reporting shall include:

1) The total cost for the contractor's work.

2) Itemized material costs (excluding the contractor's labor, equipment, overhead and profit).

c. The percentages (by weight) of pre-consumer and post-consumer recycled content in the supplied product(s).

d. The percentages (by weight) of regional material content in the supplied product.

e. The percentage (by weight) of rapidly renewable content in the supplied products.

f. The percentage of FSC certified wood content in the supplied products. Calculate percentage by weight, volume and cost. Use whichever provides the highest percentage of FSC content.

g. The percentage (by weight) of salvaged content in the supplied products

h. If applicable, indication that product has been certified as low-VOC by SCS – Indoor Advantage Gold or the GREENGUARD Certification Program.

2. CRF Back-Up Documentation: These documents are used to validate the information provided on the CRF (except cost data). For each material listed on the CRF, provide documentation to certify the material's Sustainable Building attributes, as applicable:

a. Recycled content: Provide published product literature or letter of certification on the manufacturer's letterhead certifying the amounts of post-consumer and/or post-industrial content. For concrete, provide concrete mix designs and volumes to verify the percentage of recycled material included, by weight and by cost.

b. Regional manufacturing (within 500 mile radius): Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state where the manufacturing plant is located and the direct distance in miles from the project site.

c. Regional raw materials (within 500 mile radius):

1) Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state from which each of the raw materials in the product were extracted, harvested or recovered, and the direct distance in miles from the project site.

2) If only some of the raw materials for a particular product or assembly originate within a 500 mile radius of the subproject site, provide the percentage (by weight) that these materials comprise in the complete product.

d. FSC Certified Wood:

1) Provide vendor invoices for each FSC wood product or assembly. Invoices shall include chain-of-custody certificate numbers and itemized costs for all certified products.

2) For assemblies, provide the percentage (by cost and by weight) of the assembly that is FSC-certified wood.

e. Rapidly renewable resources: Provide published product literature or letter of certification on the manufacturer's letterhead indicating the rapidly renewable content in the installed product.

f. VOC content: Provide manufacturer's published product literature or stated in a letter of certification on the manufacturer's letterhead that the product has been certified as low-VOC by either SCS – Indoor Advantage Gold or the GREENGUARD certification program.

D. CTHPB Action Plans: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:

1. Construction Waste Management: Waste management plan complying with Division 01 Section "Construction Waste Management and Disposal."
2. Recycled Content: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
3. Local or Regional Content: List of proposed regionally manufactured materials and regionally extracted and manufactured materials.
4. Certified Wood Products: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
5. Construction indoor-air-quality management plan – During Construction.
6. Construction indoor-air-quality management plan - Before Occupancy

E. CTHPB Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with CTHPB action plans for the following:

1. Construction Waste Management: Waste reduction progress reports complying with Division 01 Section "Construction Waste Management and Disposal."
2. Recycled Content.
3. Local or Regional Content: Regionally manufactured materials and regionally extracted and manufactured materials.
4. Certified wood products.

F. Additional CTHPB Documentation Submittals:

1. Construction Activity Pollution Prevention: Provide supporting documentation of erosion and sedimentation control measures on site with:
    a. Photographs
    b. Maintenance Logs
    c. Meeting Minutes
    d. Field Sketches and Shop Submittals
2. Reduce Outdoor Light Pollution: Product data for interior and exterior lighting fixtures that stop direct-beam illumination from leaving the building site.
3. Reduce Potable Water Use: Product data for plumbing fixtures indicating water consumption.
4. CIAQ Plan – During Construction:
    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
5. CIAQ Plan – Before Occupancy:
    a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
    b. Product data for filtration media used during flush-out and during occupancy.
    c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

A. A. Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 20 percent of cost of materials used for Project.
    1. Cost of recycled content of an item shall be determined by adding the percentage (by weight) of post-consumer recycled content and one-half the percentage (by weight) of pre-consumer recycled content and multiplying by cost of the item.

2. Do not include plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

3. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims" 16 CFR 260.7 (e).

2.2 REGIONAL MATERIALS

A. Provide a minimum of 20 percent of building materials (by cost) that are regionally extracted and manufactured materials.

2.3 CERTIFIED WOOD

A. Provide a minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

1. Rough carpentry.
2. Miscellaneous carpentry.
3. Heavy timber construction.
4. Finish carpentry.
5. Architectural woodwork.
6. Wood paneling.
7. Wood veneer wall covering.
8. Wood flooring.
9. Wood cabinets.

2.4 LOW-EMITTING MATERIALS REQUIREMENTS

A. The following materials shall be certified as low-VOC products by either the Scientific Certification Systems – Indoor Advantage Gold system or GREENGUARD Certification Program:

1. Adhesives and sealants used in the interior of the building
2. Acoustic ceiling tiles and wall panels
3. Interior paints
4. Wall coverings
5. Carpet systems and associated adhesives
6. Composite and solid wood flooring
7. Resilient flooring and associated adhesives

B. All composite wood and agrifiber products used within the shell of the building shall meet the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.

PART 3 EXECUTION

3.1 REFRIGERANT REMOVAL

A. Remove CFC-based refrigerants from existing HVAC&R equipment indicated to remain and replace with refrigerants that are not CFC based. Replace or adjust existing equipment to accommodate new refrigerant as described in Division 23 Sections.

3.2 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes during any phase of construction.

1. Follow protocol of project owner if smoking policy is more stringent.

3.3 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Section 017419 - Construction Waste Management and Disposal and Construction Waste Management Plan.

3.4 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Comply with requirements in Division 01 Sections “Indoor Air Quality Requirements” and “Construction Indoor Air Quality (IAQ) Program.”

3.5 ATTACHMENTS

A. CTHPB Compliance Manual - Appendix C

B. Environmental Materials Reporting Form - Appendix D

C. CTHPB Compliance Checklist - Schools - Appendix E

END OF SECTION

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SECTION 020750 – SELECTIVE DEMOLITION FOR HAZARDOUS MATERIALS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. The Hazardous Materials Abatement Contractor (HMAC) shall be responsible for performing selective demolition, as directed by the Owner’s Consultant/Construction Manager, to determine the presence of concealed materials throughout the work area(s) and to access known hazardous materials scheduled for removal.

B. The HMAC shall refer to Architect’s demolition plans and specifications to determine extent of selective demolition required. Items that are scheduled to remain shall be protected by the HMAC. Items that are scheduled for removal and reinstallation shall be removed by the HMAC and turned over to the Construction Manager. All returned items shall be fully decontaminated of asbestos debris.

C. Related Sections:
1. Section 011001: Hazardous Materials General Conditions
2. Section 012200: Hazardous Materials Unit Pricing
3. Section 011600: Hazardous Materials Scheduling and Phasing
4. Section 017701: Hazardous Materials Contract Closeout
5. Section 020800: Asbestos Abatement
6. Section 020820: Universal Waste Reclamation
7. Section 020900: Lead Paint Awareness
8. Section 021100: PCB Remediation

D. The HMAC shall open up specified pipe chases for exploratory inspection of plumbing walls in select areas of the building. The HMAC shall remove masonry walls where required to access asbestos-containing thermal system insulation throughout building. Demolition work to be performed within negative pressure enclosures if asbestos-containing materials may be impacted.

E. The HMAC shall perform selective demolition of all suspended ceilings. The suspended ceiling systems, including ceiling tiles, grids and support wires shall be removed by the HMAC to access all thermal system insulation and expansion joint caulk.

F. The HMAC shall remove all window air conditioning units, where present. Properly reclaim refrigerant from all AC units prior to disposal or recycling. Provide refrigerant reclamation certificates for reclaimed refrigerant.

G. The HMAC shall remove all counters, shelving, cabinets, and all associated mechanical, electrical, and plumbing equipment and fixtures to access asbestos-containing flooring materials and expansion joint caulks. Temporarily support all conduit, piping, and fixtures that cannot be fully removed and protect against contamination and damage.

1.3 PROJECT CONDITIONS

A. Occupancy:
1. Areas of the building in which selective demolition will occur will be unoccupied during work.
2. No students or children under the age of 18 will be present within the school building during this work.

B. Existing Conditions:
1. After the project has begun, the HMAC is responsible for the condition of the structures to be selectively demolished and surfaces to remain.
2. Unforeseen Conditions: Should unforeseen conditions be encountered that affect design or function of project, investigate and fully submit an accurate, detailed, written report to the office of the Architect/Consultant. While awaiting a response, reschedule operations if necessary to avoid delay of overall project.

C. Work under this project may be performed in phases to accommodate Owner's/Architect's requirements and remaining construction phases. Coordinate abatement schedule and operations with the Owner/Architect/Consultant and other trades.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that all utilities have been disconnected and sealed.

B. Insofar as is practicable, arrange operations to reveal unknown or concealed conditions for examination and verification before removal or demolition.

C. Verify actual conditions to determine, in advance, whether removal or demolition of any element will result in structural deficiency, overloading, failure, or unplanned collapse.
1. Demolish and remove connections to all electrical, gas and plumbing fixtures required to remove asbestos-containing materials.
2. Demolish all building materials as required to access asbestos, lead-based paint, and presumed PCB containing materials for abatement and remediation. Selective demolition that impacts asbestos-containing materials shall be performed with engineering controls in place.

3.2 PREPARATION

A. Traffic: Do not obstruct walks or public ways without the written permission of governing authorities and of the Owner. Where routes are permitted to be closed, provide alternate routes if required.

B. Protection:
1. Provide for the protection of persons passing around or through the area of demolition.
2. Perform demolition so as to prevent damage to adjacent improvements and facilities to remain.
3. Protect walls, floors, and other new or existing work from damage during demolition operations and abatement work.

3.3 POLLUTION CONTROLS

A. Control as much as practicable the spread of dust and dirt.

B. Observe environmental regulations.

C. Do not allow water usage that results in freezing or flooding.

D. Do not allow adjacent improvements to remain to become soiled by demolition operations.

3.4 DEMOLITION - GENERAL

A. Remove: Items indicated to be removed shall be removed by the HMAC.

B. Existing to Remain: Construction or items indicated to remain shall be protected against damage during demolition operations. Where practical, and with the Construction Manager's permission, the HMAC may elect to remove items to a suitable storage location during demolition and then properly clean and reinstall the items.

C. Perform work in a systematic manner.

D. Demolish and remove existing structures only to the extent required, as indicated in the Contract Documents.

E. Perform selective demolition using methods that are least likely to damage work to remain and which will provide proper surfaces for patching.

F. Remove debris daily.

G. Use any methods permitted by governing regulations and the requirements of the Contract Documents.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. Promptly dispose of materials resulting from demolition operations. Non-contaminated material may be disposed of as construction waste. Do not allow materials to accumulate on site.

B. All rubbish and waste material from the Work shall be neatly stacked or kept in suitable containers and removed from the premises daily. The premises shall be kept clean and in an orderly condition at all times to the satisfaction of the Owner and the Consultant.

C. Transport materials resulting from demolition operations and legally dispose of off-site.

D. Off-site disposal location shall not be within one-half mile of any portion of the project site or within sight of the project site.

E. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

F. All disposal containers, receptacles, dumpsters shall be properly labeled and sealed from the onset of waste accumulation. Exterior waste containers shall be locked.

3.6 CLEANING

A. Throughout the abatement and remediation period, the HMAC shall maintain the building and

Site free of rubbish, debris, surplus materials, and other items not required for the Work. Remove such material from the site daily to prevent accumulations. Remove all construction debris from work areas, and remove all hazardous waste and asbestos waste as required by the most current federal, state, and local regulations and the requirements of the specifications.

END OF SECTION 020750

SECTION 020800 – ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. The work specified herein covers the proper worker protection, work area preparation, removal procedures, disposal requirements, and post abatement re-occupancy air testing for the abatement of asbestos-containing building components associated with the demolition work at the Edgewood Pre-K Academy located at 345 Mix Street in Bristol, Connecticut (Site).

B. Related Sections:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 011600:	Hazardous Materials Scheduling and Phasing
3.	Section 012200:	Hazards Materials Unit Prices
3.	Section 017701:	Hazardous Materials Contract Closeout
4.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
5.	Section 020900:	Lead Paint Awareness
6.	Section 020820:	Universal Waste Reclamation
7.	Section 021100:	PCB Remediation

C. Related drawings:
1. Hazardous Building Materials Abatement Plans HM-1 through HM-3

1.3 GENERAL PROVISIONS

A. The Edgewood Pre-K Academy located at 345 Mix Street in Bristol, CT (the "Site") consists of an approximately 44,500 square foot single story steel framed masonry building. The original building was constructed in 1956-1957 with two additions added to the original structure in 1963-1965 and 1985-1987. The building will be renovated as new under a State of Connecticut Office of Grants Administration (OGA) grant.

B. Asbestos containing material (ACM) testing has identified materials within the building that contain asbestos. The work covered in this section includes the minimum procedures that shall be employed during the abatement of the ACM.

C. The abatement project may be divided into phases that are to be coordinated with the overall phasing of the renovation project. Refer to the Construction Manager's phasing plans for additional information. It is the Hazardous Materials Abatement Contractor's (HMAC) responsibility to become familiar with the phasing plan for the project and to include the required remobilization fees to support the phasing. The HMAC shall comply with the overall project schedule established by the Construction Manager. Modifications or changes to the project phasing shall not be grounds for a change order.

D. The facility meets the definition of a school under the USEPA Asbestos Hazard Emergency Response Act (AHERA) 40 CFR 763 Subpart E and the Asbestos-Containing Materials in Schools Rule 19a-333-1 to Section 19a-333-13 of the Regulations of Connecticut State Agencies. Asbestos abatement may not be performed while children under the age of eighteen

(18) are within the school building without prior approval from the State of Connecticut Department of Public Health.

E. It is anticipated that the building will be vacant and no students under the age of eighteen (18) will be present during the asbestos abatement work.

F. Mr. Chris Liberti of Eagle Environmental, Inc. is the designer of this Specification. Mr. Liberti is a State of Connecticut Department of Public Health (CTDPH) Licensed Asbestos Project Designer (License #000261).

1.4 PROJECT DESCRIPTION

A. The work to be performed includes but is not limited to the proper removal, handling, and disposal of all regulate asbestos-containing materials (ACM) present within the building. Detailed descriptions of materials and locations of ACM scheduled for removal are shown on Table I below and on the Hazardous Building Materials Abatement Plans HM-1 through HM-4.

B. The asbestos abatement work includes but is not limited to the abatement of interior friable and non-friable ACM and the abatement of exterior non-friable ACM associated with the building specified for demolition.

C. The asbestos abatement work shall include all selective demolition to access concealed ACM within masonry walls and above solid ceilings.

D. The Base Bid asbestos abatement work shall include but not be limited to the ACM identified in the following Table 1 - Table of ACM. The Table provides information on the magnitude of the project. It is the sole responsibility of the Hazardous Materials Abatement Contractor (HMAC) to visit the site, review the Contract Documents and determine the quantities of ACM to be removed when developing their bid. Locations and estimated quantities of specific items noted in paragraph A above include:

TABLE I – BASE BID - TABLE OF ACM

LOCATION(S)	MATERIAL	ESTIMATED QUANTITY	SHEET NUMBER	KEY CODE
1-01, 1-02, 1-03, 1-04, 1-05, 1-06, 1-07, 1-07B, 1-08, 1-08B, 1-09, 1-09B, 1-10, 1-10B, 1-11, 1-11B, 1-12, 1-12B, 1-13, 1-14, 1-15, 1-16, 1-17, 1-18, 1-21, 1-21B, 1-22, 1-23, 1-24, 1-26, 1-27, 1-29, 1-37, 1-46, 1-52, 1-53, 1-54, 1-55, 1-56, 1-57, 1-58, 1-71, 1-76, 1-77, 1-78, 1-80, 1-96, 1-97	Mudded pipe fitting insulation on domestic water pipes (exposed and above ceiling)	190 EA	HM-2	1
Pipe Tunnels	Mudded pipe fitting insulation	115 EA	HM-1	GREY SHADE
1-01, 1-02, 1-03, 1-04, 1-05, 1-06, 1-07, 1-07B, 1-08, 1-08B, 1-09, 1-09B, 1-10, 1-10B, 1-11, 1-11B, 1-12, 1-12B, 1-15, 1-16, 1-17, 1-21B, 1-22, 1-23, 1-24, 1-26, 1-45, 1-53, 1-57, 1-71, 1-72, 1-73, 1-74, 1-77, 1-76, 1-77, 1-96	Mudded pipe fitting insulation on domestic water pipes (within masonry walls)	200 EA	HM-2	2
1-15	Air cell pipe insulation (within CMU wall)	48 LF	HM-2	3

LOCATION(S)	MATERIAL	ESTIMATED QUANTITY	SHEET NUMBER	KEY CODE
1-01, 1-02, 1-03, 1-04, 1-05, 1-06, 1-07, 1-07B, 1-08, 1-08B, 1-09, 1-09B, 1-10, 1-10B, 1-11, 1-11B, 1-12, 1-12B, 1-13, 1-14, 1-24, 1-28, 1-29, 1-30, 1-37,1-38, 1-39, 1-40, 1-41, 1-46, 1-52, 1-54, 1-55, 1-56, 1-71, 1-72, 1-73, 1-74, 1-75, 1-80, 1-86, 1-91, 1-96	Interior caulk at interior door and partition window frames, steel columns, and masonry wall junctions	2155 SF	HM-2	5
1-13, 1-14, 1-20, 1-24, 1-26, 1-28, 1-29, 1-30, 1-37, 1-38, 1-52, 1-59, 1-70, 1-75, 1-86, 1-91	Interior window glazing compound at metal sashes - black (partition windows, sidelights, transom windows)	2.5'x1' - 24 EA; 3'x1' - 14 EA; 3'x2.5' - 37 EA; 2'x2.5' - 22 EA; 4'x2' - 8 EA; 6'x3' - 4 EA; 1.5'x2' - 17 EA; 2.5'x2.5' - 26 EA; 2'x2' - 21 EA; 3'x3' - 2 EA; 3'x2' - 3 EA	HM-2	6
1-13, 1-14, 1-20, 1-24, 1-26, 1-28, 1-29, 1-30, 1-37, 1-38	Interior window glazing compound at metal sashes - black (within metal doors)	11 EA	HM-2	6
1-14, 1-24, 1-28B,1-29, 1-36, 1-37, 1-52, 1-80	Fire door core insulation - white (wood doors)	42 EA	HM-2	7
1-01, 1-02, 1-03, 1-04, 1-05, 1-06, 1-07, 1-08, 1-09, 1-10, 1-11, 1-12, 1-13, 1-14, 1-19, 1-24, 1-27, 1-28, 1-28B, 1-29, 1-30, 1-33 1-37, 1-38, 1-39, 1-40, 1-42, 1-43, 1-46, 1-50, 1-51, 1-52, 1-58, 1-60, 1-61, 1-62, 1-63, 1-64, 1-65, 1-66, 1-67, 1-68, 1-71, 1-72, 1-73, 1-74, 1-75, 1-79, 1-80, 1-81, 1-86, 1-87, 1-88, 1-89, 1-91	9"x9" Vinyl floor tile	24,650 SF	HM-2	DIAG-ONAL HATCH
1-97	Duct flange sealant - black	10 LF	HM-2	8
1-79	Roof drain pipe fitting insulation	4 EA	HM-2	4
1-47	Pipe flange gaskets	30 EA	HM-2	10
1-47	Pipe valve packings	12 EA	HM-2	11
Façades A, B, C, D, 1-52, 1-91	Expansion joint caulks (beige and white)	130 LF	HM-2	9
Façade A, Façade C	Caulk at wood soffit - beige	35 LF	HM-2	17
Roof 1, Roof 2, Roof 3, Roof 4, Roof 5, Roof 6	Top layer edge flashing cement	1,570 SF	HM-3	12
Roof 1, Roof 2, Roof 3, Roof 5, Roof 6	Tar at roof drain pans	95 SF	HM-3	13

LOCATION(S)	MATERIAL	ESTIMATED QUANTITY	SHEET NUMBER	KEY CODE
Roof 1, Roof 3, Roof 5, Roof 6	Cement board at raised wall (to Roof 2)	210 SF	HM-3	14
Roof 1, Roof 2, Roof 3, Roof 5, Roof 6	Silver paint at raised penetrations, skylight bases, expansion joints and roof wall junctions	1,300 SF	HM-3	15
Roof 3, Roof 5, Roof 6	Caulk at top of cement board	65 LF	HM-3	16

E. All asbestos-containing materials shall be removed and disposed of as combination regulated asbestos and presumed polychlorinated biphenyls (PCB) Bulk Product Waste >50 ppm. Thermal system insulation may be removed and segregated for disposal as friable asbestos waste. Refer to Section 021100 PCB Remediation for additional removal and disposal requirements. All asbestos-containing caulks and window glazing compounds shall be removed and disposed of as combination regulated asbestos and presumed polychlorinated biphenyls (PCB) Bulk Product Waste >50 ppm. Refer to Section 021100 PCB Remediation for additional removal and disposal requirements.

F. The HMAC shall determine the quantities of asbestos-containing materials requiring removal prior to submission of their Bid. Any discrepancies must be submitted in writing in RFI format to the Architect or Owner's Consultant for interpretation prior to submission of their Bid. The quantities provided above are estimates only.

G. The HMAC shall not perform any work that raises dust or creates emissions without proper engineering controls in place. Work of this project shall be performed in a manner that protects the occupied spaces of the building from fugitive dust, emissions, gross debris, waste, materials, etc.

H. The HMAC shall be responsible for select wall and ceiling demolition, the removal of counters, cabinets, fixtures, electrical, mechanical, plumbing systems, and miscellaneous items to facilitate asbestos removal. Refer to Section 020750 Selective Demolition for Hazardous Materials Abatement for additional requirements.

I. The HMAC is directed to review Section 020900 Lead Paint Awareness for additional requirements affecting the work of this Section.

J. The pipe tunnels are defined as confined spaces under U.S. Department of Labor's Occupational Safety and Health Administration's (OSHA) confined space Standard. The HMAC shall assess the potential hazards in the pipe tunnels for determination of they are a permitted or non-permitted confined space. The HMAC shall develop a site-specific confined space entry program to ensure compliance with the OSHA's confined space Standard.

K. The tunnel configuration depicted on HM-1 may vary from actual field conditions. The pipe tunnel floors and walls consist of poured concrete and are of varying widths. The pipe tunnels contain mechanical and plumbing piping, waste lines, electrical conduit, and minimal lighting. The HMAC shall provide temporary lighting to complete the work of this project.

L. The AAC shall install carbon monoxide detectors at the entrance to each pipe tunnel.

M. Asbestos-containing mudded pipe fitting insulation has been identified throughout the original building and the 1965-1967 addition. The mudded pipe fitting insulation is associated with fiberglass domestic water lines and heating lines. The fittings are located above suspended

ceilings, within masonry plumbing walls and throughout the tunnels. Localized areas of damage pipe fitting insulation has been identified within the tunnels.

N. It is anticipated that all asbestos-containing materials shall be removed from the interior, facades and roofs during the building renovation project.

1.5 QUALITY ASSURANCE

A. The HMAC shall be licensed by the State of Connecticut Department of Public Health (DPH) to perform asbestos abatement.

B. The Asbestos Abatement Supervisor(s) and Asbestos Abatement Workers shall be accredited in accordance with EPA regulation 40 CFR Part 763, subpart E, Appendix C; and shall be licensed by the State of Connecticut Department of Public Health.

1.6 APPLICABLE CODES

A. The HMAC shall be solely responsible for conducting this project and supervising all work in a manner that will be in conformance with all federal, state and local regulations and guidelines pertaining to asbestos abatement. Specifically, the HMAC shall comply with the requirements of the following:
1. USEPA AHERA Regulation (40 CFR 763 Final Rule and Notice);
2. USEPA NESHAP Regulations (40 CFR 61, Subpart M);
3. OSHA Asbestos Regulations (29 CFR 1910.1001 and 1926.1101);
4. Connecticut DEEP Regulations (Section 22a-209-8 (I) and Section 22a-220 of the Connecticut General Statutes);
5. Connecticut DPH Standards for Asbestos Abatement Sections 19a-332a-1 to 19a-332a-16;
6. Connecticut DPH Asbestos-Containing-Materials in Schools Regulations (19a-333-1 through 19a-333-13);
7. Connecticut DPH Licensure and Training Requirements Section 20-440-1 to Section 20-440-9.
8. Connecticut Basic Building Code (BOCA);
9. Connecticut Fire Safety Code (NFPA);
10. Local health and safety codes, ordinances or regulations pertaining to asbestos remediation and all national codes and standards including ASTM, ANSI, and Underwriter's Laboratories.

1.7 EXEMPTIONS

A. This project was designed by a State of Connecticut Department of Public Health licensed Asbestos Abatement Designer. Any deviation from these specifications requires the written approval and authorization from the Designer.

B. Any deviations from CTDPH Standards for Asbestos Abatement Sections 19a-332a-1 through 19a-332a-16 must be requested in writing and must be approved in writing by CTDPH.

1.8 NOTIFICATIONS, POSTINGS AND PERMITS

A. The HMAC shall make the following notifications and provide the submittals to the following agencies prior to the commencement of removal work. This notification is required ten (10) days (10 calendar days for CTDPH and 10 business days for USEPA) prior to the start of the abatement project:

1. State of Connecticut
   Department of Public Health
   Indoor Air Program, MS #12 AIR
   410 Capitol Avenue
   P.O. Box 340308
   Hartford, CT 06134-0308
2. USEPA New England Headquarters
   5 Post Office Square, Suite 100
   Boston, Massachusetts 02109-3912

B. The minimum information included in the notification includes:
   1. Name and address of building owner/operator
   2. Building location
   3. Building size, age, and use
   4. Amount of friable asbestos
   5. Work schedule, including proposed start and completion date
   6. Asbestos removal procedures to be used
   7. Name and location of disposal site for generated asbestos waste, residue, and debris

C. Ten day notifications shall be posted for each individual building and phase of the project.

1.9 WORK SITE SAFETY PLAN

A. The HMAC shall establish a set of emergency procedures and shall post them in a conspicuous place at the work site. The safety plan should include provisions for the following:
   1. Evacuation of injured workers.
   2. Emergency and fire exit routes from all work areas.
   3. Emergency first aid treatment.
   4. Local telephone numbers for emergency services including ambulance, fire, and police.
   5. A method to notify workers in the event of a fire or other emergency requiring evacuation of the building.
   6. 24 hour site security program.

B. The HMAC is responsible for training all workers in these procedures.

1.10 ALTERNATIVE WORK PRACTICES (AWP)

A. No AWPs have been developed for this project.

B. Any deviations from these specifications require the written approval and authorization from the Owner and the Owner’s Consultant.

C. Any deviations from CTDPH Standards for Asbestos Abatement Sections 19a-332a-1 through 19a-332a-16 must be requested in writing by the designer of record for the project and must be approved in writing by CTDPH.

1.11 RE-OCCUPANCY CLEARANCE

A. Re-occupancy air sampling will be required within all interior work areas prior to the removal of containment barriers and engineering controls. Make up air into the work area must be free of demolition dust to ensure samples can be analyzed.

B. The HMAC shall work with the Construction Manager to coordinate activities outside the abatement work area to ensure dusty conditions that may impact the ability to analyze clearance samples are not created.

C. The Owner shall be responsible for payment of the sampling and analysis of initial final air clearance samples only. The HMAC shall be responsible for payment of all costs associated with the collection and analysis of additional final air clearance samples for areas that failed the initial test. This shall also include the laboratory charges for preparation of slides for samples that are “overloaded” and become unreadable.

D. Phase Contrast Microscopy (PCM) air samples will be analyzed by the Owner’s Consultant. Transmission Electron Microscopy (TEM) air samples will be analyzed by an outside laboratory on a twenty-four (24) hour turn-around time. The turnaround starts once the samples are received at the laboratory.

1.12 CONTROL OVER REMOVAL WORK

A. All HMAC work procedures shall be monitored by the HMAC’s “Competent Person” to ensure that areas outside the designated work locations do not become contaminated. The following controls shall be implemented each working day to help ensure this:
1. Prior to work on any given day, the HMAC’s designated "Competent Person" shall evaluate job tasks with respect to safety procedures and requirements specified to prevent contamination of the building or the employees. This includes a visual survey of the work area and the decontamination enclosure systems.

B. The HMAC shall maintain control of and be responsible for access to all work areas to ensure the following requirements:
1. Nonessential personnel are prohibited from entering the area;
2. All authorized personnel entering the work area shall sign the work area entry log at the entrance to each work area;
3. All authorized personnel entering the work area shall read the "worker protection procedures" which are posted at the entry points to the enclosure system, and shall be equipped with properly fitted respirators and protective clothing;
4. All personnel who are exiting from the decontamination enclosure system shall be properly decontaminated;
5. Asbestos waste that is taken out of the work area must be properly bagged and labeled in accordance with these specifications. The surface of the bags shall be decontaminated. Asbestos waste leaving the enclosure system must be transported off site or immediately placed in locked, posted temporary storage on site, and be removed within 24 hours of the project conclusion.
6. Any material, equipment, or supplies that are brought out of the decontamination enclosure system shall be cleaned and decontaminated by wet cleaning and/or HEPA vacuuming of all surfaces.

1.13 SITE SECURITY

A. The HMAC shall be responsible for the security of regulated areas. Post asbestos abatement warning signs at entrances to the work area including the waste load out and worker decontamination chamber. The HMAC shall have a supervisor monitoring the entrance of the worker decontamination chamber during abatement work.

B. The HMAC shall be responsible for the security of regulated areas. Post asbestos abatement warning signs at entrances to the work area including the waste load out and worker decontamination chamber. The HMAC shall have a supervisor monitoring the entrance of the worker decontamination chamber during abatement work.

C. The supervisor shall maintain a work area access log for each work area. The access log shall document each person that enters the work area, the time entered, and the time exited. Copies of the work area access logs shall be provided to the Owner’s Consultant during the course of

the project.

D. Although the Site building will be vacant, the school campus will be under full or partial occupancy at the time of this project. The HMAC shall maintain all signage and barriers as defined in the Variance Approval for each phase of work.

E. The HMAC shall use only those entrances and exits to the building established for contractors' use.

1.14 PERSONNEL PROTECTION

A. Prior to commencing work, instruct all workers in all aspects of personnel protection, work procedures, emergency procedures use of equipment including procedures unique to this project.

B. Respiratory protection shall meet the requirements of OSHA as required in 29 CFR 1910.134, 29 CFR 1926.11, 29 CFR 1926.62 and the requirements of the CTDPH Standards for Asbestos Abatement (19a-332a-1 through 16). A formal respiratory protection program must be implemented in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134. The HMAC shall conduct exposure assessment air sampling, analysis and reporting to ensure the workers are using appropriate respiratory protection.

C. The HMAC shall provide appropriate respiratory protection for each worker and ensure usage during potential asbestos exposure.

D. The HMAC shall provide respirators from among those approved as being acceptable for protection by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part II.

E. The HMAC shall provide an adequate supply of filter for respirators in use.

F. Minimum respiratory protection shall be as follows:

Air borne Asbestos Level:	Required Respirator:
Not in excess of 1 f/cc (10 x PEL)	Half mask air purifying or otherwise as required respirator other than a disposable respirator, equipped with HEPA P 100 filters.
Not in excess of 5 f/cc (50 x PEL)	Full facepiece air purifying respirator equipped with HEPA P 100 filters.
Not in excess of 10 f/cc (100 x PEL)	Any powered air purifying respirator equipped with HEPA P 100 filters, or any supplied air respirator operated in continuous flow mode.
Not in excess of 100 f/cc (1000 x PEL)	Full facepiece supplied air respirator operated in pressure demand mode.
Greater than 100 f/cc (1000 x PEL)	Full facepiece supplied air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus.

Notes:

1. Respirators assigned for higher airborne fiber concentrations may be used at lower concentrations.

2. A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.
3. In addition to the selection criteria in paragraph 1.15F, the HMAC shall provide a tight-fitting powered air purifying respirator equipped with high efficiency filters or a full facepiece supplied air respirator operated in the pressure demand mode equipped with HEPA egress cartridges or an auxiliary positive pressure self- contained breathing apparatus for all employees within the regulated area where Class I work is being performed for which a negative exposure assessment has not been produced and the exposure assessment indicates the exposure level will not exceed 1 f/cc as an 8-hour time weighted average. A full facepiece supplied air respirator operated in the pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus shall be provided under such conditions if the exposure assessment indicates exposure levels above 1 f/cc as an 8 hour time weighted average.
4. If compresses air is used for supplied air respirators, this air will meet the requirements for grade D breathing air as described by the Compresses Gas association commodity Specification G-7.1-1966. The compressor will be equipped with the necessary safety devices and sorbends/filters, and be situated to avoid entry of contaminated air. In addition, the compressor will be equipped with alarms to indicate failure or overheating, and additional alarms for indicating the presence of carbon monoxide. Air line couplings will be incompatible with outlets for other gas system to prevent inadvertent servicing of air line respirators with non-respirable gases.

G. The HMAC shall provide and require all workers to wear protective clothing in Work Areas where asbestos fiber concentration exceeds permissible limits established by the OSHA or where contamination exists. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings.

H. The HMAC shall ensure that all authorized persons entering contaminated areas are equipped with proper respirators and protective clothing.

1.15 WORKER PROTECTION PROCEDURES

A. The HMAC shall monitor airborne asbestos concentrations in the workers' breathing zone to establish conditions and work procedures for maintaining compliance with OSHA Regulations 29 CFR 1910.1001 and 1926.1001.

B. The HMAC’s air sampling professional shall document all air sampling results and provide all air sampling reports as soon as feasible. OSHA air monitoring results shall be posted at a conspicuous location at the job site.

C. All personnel air sampling shall be conducted in accordance with methods described in OSHA standards 29 CFR 1910.1001 and 1926.1101.

1.16 SUBMITTALS

A. The HMAC will submit one hard copy of the following submittals to the Owner's Consultant ten (10) calendar days prior to the commencement of removal work:
1. HMAC’s construction schedule
2. Shop drawings showing work area configuration with decontamination facility and negative air exhaust locations
3. Waste generator label to be used including facility address, Owner’s information and name of HMAC
4. Waste shipment and disposal form to be used with generator information completed
5. Waste hauling contractor and associated licenses

6. Asbestos abatement training (initial and current refresher), licenses, medical and respirator fit-test records of each employee who may be on the project site
7. Copies of all notifications and permits, if required
8. Copies of the written respirator plan compliant with the most current issue of OSHA 1910.134
9. Copies of all SDS sheets for materials to be used on Site
10. Work Site Safety Plan
11. Negative Exposure Assessment, if any
12. HMAC's State of Connecticut Asbestos Contractor license
13. State and EPA Asbestos Notifications
14. Site-specific confined space entry program

B. If rental equipment will be utilized during abatement activities, the HMAC shall provide written acknowledgement to the rental equipment provider and copy the Owner's Consultant stating that equipment will be used during hazardous material removal and will be thoroughly decontaminated prior to being returned.

C. The HMAC will submit the following to the Consultant during the work:
1. Results of all personal air sampling
2. Certificate of training (initial and current certification), medical, and fit-test records for new employees to start work (24 hours in advance of work)
3. HMAC site logs and containment access logs
4. Revised Notifications, if any

D. The following shall be submitted to the Consultant at the completion of work:
1. Completed copies of Waste Shipment Records (WSR).
2. Remaining personal air sampling results and work area access control logs.

1.17 DEFINITIONS

A. ABATEMENT - Procedures to control fiber release from asbestos-containing materials; includes removal, encapsulation, and enclosure.

B. AIRLOCK - A system for permitting ingress and egress while assuring air movement to a contaminated area from an uncontaminated area. Two curtained doorways spaced a minimum of six feet apart can form an airlock.

C. AIR MONITORING - The process of measuring the fiber concentration of an area or of a person.

D. AIR SAMPLING PROFESSIONAL – A licensed professional capable of developing air sampling protocols and conducting air monitoring and analysis. This individual should be an industrial hygienist, an environmental scientist, or an engineer with experience in asbestos air monitoring and worker protection equipment and procedures. This individual should have demonstrated proficiency in conducting air sample collection in accordance with 29 CFR 1910.1001 and 1926.1101.

E. ADEQUATELY WETTED - means sufficiently mixed or coated with water, amended or an aqueous solution; or the use of removal encapsulant to prevent dust emissions.

F. AMENDED WATER - Water to which a surfactant has been added.

G. ASBESTOS - The name given to a number of naturally occurring fibrous silicates. This includes the serpentine forms and the amphiboles and includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite, or any of these forms that have been chemically altered.

H. ASBESTOS ABATEMENT - Means the removal, encapsulation, enclosure, renovation, or repair of asbestos-containing materials except activities that are related to the removal or repair of asbestos cement pipe and are performed by employees of a water company as defined in Section 25-32a of the Connecticut General Statutes.

I. ASBESTOS ABATEMENT SITE SUPERVISOR - Means any licensed individual who is employed or engaged by an HMAC to supervise an asbestos abatement project.

J. ASBESTOS ABATEMENT WORKER - Means any employee of an HMAC who engages in asbestos abatement.

K. ASBESTOS CONSULTANT - Any person who engages in any activity directly involved with asbestos consultation services and who has been issued a certificate by the commissioner and a license by the department.

L. ASBESTOS CONTAINING MATERIAL (ACM) - A material composed of asbestos of any type and in an amount greater than one percent be weight, either alone or mixed with other fibrous or nonfibrous material.

M. ASBESTOS CONTRACTOR - Any person or entity engaged in asbestos abatement whose employees actually perform asbestos abatement work.

N. ASBESTOS CONTROL AREA - An area where asbestos abatement operations are performed which is isolated by physical boundaries to prevent the spread of asbestos dust, fibers, or debris.

O. ASBESTOS FIBERS - Those particles with a length greater than five (5) microns and a length to diameter ratio of 3: 1 or greater.

P. ASBESTOS PERMISSIBLE EXPOSURE LIMIT (PEL) - The maximum airborne concentration of asbestos fibers to which an employee is allowed to be exposed. The current level established by OSHA is 0.1 fibers per cubic centimeter of air as an eight (8) hour time weighted average and 1.0 fibers/cc averaged over a sampling period of 30 minutes as an excursion limit. The HMAC is responsible for maintaining work areas in a manner that this standard is not exceeded.

Q. ASBESTOS PROJECT MONITOR - The licensed asbestos consultant who is certified as a project monitor and who functions as an on-site representative of the facility Owner or other persons by over-seeing the activities of the asbestos abatement contractor.

R. AUTHORIZED VISITOR - Any person authorized by the Owner to enter the building.

S. BUILDING OWNER - For this Contract only, the building Owner is the Bristol Public Schools.

T. CLEAN ROOM - An uncontaminated area or room, which is a part of the workers' decontamination enclosure with provisions for storage of workers' street clothes and protective equipment.

U. CLEARANCE SAMPLING - Final air sampling performed aggressively after the completion of the abatement project in a regulated area. Five (5) air samples collected by the asbestos abatement project monitor inside the work area, and having a fiber concentration of less than 0.010 fibers/cc of air will denote acceptable clearance sampling by Phase Contrast Microscopy. Five air samples collected by the asbestos abatement project monitor having an average asbestos concentration of less than 70 asbestos structures mm/sq. will denote acceptable clearance sampling for Transmission Electron Microscopy.

V. COMMISSIONER - Means the Commissioner of the Connecticut Department of Health Services or his/her authorized agent.

W. COMPETENT PERSON - A representative of the HMAC who is capable of identifying an asbestos hazard and who has the authority to take prompt corrective measures to eliminate the hazard during asbestos removal.

X. CONFINED SPACE - A work zone where access and egress are restricted, a potential for gaseous vapors to accumulate exist, or a potential for low oxygen content exists.

Y. DECONTAMINATION ENCLOSURE SYSTEM - A series of connected areas, with curtained doorways between any two adjacent areas, for the decontamination of workers and equipment. A decontamination enclosure system always contains at least one airlock and is adjacent and connected to the regulated area, where possible.

Z. DEPARTMENT - The Department of Public Health.

AA. EPA - Means the U.S. Environmental Protection Agency.

BB. ENCAPSULANT - A liquid material that can be applied to asbestos-containing material that controls the possible release of asbestos fibers from the materials by either creating a membrane over the surface (bridging encapsulant) or penetrating the material and binding its components together (penetrating encapsulant).

CC. ENCAPSULATION - A specified asbestos remediation strategy involving the application of an encapsulant to asbestos containing materials to control the release of asbestos fibers into the air.

DD. EQUIPMENT DECONTAMINATION ENCLOSURE - That portion of a decontamination enclosure system designed for controlling the transfer of materials and equipment, typically consisting of a washroom and a holding area.

EE. EQUIPMENT ROOM - A contaminated area or a room, which is part of the workers' decontamination enclosure with, provisions for storage of contaminated clothing and equipment.

FF. FACILITY - Means any private or public building or structure including but not limited to those used for institutional, residential (including single family homes), commercial or industrial purposes and vessels while ashore or in dry-dock.

GG. FIXED OBJECT - A unit of equipment or furniture in the work areas which cannot be removed from the work area.

HH. FRIABLE ASBESTOS MATERIAL - Any material that contains more than 1% asbestos by weight, that can be crumbled, pulverized or reduced to powder by hand pressure.

II. GLOVE BAG - An impervious plastic bag-like enclosure affixed around asbestos containing material, with glove-like appendages through which materials and tools may be handled.

JJ. HAZARDOUS MATERIALS ABATEMENT CONTRACTOR (HMAC) - Means the Asbestos Contractor, Lead Based Paint Abatement Contractor and or PCB/DEHP and Mercury Vapor Lighting Removal Contractor.

KK. HEPA FILTER - A high efficiency particulate air (HEPA) filter in compliance with ANSI Z9.2-1979.

LL. HEPA VACUUM EQUIPMENT - Vacuum equipment with a HEPA filter system for filtering the effluent air from the unit.

MM. HOLDING AREA - An air-locked chamber in the equipment decontamination enclosure located between the washroom and an uncontaminated area.

NN. INSPECTOR (ASBESTOS ABATEMENT PROJECT MONITOR)- An individual, retained by the Building Owner, who is a "qualified asbestos abatement project monitor" as defined by the State of Connecticut Department of Public Health, and who will be responsible for monitoring the HMAC during the asbestos abatement project.

OO. MOVABLE OBJECT - A unit of equipment or furniture in the work area, which can be removed from the work area.

PP. NEGATIVE AIR FILTRATION EQUIPMENT - A portable local exhaust system equipped with HEPA filtration used to create negative pressure in a regulated area (negative with respect to adjacent unregulated areas) and capable of maintaining a constant, low velocity air flow into regulated areas from adjacent unregulated areas.

QQ. OWNER'S REPRESENTATIVE -The Asbestos Consultant for the project.

RR. NESHAPS - National Emissions Standard for Hazardous Air Pollutants regulations enforced by the EPA.

SS. PLASTICIZE - To cover floors and walls with plastic sheeting as specified herein.

TT. SEPARATION BARRIER - A rigid barrier sealed with two (2) layers of six (6) mil polyethylene sheeting installed between an occupied area and the asbestos abatement work area.

UU. SHOWER ROOM - A room between the clean room and the equipment room in the workers' decontamination enclosure with hot/cold running water and suitably arranged for employee showering during decontamination. The shower room is located in an airlock between the contaminated area and the clean area.

VV. STRIPPING - Removing asbestos materials from any structural member, pipe surface, HVAC, or other equipment.

WW. WASHROOM - A room between the work area and the holding area in the equipment decontamination enclosure with provisions for storage of contaminated clothing and equipment.

XX. WET CLEANING - The process of reducing asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools, which have been dampened by amended water, and by then disposing of these cleaning items as asbestos contaminated waste.

YY. WORK AREA - Designated rooms, spaces, or areas of the project in which asbestos abatement actions are occurring and which may become contaminated as a result of such abatement actions. The work area must be totally self-contained by sealing, plasticizing and equipping the area with a decontamination enclosure system.

ZZ. WORKER DECONTAMINATION ENCLOSURE SYSTEM - That portion of a decontamination enclosure system designated for controlled passage of workers, other personnel, and authorized visitors, typically consisting of a clean room, a shower room, and an equipment room.

AAA. WORK STOPPAGE CLEANUP PROCEDURE - A process following the issuance of a written

stop work order, whereby the HMAC thoroughly cleans and decontaminates the work area, the decontamination enclosure system, and any other areas of the building affected by the removal project, to the satisfaction of the Asbestos Project Monitor.

BBB. WORK ZONE - The area of the decontamination enclosure system where asbestos is being removed.

1.18 PRECONSTRUCTION MEETING

A. The HMAC shall be required to attend a preconstruction meeting with his/her site supervisor, any subcontractor they employ on site for the purpose of reviewing the contract requirements.

PART 2 - MATERIALS AND EQUIPMENT

2.1 MATERIALS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to job site with factory label indicating 4 or 6 mil.

D. Polyethylene disposable bags shall be true six (6) mil with preprinted labels.

E. Tape shall be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

F. Surfactant (wetting agent) - shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration of one (1) ounce surfactant to five (5) gallons of water or as directed by manufacturer.

G. Impermeable containers are to be used to receive and retain any asbestos-containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with OSHA Standard 29 CFR 1926-1101.) Containers must be both air and watertight.

H. Labels and signs, as required by OSHA Standard 29 CFR 1926.1001 will be used.

I. Encapsulant shall be bridging or penetrating type which has been found acceptable to Eagle Environmental. Usage shall be in accordance with manufacturer’s printed technical data.

J. Disposal labels shall be preprinted on self-adhesive labels with the generator name, abatement site and HMAC's name and address. Labels shall not be photocopied and applied with spray adhesive.

2.2 TOOLS AND EQUIPMENT

A. Provide suitable tools for asbestos removal, encapsulation and enclosure.

B. The HMAC shall have air monitoring equipment of type and quantity to monitor operations and conduct personnel exposure surveillance per OSHA requirements.

C. The HMAC shall have available sufficient inventory on site for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape, and air filters.

D. The HMAC shall provide temporary electrical power sources such as generators (when required).

E. The HMAC shall have available shower stalls and sufficient hose length and a drain system equipped with 5-micron filters.

F. Exhaust air filtration system units shall contain HEPA filter(s) capable of sufficient air exhaust to create negative pressure of 0.02 inches of water within the enclosure with respect to the outside area. Equipment shall be checked for proper operation by smoke tubes or a differential pressure gauge before the start of each shift and at least twice during the shift. Adequate exhaust air shall be provided for a minimum of four (4) air changes per hour within the enclosure. No air movement system or air filtering equipment shall discharge unfiltered air outside.

G. Vacuum units, of suitable size and capacities for project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97 percent of all monodispersed particles of 0.3 micrometers in diameter or larger.

H. The HMAC will have reserve exhaust air filtration system units in order to maintain negative air filtration in the event that a unit malfunctions during use.

I. The HMAC shall have available and use recording manometers to monitor pressure differential between the work area and occupied areas of the building. A minimum negative pressure differential of 0.02 inches of water column shall be maintained.

J. The HMAC shall have available spray equipment capable of mixing a wetting agent with water and capable of generating sufficient pressure and volume and having sufficient hose length to reach all areas with asbestos.

K. HEPA filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports where asbestos-containing materials may be disturbed.

PART 3 - EXECUTION

3.1 INTERIOR WORK AREA PREPARATION - GENERAL

A. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes. All temporary installations are to be made by a licensed electrician.

B. Shut down electrical power, including receptacles and light fixtures. Lock and tag out circuits associated with the electrical components in the work area(s). Under no circumstances during the abatement and ceiling demolition procedures will lighting fixtures be permitted to be energized.

C. Shut down and/or isolate heating, cooling, and ventilation air systems or zones to prevent contamination and fiber dispersal to other areas of the structure. Lock and tag out circuits associated with heating and cooling units. During the work, vents within the work area shall be sealed with duct tape and polyethylene sheeting.

D. Where asbestos abatement work will be performed under an approved variance, ensure the construction of temporary rigid fire rated barriers within interior spaces of the building, to isolate the construction area from the occupied spaces of the school building, and exterior fencing, where required, are established by the Construction Manager prior to the work. No work area preparation shall be permitted until the construction barriers and fencing are fully installed. Temporary barriers shall be made air tight and shall extend from the floor to the ceiling deck, above suspended ceiling. Personnel decontamination systems shall be established on the work area side of the temporary rigid barrier. Temporary barriers shall contain a locking door to allow ingress and egress through the barrier.

E. Seal off all openings, including but not limited to windows, corridors, doorways, skylights, ducts, grills, diffuser, and any other penetration of the work areas, with polyethylene sheeting minimum of six (6) mils thick sealed with duct tape. This includes doorways and corridors which will not be used for passage during work areas and occupied areas. Install 5 micron water filtration socks in all floor drains prior to sealing.

F. Establish worker decontamination facility, containment barriers and negative air filtration prior to conducting pre-cleaning activities or selective demolition where ACM will be affected. Pre-clean fixed objects within the work areas, using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and enclose with minimum six (6) mil plastic sheeting sealed with duct tape.

G. Pre-clean movable objects within the work areas, using HEPA vacuum equipment and wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

H. After HEPA vacuum pre-cleaning, conduct work area preparation in accordance with this Specification section.

I. Where fixed walls are not used, one layer of six (6) mil polyethylene sheeting will be applied to a rigid framework of wood, metal, or PVC as the primary isolation barrier.

J. Install two (2) layers of four (4) mil polyethylene wall sheeting over all wall surfaces and isolation barriers (where wall materials are not being removed as ACM) or as identified in an approved AWP. All overlaps shall be sealed with tape.

K. Cover all floors in the work area with two (2) layers of six (6)-mil polyethylene sheeting (where flooring materials are not being removed as ACM) or as identified in an approved AWP. Extend the polyethylene flooring a minimum of twelve (12) inches up the walls. Ensure that the wall sheeting overlaps the floor sheeting from the top.

L. Maintain emergency and fire exits from the work area, or establish alternative exits satisfactory to fire officials.

M. Create pressure differential between work areas and occupied areas by the use of acceptable negative air pressure equipment. The HMAC shall ensure required negative air pressure is obtained throughout the containment and the total volume of air within the work area is changed every fifteen (15) minutes.

N. Install and maintain a manometer for each negative pressure enclosure where Class I work will be performed.

O. Post all approaches to each work area with Asbestos Warning signs. Warning signs shall be of size and type that are easily readable and are visible from all approaches to the work areas.

3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM

A. The HMAC shall establish contiguous to each work area, a personnel decontamination system consisting of equipment room, shower room and clean room in series. Access between the contaminated and uncontaminated areas shall be through this decontamination enclosure only. The decontamination system shall be constructed of two (2) layers of six (6)-mil polyethylene sheeting. Pre-fabricated "pop-up" decontamination chambers will not be permitted on this project.

B. Access between rooms in decontamination system shall be through double flap-curtained openings. Clean room, shower room and equipment room within decontamination system shall be completely sealed ensuring that the sole source of air flow through this area originates from uncontaminated areas outside the work area.

C. The shower unit shall be equipped with an adequate supply of warm water. A shower filtration pump containing two (2) 5-micron sock filters or the best available technology shall be installed to filter shower water. Filtered shower water shall be discharged into sanitation drains and shall not be discharged into storm drains or onto floor or ground surfaces.

D. The shower room shall have soap and an adequate supply of drying towels. Provide an adequate number of shower units in accordance with OSHA 29 CFR 1926.1101.

E. Each personnel decontamination system shall be established on two layers of polyethylene sheeting to protect floor finishes from water damage.

F. Each personnel decontamination system shall have a water supply that can be turned off from outside the work area. Water shall be turned off to the personnel decontamination system at the end of each shift.

G. If the decontamination system will be constructed on the exterior of the building, the entire unit shall be constructed of a solid frame and sturdy wall and ceiling system to prevent unauthorized entry and to keep out the weather. The entrance to the decontamination system shall be lockable and vented to allow for adequate make-up air into containment. The unit shall have a change area for the workers to change into street clothes before exiting.

3.3 REMOTE PERSONNEL DECONTAMINATION SYSTEM

A. The HMAC shall establish a remote personnel decontamination system where contiguous decontamination systems are not feasible. The use of such remote decontamination unit must be indicated in the State Notification. Access between the contaminated and uncontaminated areas shall be through this decontamination enclosure only. The decontamination system shall be constructed of two layers of six (6)-mil polyethylene sheeting. Pre-fabricated "pop-up" decontamination chambers will not be permitted on this project.

B. Access between rooms in decontamination system shall be through double flap-curtained openings. Clean room, shower room and equipment room within decontamination system shall be completely sealed ensuring that the sole source of air flow through this area originates from uncontaminated areas outside the work area.

C. The shower unit shall be equipped with an adequate supply of warm water. A shower filtration pump containing two (2) 5-micron sock filters or the best available technology shall be installed to filter shower water. Filtered shower water shall be discharged into sanitation drains and shall not be discharged into storm drains or onto floor or ground surfaces.

D. The shower room shall have soap and an adequate supply of drying towels. Provide an

adequate number of shower units in accordance with OSHA 29 CFR 1926.1101.

E. When a remote personnel decontamination system is utilized, two (2) contiguous chambers shall be attached to the work area consisting of an equipment room (for workers to remove asbestos contaminated work suits) and a change room (for workers to don a clean work suit prior to proceeding to the remote personnel decontamination system).

3.4 WASTE LOAD OUT SYSTEMS

A. The HMAC shall establish waste load out systems, where feasible, attached to the work areas. Waste load out systems shall consist of a minimum of two (2) chambers that are of suitable size for transporting waste out of the work area. Waste load out systems shall be constructed of two (2) layers of six (6)-mil polyethylene sheeting.

B. Where waste load out systems are not feasible, the HMAC shall remove waste through the personnel decontamination system.

C. Access between rooms in the waste load out system shall be through double flap-curtained openings. The waste load out system shall be used for decontaminating waste containers, bags, bundles, etc. prior to removal from the work area and transporting waste from the work area to the non-work area.

D. Persons working inside the contaminated work area are not permitted to pass from the work area to the non-work area through the waste load out system. Persons inside the contaminated work area shall not be permitted to enter into the clean area of the waste load out system.

E. The waste load out system shall remain sealed at all times except during decontamination of waste containers and transport of waste from the work area to the non-work area.

F. Asbestos waste shall remain within the construction area of each phase and shall not be transported through occupied areas of the building.

G. Asbestos waste shall be transported out of the work area at the completion of each shift. Asbestos waste shall not be transported through the building during normal school hours.

3.5 EXTERIOR WORK AREA PREPARATION – NON-FRIABLE ASBESTOS CONTAINING MATERIALS

A. Where exterior non-friable ACM is to be removed outdoors, post asbestos abatement warning signs and erect temporary barricades to create regulated areas. Regulated areas should be kept clear of any persons not fully trained and protected against potential exposure to asbestos fibers.

B. Exterior work areas shall be regulated with four-foot high orange construction fencing staked in place. Warning tape shall not be permitted in place of construction fencing. The fencing shall be established around the entire exterior work area leaving no openings in the fence other than at a single access point into the work area.

C. Post asbestos warning signs at twenty (20) foot intervals around the entire exterior regulated work area.

D. Establish temporary water service to support the work of this project. All temporary water service connections shall be made by a licensed plumber.

E. Comply with all OSHA requirements for all work including roof and caulk removal work.

F. Install single six (6)-mil drop cloths extending a minimum of ten (10) feet from the exterior wall of the building. Extend polyethylene sheeting outward from the base of the structure in order to collect debris when working from higher elevations. Install single six (6)-mil isolation barriers over any louver, vent, or penetration into the building interior within or directly adjacent to the regulated area.

G. Maintain an operable remote worker decontamination system adjacent to the work area during exterior abatement work.

H. Maintain a work area access log at each exterior regulated work area. Access to the regulated area shall be established at a designated location.

3.6 ASBESTOS REMOVAL PROCEDURE - GENERAL

A. The HMAC shall have a designated "Competent Person" on the job at all times to ensure establishment of a proper enclosure system and proper work practices throughout the project. At a minimum, the HMAC Competent Person shall perform or supervise the following duties, as applicable:
1. Ensure the integrity of the containment or enclosure.
2. Set up procedures to control entry to and exit from the enclosure.
3. Supervise employee exposure monitoring.
4. Ensure that employees set up, use and remove engineering controls, use work practices and personal protective equipment in compliance with OSHA regulations.
5. Ensure that employees use the worker decontamination facilities and observe decontamination procedures.
6. Ensure the requirements of the Technical Specification are fulfilled.
7. Ensure the HMAC is in compliance with all applicable asbestos regulations.

B. Abatement work will not commence until all work area preparation is completed in accordance with this technical specification section.

C. Spray asbestos materials with amended water using airless spray equipment or apply removal wetting agent to reduce the release of fibers during removal operation.

D. Spraying of amended water shall be adequate enough to allow the ACM to absorb the water. Actual removal of ACM shall not be allowed until all ACM has become adequately wet.

E. Do not create any visible emissions during asbestos removal. Ensure all ACM is adequately wet prior to removal.

F. Fill disposal containers as removal proceeds. Seal filled containers before moving to waste load out system. Wet clean each container thoroughly, double bag, drum or use other approved containerization methods and apply a caution label before moving to holding area.

G. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris.

H. Solidify all liquid waste prior to containerization for disposal.

I. Wastes containing sharp edges including but not limited to metal lath, floor tiles, boiler components, etc. shall be placed in reinforced nylon or burlap bags prior to placing into six mil disposal bags or double lined drums.

J. Sealed disposal containers and all equipment used in the work area shall be included in the cleanup and shall be removed from work areas, via the waste load out system at an appropriate

time in the cleaning sequence.

K. The HMAC shall remove from each containment all abated asbestos containing materials at the end of each work shift.

L. At any time during asbestos removal, should the competent person suspect contamination of areas outside the work area(s), they shall cause to stop all abatement work until steps to decontaminate these areas and eliminate causes of such contamination are completed. Unprotected individuals shall be prohibited from entering suspected contaminated areas until air sampling and visual inspections certify decontamination.

M. Immediately seal openings between work area and non-work that may be exposed during abatement activities.

N. All asbestos waste removed during a shift must be packaged in sealed containers by the end of each shift. At no time shall asbestos-containing materials be allowed to dry out while awaiting waste packaging.

O. The HMAC's Supervisor shall perform a final visual inspection of each work area to determine completeness of abatement and cleaning work prior to requesting a final visual inspection from the Owner's Consultant.

P. Upon acceptance of the work area by the Owner's Consultant, the HMAC shall apply an even coating of bridging encapsulant with airless spray equipment to all exposed surfaces contained within the work area. Apply encapsulant in accordance with manufacturer's recommendation.

Q. Re-occupancy air monitoring shall be performed within each interior abatement work area. Containment barriers shall not be removed until re-occupancy air clearance results are on site.

R. After successful re-occupancy air testing, the HMAC shall removal all containment barriers and dispose of as asbestos-contaminated waste. Negative air filtration equipment shall remain in operation during containment removal.

S. The HMAC shall perform a post tear down inspection and perform any necessary final cleaning of the work area.

T. Negative air equipment shall be properly shut down by concurrently sealing the intake with polyethylene sheeting and turning the power off to the equipment. At no time shall negative air intakes be unsealed while the equipment is not in operation.

3.7 WASTE PACKAGING AND REMOVAL PROCEDURE

A. The HMAC shall strictly adhere to the requirements of this section for ACM waste packaging and transporting waste from the work area enclosure to the disposal dumpster.

B. Waste disposal bags and drums shall be affixed with pre-printed OSHA warning labels, DOT labels and NESHAP labels.

C. Each container of ACM waste shall be made adequately wet prior to sealing the container. Bags shall be sealed immediately following additional wetting procedures. Bags of ACM waste shall not be permitted to remain unsealed while in the work area enclosure.

D. Each bag of ACM waste shall be double-bagged during waste load out procedures. The following waste load out procedure shall be strictly adhered to:
1. Wet wipe inner bag or drum to remove all ACM contamination. Ensure the inner bag is

sealed.

2. Transport bag or drum to the equipment room located in the worker decontamination enclosure.
3. One (1) worker, equipped with personal protective equipment, shall be inside the clean room of the worker decontamination enclosure.
4. The worker in the clean room of the decontamination enclosure shall open a six-mil disposal bag and hold it open inside the shower room where the inner bag containing the ACM waste shall be placed.
5. The outer bag shall be sealed with duct tape inside the shower room.
6. The double bagged or drummed waste shall be removed from the decontamination enclosure and waste generator labels shall be immediately affixed to the outer bag or drum.
7. Waste generator labels shall be printed self-adhering labels and shall contain the Owner's name, the site location address, and the HMAC's name.
8. The properly labeled waste shall be transported directly to the lined waste container.
9. The waste container shall be double lined with six (6)-mil polyethylene sheeting.
10. OSHA warning signs shall be secured to the waste container prior to any loading and unloading operations.
11. The waste container shall be kept locked at all times other than loading and unloading.

3.8 MINIMUM SPECIFIC ASBESTOS REMOVAL PROCEDURE – THERMAL SYSTEM INSULATION

A. Prior to the removal of any thermal system insulation, the HMAC shall ensure the work area is prepped in accordance with the requirements of Part 3.1 INTERIOR WORK AREA PREPARATION – GENERAL and Part 3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM.

B. Depending on containment configurations, the tunnels may meet the definition of a confined space under the US Department of Labor Occupational Safety and Health Administration (OSHA). Prior to any work within the tunnels, the HMAC shall submit a site-specific confined space entry program and implement all safety procedures. The HMAC shall be responsible for performing confined space entry procedures and monitoring in accordance with all OSHA regulations, if applicable.

C. Isolated areas of damaged fitting insulation have been identified within the pipe tunnels. All engineering controls shall be in place prior to the start of precleaning activities within the tunnels.

D. Minimum specific requirements relative to the removal of thermal system insulation, including mudded pipe fitting cement, are as follows.
1. Prior to starting any removal activities, the HMAC shall perform all required demolition to access all thermal system insulation within each work area. This shall include the removal of built-in cabinets, sheetrock and plaster walls, ceilings, masonry block, plumbing fixtures, etc. to access thermal system insulation for removal.
2. The selective demolition shall be performed following the completion of work area preparation in accordance with the requirements of Part 3.1 INTERIOR WORK AREA PREPARATION – GENERAL but prior to the start of any asbestos removal work. During demolition, the HMAC shall confirm the presence and condition of thermal system insulation within walls and above ceilings and shall not damage the ACM. If damaged ACM is encountered, the remaining wall/ceiling system shall be removed and disposed of as ACM. Demolition debris not contaminated by ACM may be removed from work area as construction debris prior to the start of asbestos removal work. Install additional isolation barriers and wall poly as necessary following cabinet demolition.
3. No asbestos abatement or the removal of fiberglass insulation from pipe lengths shall be

performed prior to the completion of all selective demolition. Should asbestos abatement commence prior to the completion of all selective demolition, the materials removed during selective demolition shall be disposed of as friable asbestos waste at the HMAC's expense.

4. Following wall/ceiling demolition, install additional isolation barriers and wall/floor sheeting, where required, to complete work area preparations. Pre-clean all surfaces by HEPA vacuuming and wet wiping surfaces prior to installation of barriers.
5. Utilizing an airless sprayer, the HMAC shall adequately wet all thermal system insulation. Thermal system insulation shall include pipe insulation, pipe fittings, contaminated fiberglass insulation on pipes, residual insulation in penetrations and debris on ground, if identified during demolition.
6. Large pieces of thermal system insulation and contaminated materials shall be reduced to manageable sections and made wet prior to packaging for disposal.
7. The HMAC shall cut banding, remove thermal system insulation in sections and package for disposal. Ensure material is adequately wet prior to sealing disposal bag.
8. Remove all thermal system insulation debris from masonry walls and floor penetrations.
9. Remove all visible residues from pipes, fittings and ducts using nylon scrub pads. Wire brushes are prohibited.
10. Remove fiberglass insulation a minimum of 4-inches from each side of mudded fitting and dispose of as asbestos waste.
11. Clean all lengths of pipes, ducts, fittings, hangars, saddles, supports, threads and adjacent masonry until they are free of visible residue.
12. Where pipes and ducts enter/exit walls, ceilings, floors, remove all insulation from penetrations and HEPA vacuum all penetrations.
13. Remove asbestos waste from work area enclosure in conformance with Part 3.7 WASTE PACKAGING AND REMOVAL PROCEDURES.

3.9 MINIMUM SPECIFIC REMOVAL PROCEDURE – FLOORING

A. Provide selective demolition to remove walls, cabinets, suspended ceilings systems, millwork, bookshelves, wood platforms, base cove with non-asbestos adhesives, miscellaneous fixtures or furniture and other restrictive molding to access all floor area.

B. Within select areas of the building, multiple layers of flooring have been identified. Removal of all layers of flooring and mastic down to structural concrete, whether individual layered flooring components are shown on abatement plan drawings, is included in the base work. Dispose of all layers of flooring as asbestos waste.

C. The HMAC shall examine all walls and demolish sections of walls and wall plates to access asbestos-containing flooring materials underneath.

D. Minimum specific requirements relative to the removal of asbestos-containing non-friable flooring and sanitary base and associated adhesives are as follows:
1. Prior to the removal of any non-friable flooring products, the HMAC shall ensure the work area is prepped in accordance with the requirements of Part 3.1 INTERIOR WORK AREA PREPARATION – GENERAL and Part 3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM.
2. The HMAC shall continuously mist the non-friable flooring products with amended water, removal encapsulant, or detergent solution, so that entire surface is wet. Do not allow wetting agent to puddle, or run off to other areas. If removal encapsulant is used, use in strict accordance with the manufacturer's instructions.
3. Carpet applied to asbestos-containing flooring shall be removed and disposed of as asbestos waste.
4. Continuously mist floor in area where flooring is being removed. Wet any debris generated as necessary to keep continuously wet.

5. Continuously pick up flooring materials and place in lined drums or in nylon mesh bags. Place nylon mesh bags into six (6)-mil thick disposal bags with pre-printed OSHA warning labels. Ensure that all waste is placed in six (6)-mil disposal bags during waste load out operations.
6. Following removal of carpet and floor tiles, there will be a layer of adhesive remaining on the concrete floors. The adhesives shall be removed using blastract, manual scraping methods or grinder with a dust collection device fitted with a HEPA filtration system. One (1) worker shall be dedicated to continuously misting work area during blastract and grinder use.
7. The waste captured by blastrac operations and grinders, if used, shall be removed from the blastrac hopper and vacuums, wetted and disposed of as friable asbestos waste.
8. Manually remove adhesives from all imperfections, seams, cracks, gaps, or other spaces in floor which is not removed during blastrac or grinding operations.
9. All liquid wastes shall be solidified once packaged for disposal. No liquid wastes shall be permitted to leave the Site in liquid form.
10. Remove asbestos waste from work area enclosure in conformance with Part 3.7 – WASTE PACKAGING AND REMOVAL PROCEDURES.

E. Final clean all floor and exposed wall surfaces so no visible residue remains.

3.10 MINIMUM SPECIFIC ASBESTOS REMOVAL PROCEDURE – INTERIOR CAULKS

A. The HMAC shall perform all selective demolition of wall covering, counters, cabinets, ceiling grids, and mechanical systems to access caulks.

B. Prior to the removal of any caulk, the HMAC shall ensure the work area is prepped in accordance with the requirements of Section 3.1 INTERIOR WORK AREA PREPARATION – GENERAL and Part 3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM.

C. Removal procedure shall include the following:
1. The HMAC shall continuously mist the caulks with amended water, removal encapsulant, or detergent solution, so that entire surface is wet. Do not allow wetting agent to puddle or run off to other areas. If removal encapsulant is used, use in strict accordance with the manufacturer’s instructions.
2. Remove caulk using manual techniques. Remove all backer rod material in contact with caulk and dispose of as asbestos contaminated waste. Do not damage substrates scheduled to remain.
3. Continuously mist area where materials are being removed. Wet any debris generated as necessary to keep continuously wet.
4. Continuously pick up debris and place into six (6)-mil thick disposal bags with pre-printed OSHA warning labels. Ensure that all waste is placed in six (6)-mil disposal bags during waste load out operations.
5. Following caulk removal, remove all residual caulk and residues from behind framing or within wall depressions, mortar seams, and divots in masonry substrate.
6. All liquid wastes shall be solidified once packaged for disposal. No liquid wastes shall be permitted to leave the Site in liquid form.

D. Remove waste from area in conformance with Part 3.7 – WASTE PACKAGING AND REMOVAL PROCEDURES.

3.11 MINIMUM SPECIFIC ASBESTOS REMOVAL PROCEDURE – INTACT REMOVAL OF DOORS, GASKETS, VALVE PACKING, DUCT FLANGE SEALANT

A. Minimum specific requirements relative to the removal of doors with window glazing compound, gaskets, and valve packing:

1. The HMAC may remove the components following CTDPH guideline dated April 7, 2003 for “intact removal of non-friable ACM”.
2. The HMAC shall remove doors by unscrewing hinges and dispose of entire door and associated window sash as asbestos waste. Doors shall not be reduced in size. Doors with window sash and associated asbestos-containing glazing compound shall be disposed of as asbestos and presumed PCB Bulk Product Waste >50 ppm.
3. The HMAC shall confirm all plumbing disconnects are performed and systems drained prior to the removal of any sink, gasket or valve.
4. Valves, gaskets and ducts flanges may be removed intact by cutting pipe on either side of bolted connections or either side of flange and disposing of entire valve, gasket and flange as asbestos waste. The HMAC shall provide a hot-works permit if required by General Contractor if pipes will be torch cut.
5. Remove fasteners and stops to allow for window sash to be pulled out of the opening without any disturbance to the window sash and associated glazing compound. Do not break glass.
6. Removed items shall be misted with amended water, removal encapsulant, or detergent solution and immediately packaged for disposal in leak tight containers.
7. Properly label all packages and transport immediately to waste disposal container.

B. If asbestos-containing materials will be disturbed during component removal, material shall be removed utilizing full containment work procedures defined in Part 3.1 INTERIOR WORK AREA PREPARATION – GENERAL and Part 3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM.

3.12 MINIMUM SPECIFIC REMOVAL PROCEDURE – EXTERIOR NON-FRIABLE ROOF FLASHING CEMENTS, SILVER PAINT

A. Prior to the removal of any exterior non-friable roofing materials, the HMAC shall ensure the work area is prepped in accordance with the requirements of Part 3.5 EXTERIOR WORK AREA PREPARATION – NON FRIABLE ASBESTOS CONTAINING MATERIALS and Part 3.3 REMOTE PERSONNEL DECONTAMINATION SYSTEM..

B. The HMAC shall confirm all locations and full extents of roofing material demolition with the Construction Manager prior to the start of removal activities. Coordinate removal of roofing materials with interior work to prevent water from penetrating the building while still occupied.

C. Remove exterior non-friable ACM utilizing methods that do not cause the material to become friable. Cutting, sanding, and abrading of roofing materials is strictly prohibited.

D. The asbestos-containing silver paint has been identified on penetrations, skylight bases, expansion joints, and roof wall junctions. All silver paint and associated substrates shall be included in the abatement scope of work.

E. Wet and remove all silver paint and roof flashing cement from brick and metal substrates or remove substrate in its entirety. Place directly in six (6)-mil disposal bags and transport to the appropriate waste container.

F. Remove all silver paint and roof flashing materials down to bare substrate where indicated for removal.

G. Continuously mist material during removal. Keep debris wet and provide immediate cleanup following removal operation. Do not create visible emissions during removal operations.

H. All roofing materials removed shall be lowered to the ground and placed in the appropriate waste container by the end of each shift for disposal as asbestos waste.

3.13 MINIMUM SPECIFIC ASBESTOS REMOVAL PROCEDURE – EXTERIOR CAULK

A. Prior to the removal of any exterior caulk or framing components, the HMAC shall ensure the work area is prepared in accordance with the requirements of Part 3.5 EXTERIOR WORK AREA PREPARATION and Part 3.3 REMOTE PERSONNEL DECONTAMINATION SYSTEM.

B. All layers of caulk shall be removed from window openings, vents, door casing, expansion joints, wall junctions, soffits, and under windowsills and disposed of as asbestos waste and presumed PCB Bulk Product Waste >50 ppm. Removal of replacement window sashes and door casings may be required to access all caulks from openings.

C. Wet exterior caulk and remove utilizing hand tools or caulk removal equipment.

D. Remove caulk from all head, sill, and side jambs of each opening and from all surfaces within each window opening including under metal windowsills where indicated.

E. Remove vent, window, and door frames if scheduled for demolition and as required to access all caulk concealed behind frames. Do not damage substrates scheduled to remain.

F. Remove all backer rod material in contact with caulk and dispose of as asbestos contaminated waste.

G. Vents, expansion joints, window and door frames that are removed from openings may be properly packaged and disposed of as contaminated asbestos waste or cleaned for disposal as non-hazardous construction debris. Components to be disposed of as non-hazardous construction debris shall be cleaned of all caulk residues then thoroughly cleaned by wet wiping and HEPA vacuuming techniques within regulated area. Once dry, all components shall be subjected to a visual inspection by the Owner's Consultant prior to being removed from the work area.

H. Final clean openings by wet scrubbing substrates to remove caulk residue. Utilize nylon brushes to remove caulk from masonry. Removal of caulk by mechanical methods is prohibited. Remove all caulk and caulk residue from remaining substrate(s) until no visible residue is present.

I. If any exterior asbestos containing material will become friable during removal activities, the work area shall be prepared in accordance with Part 3.1 INTERIOR WORK AREA PREPARATION – GENERAL and Part 3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM.

J. Each window and door opening and expansion joint shall be visually inspected by the HMAC Site Supervisor and Asbestos Project Monitor to determine the completeness of the work. The HMAC shall continue to clean the openings until no visible caulk residues are observed.

3.14 MINIMUM SPECIFIC REMOVAL PROCEDURE – EXTERIOR CEMENT BOARD PANELS

A. Removal procedures that render the ACM friable shall be performed within a negative pressure enclosure as identified in Part 3.1 INTERIOR WORK AREA PREPARATION – GENERAL and Part 3.2 CONTIGUOUS PERSONNEL DECONTAMINATION SYSTEM.

B. Prior to the removal of any exterior cement board panels, the HMAC shall ensure the work area is prepared in accordance with the requirements of Part 3.5 EXTERIOR WORK AREA PREPARATION and Part 3.3 REMOTE PERSONNEL DECONTAMINATION SYSTEM.

C. The HMAC shall sufficiently wet materials with removal encapsulant, amended water, or a

detergent solution prior to the start of removal.

D. The cement board panels shall not be saw cut or damaged; the cement board panels shall remain intact and non-friable during removal procedures.

E. Remove all cement board panels scheduled for removal and associated flashing cements and caulk from substrates. Do not damage substrates scheduled to remain.

F. Asbestos-containing cement board panels must be removed in manageable sections. Materials that have been removed shall not be dropped or thrown to the ground. Materials shall be carried or passed to the ground by hand, prior to being properly packaged as asbestos waste.

G. Upon being lowered, unwrapped material shall be transferred to a closed receptacle in such manner so as to preclude the dispersion of dust.

H. All ACM shall be placed directly into disposal bags or shall be transferred to the lined asbestos disposal dumpster. Do not allow waste to accumulate in work areas. All waste shall be removed from the roof at the end if each work shift.

I. The HMAC shall ensure that no visible emissions are generated during any portion of the abatement operation.

3.15 SPECIFIC REQUIREMENTS – SPOT REMOVAL GLOVEBAG

A. Where less than three (3) linear/square feet of ACM is to be removed by glovebag operation, post asbestos abatement warning signs and erect temporary barricades to create regulated areas. Regulated areas should be kept clear of any persons not fully trained and protected against exposure.

B. Provide GFCI devices and temporary power installed in compliance with the applicable electrical codes.

C. Pre-clean surfaces contaminated with ACM, using HEPA vacuum equipment or wet wiping as appropriate. Where friable asbestos containing materials are present, establish worker decontamination facility, isolation barriers and negative air filtration prior to conducting pre-cleaning activities.

D. Install one layer of six (6) mil polyethylene sheeting on the ground below the work inside the regulated area. All overlaps shall be sealed with tape or spray adhesive.

E. Install six (6) mil glovebag in accordance with OSHA 1926.1101.

F. Post all approaches to each work area with asbestos warning signs. Warning signs shall be of size and type that are easily readable and are visible from all approaches to the work areas.

G. A minimum of two (2) workers will be required to perform glovebag removal activities. Perform removal in accordance with OSHA 1926.1101.

H. All applicable OSHA requirements and glovebag manufacturer’s recommendations shall be met during glove bag operations. In the case where a glovebag is not feasible, the Contractor will need to build a full negative pressure containment of sufficient size and follow all regulations as it pertains to removal.
   1. Mix the surfactant with water in the garden sprayer, following the manufacturer's directions.

2. Have each employee put on a HEPA filtered respirator approved for asbestos and check the fit using the positive/negative fit check.
3. Have each employee put on a disposable full-body suit. Remember, the hood goes over the respirator straps.
4. Check closely the integrity of the glove bag to be used. Check all seams, gloves, sleeves, and glove openings. OSHA requires the bottom of the bag to be seamless.
5. Attach glovebag with required tools per manufacturer's instructions.
6. Using the smoke tube and aspirator bulb, test 10% of glovebags by placing the tube into the water porthole (two-inch opening to glove bag), and fill the bag with smoke and squeeze it. If leaks are found, they should be taped closed using duct tape, and the bag should be retested with smoke.
7. Insert the wand from the water sprayer through the water porthole.
8. Insert the hose end from a HEPA vacuum into the upper portion of the glove bag.
9. Wet with removal encapsulant and remove the pipe/cork insulation. Scrub remaining pipes with nylon pads to remove all asbestos residue.
10. If the section of pipe is covered with an aluminum jacket, remove it first using the wire cutters to cut any bands and the tin snips to remove the aluminum. It is important to fold the sharp edges in to prevent cutting the bag when placing it in the bottom.
11. When the work is complete, spray the pipe and upper portion of the bag and clean; push all residue into the bottom of the bag with the other waste material. Be very thorough. Use adequate water.
12. Put all tools, after washing them off in the bag, in one of the sleeves of glove bag and turn it inside out, drawing it outside of the bag. Twist the sleeve tightly several times to seal it and tape it several tight turns with duct tape. Cut through the middle of the duct tape and remove the sleeve. Put the sleeve in the next glove bag or put it in a bucket of water to decontaminate the tools after cutting the sleeve open.
13. Turn on the HEPA vacuum and collapse the bag completely. Remove the vacuum nozzle, seal the hole with duct tape, twist the bag tightly several times in the middle, and tape it to keep the material in the bottom during removal of the glove bag from the pipe.
14. Slip a disposal bag over the glove bag (still attached to the pipe).
15. Remove the tape securing the ends and slit open the top of the glove bag and carefully fold it down into the disposal bag. Double bag and gooseneck waste materials.
16. Each glovebag shall pass a visual inspection by the Owner's Consultant prior to bag removal.

3.16 FINAL CLEANING AND ENCAPSULATION

A. Upon completion of gross removal of all ACM specified for removal, the HMAC shall begin final cleaning of the effected work area. The HMAC shall HEPA vacuum and wet wipe all surfaces contained within the work area.

B. Final cleaning shall include but not be limited to the removal of all visible asbestos residue from all surfaces within the work area. A visible asbestos residue includes but is not limited to any asbestos debris, water staining with visible particulate matter or discoloration, dirt, dust, grime, any particulate or liquid matter, mastic, or adhesive.

C. All tools or equipment that are not necessary for final cleaning shall be decontaminated or bagged and removed from the work area enclosure.

D. The HMAC shall begin final cleaning procedures at the furthest and highest most points from the personnel decontamination unit and move towards the unit. The HMAC shall ensure that all exposed building components and or surfaces are thoroughly HEPA vacuumed and wet wiped.

E. The HMAC shall HEPA vacuum and wet wipe any component specified to remain inside the work area enclosure. All loose debris within the work area shall be HEPA vacuumed or

otherwise collected for disposal.

F. The HMAC shall thoroughly wet wipe all polyethylene sheeting inside the work area enclosure.

G. Remove and replace all pre-filters on negative air filtration equipment. Decontaminate all negative air filtration equipment including wheels.

H. Remove all waste from Equipment Room in Decontamination System. Decontaminate entire personnel decontamination facility. Pump standing water from shower basin through filtration system.

I. Once all surfaces and components within the work area have been thoroughly cleaned, AND THE WORK AREA IS DRY, the HMAC's Competent Person shall perform a visual inspection of all surfaces and components within the work area enclosure. The HMAC's Competent Person shall sign off on the work area stating that all abatement has been completed for that portion of work and that the work area has met the no visible residue criteria.

J. The HMAC's Competent Person shall then request a final visual inspection to be performed by the Owner's Consultant. The Owner's Consultant shall visually inspect all surfaces and components in the work area for residual debris and or dust. Work areas must be dry for final visual inspection. Inspections will not be performed in work areas where there is standing water or wet surfaces. Additional cleaning shall be performed at the HMAC's expense if the Owner's Consultant identifies visual debris and/or dust during the visual inspection. Additional cleaning shall be performed until the work area meets the no visible residue/dust criteria.

K. Upon acceptance of the work area by the Owner's Consultant, the HMAC shall apply an even layer of bridging encapsulant to all surfaces contained within the work area. The Owner's Consultant shall verify the completeness of work area encapsulation.

3.17 EXTERIOR WORK AREAS FINAL CLEANING

A. Upon completion of gross removal of all ACM specified for removal, the HMAC shall begin final cleaning of the effected work area. The HMAC shall wet debris that has accumulated on the drop cloths. And shall roll up the drop cloths ensuring that all debris is contained within the polyethylene sheeting.

B. The HMAC shall HEPA vacuum and wet wipe surrounding surfaces contained within the work area. Clean all substrates under drop clothes of all debris.

C. The HMAC shall begin final cleaning procedures at the furthest and highest most within the regulated work area. The HMAC shall ensure that all exposed building components and or surfaces contained within the work area are thoroughly HEPA vacuumed and wet wiped.

D. Exterior work areas shall not be deregulated until a final visual inspection has been performed by the Asbestos Supervisor and Asbestos Project Monitor.

3.18 DISPOSAL OF ASBESTOS AND ASBESTOS CONTAMINATED WASTE

A. All disposal of asbestos containing and or asbestos contaminated material must be in compliance with requirements of the State of Connecticut Department of Energy and Environmental Protection, State of Connecticut Department of Public Health and the USEPA NESHAP regulations.

B. All ACM shall be properly packaged, labeled, and disposed of as asbestos and presumed PCB Bulk Product Waste >50 ppm.

C. Disposal approvals shall be obtained from the CTDEEP before commencing asbestos removal if waste will be disposed of in Connecticut.

D. Waste container storage locations shall be pre-approved by the Owner and Owner's Consultant.

E. A copy of approved disposal authorization shall be provided to the Owner and Owner's Consultant and any required federal, state or local agencies.

F. Copies of all landfill receipts will be retained by the Owner's Consultant as part of the project file. The receipts will be signed by the landfill operator on receipt, and the quantity of asbestos debris leaving the job site and arriving at the landfill acknowledged.

G. All asbestos debris shall be transported in covered, sealed vans, boxes or dumpsters, which are physically isolated from the driver by an airtight barrier. All vehicles must be properly licensed to meet United States Department of Transportation (USDOT) requirements.

H. Friable ACM waste shall be placed in double lined enclosed waste containers equipped with a lockable hasp. Waste containers shall be posted with OSHA warning signs during loading and unloading.

I. All liquid waste generated during the work shall be solidified. At no time will liquid wastes be permitted to be stored on site. Liquid waste generated during this project shall be solidified prior to the end of each work shift.

J. Completed Waste Shipment Records (WSR) signed by the landfill must be returned to the Owner or Owner's Consultant no later than 45 days from the time the waste was transported off-site. Completed waste shipment records that are not received by the Owner within 35 days shall require the HMAC to begin tracking the waste. The HMAC must notify the Owner of intentions on tracking the waste.

K. The HMAC must take appropriate actions as outlined in 40 CFR Part 61 NESHAP regulations when completed WSR are not forwarded to the Owner or Owner's Consultant within 45 days from the time the waste was transported off-site.

3.19 RE-OCCUPANCY AIR CLEARANCE MONITORING

A. After the presealant visual inspection has passed and all surfaces in the abatement area have dried, re-occupancy air clearance monitoring will be performed. The primary and secondary barriers, worker decontamination enclosure, and negative air filtration units shall remain in place. At no time shall tools, ladders, vacuums or waste remain inside the work area enclosure during final air clearance sampling.

B. Once the work area has dried, the Owner's Consultant shall collect aggressive re-occupancy air clearance samples. Aggressive air monitoring will be used. Selection of the locations of the air samples shall be the responsibility of the Owner's Consultant. Air monitoring volumes shall be sufficient to provide a detection limit of 0.010 f/cc (fiber per cubic centimeter of air) using NIOSH-7400 method by Phase Contrast Microscopy (PCM) or 0.005 s/mm^2 (structures per square millimeter) using Tranmission Electron Microscopy (TEM) method.

C. Areas that do not comply with the re-occupancy air clearance criteria shall continue to be cleaned by and at the HMAC's expense until the specified re-occupancy air clearance criteria is achieved as evidenced by results of air testing as previously specified.

D. Laboratories conducting analysis of final air clearance samples shall be approved by the State of Connecticut Department of Health.

3.20 OWNER'S CONSULTANT RESPONSIBILITY

A. The Owner has retained the services of Eagle Environmental, Inc. to monitor this project. The Owner's Consultant shall collect and analyze air samples to ascertain the integrity of controls, which protect the building from asbestos contamination. Independently, the HMAC shall monitor air quality within the work area to ascertain the protection of employees and to comply with OSHA regulations.

B. During phases of work to be performed while school is in session, the Owner's Consultant shall perform additional background air sampling with same-day sample analysis as required by the Variance approval.

C. The Owner's Consultant shall collect and analyze air samples during a minimum of two (2) time periods:
   1. Abatement Period: The Asbestos Abatement Project Monitor shall collect samples on a daily basis during the work period. A sufficient number of background samples shall be taken outside of the work area, at the exhaust of the negative pressure filtration equipment, and outside of the building to evaluate the degree of cleanliness or contamination of the building during asbestos removal. Additional samples may be taken inside the work area and decontamination enclosure system, at the discretion of the Asbestos Abatement Project Monitor.

      a. The Asbestos Abatement Project Monitor shall provide a continual evaluation of the air quality of the building during asbestos abatement, using his/her best professional judgments in respect to the State Department of Public Health guideline of 0.010 f/cc or the background air quality established during the pre-abatement period, whichever is higher.
      b. If the Asbestos Abatement Project Monitor determines that the building air quality has become contaminated from the project, he/she shall immediately inform the HMAC to cease all removal operations and implement a work stoppage clean up procedure. The HMAC shall conduct a thorough cleanup of areas of the building designated by the Asbestos Abatement Project Monitor. No further asbestos abatement work shall take place until the Asbestos Abatement Project Monitor has determined that the building's air has been decontaminated.
      c. Abatement air samples shall be collected for a minimum period of ninety minutes at a minimum flow rate of 12 liters per minute, or as required to obtain a volume of 1,000 liters. Samples shall be analyzed by phase contrast microscopy (PCM) using the NIOSH 7400 protocol.
   2. Re-occupancy Clearance Period: The Asbestos Abatement Project Monitor shall conduct air sampling following the final cleanup phase of the project, once the "no visible residue" criterion as established by the site supervisor and the Asbestos Abatement Project Monitor has been met.

      a. Phase Contrast Microscopy (PCM) - For work areas containing less than 260 linear feet or 160 square feet of ACM, post abatement analysis of the samples to determine if reoccupancy clearance standards have been met shall be conducted by PCM. A minimum of five (5) samples shall be collected inside each containment utilizing aggressive methods to comply with State of Connecticut DPH Standard for Asbestos Abatement sections 19a-332a-12, and 19a-332a-13. The project shall be considered complete when the results of samples collected in the work area and analyzed by phase contrast microscopy using the most current National Institute for Occupational Safety and Health (NIOSH) method 7400, to show that the concentration of fibers for <u>each</u> of the five samples is less than or equal to a limit of quantification for PCM (0.010 fibers per cubic centimeter of air).
      b. Transmission Electron Microscopy (TEM) - For work areas containing greater than

260 linear feet or 160 square feet of ACM, post abatement analysis of the samples to determine if reoccupancy clearance standards have been met shall be conducted by TEM. A minimum of five (5) samples shall be collected inside containment utilizing aggressive methods to comply with State of Connecticut DPH Standard for Asbestos Abatement sections 19a-332a-12, and 19a-332a-13. An asbestos abatement project shall be considered complete when the average concentration of asbestos fibers of five air samples collected within the work area and analyzed by the TEM method in Appendix A of 40 CFR Part 763 subpart E is less than 70.0 structures per square millimeter (s/mm^2) of filter surface or is not statistically significantly different, as determined by the Z-test calculation found in Appendix A of 40 CFR Part 763, subpart E, from the average asbestos concentration of five air samples collected at the same time outside the work area and analyzed in the same manner, and the average asbestos concentration of the three field blanks described in Appendix A of 40 CFR Part 763, subpart E, is below the filter background level, as defined in Appendix A of 40 CFR Part 763 subpart E, of 70 s/mm^2.

3. Elevated fiber counts: If elevated fiber counts exceeding the establish pre-abatement level or 0.01 f/cc are recorded, the cause for such elevated readings shall be investigated. If necessary, the HMAC shall be responsible for cleaning the affected area and will provide additional support to lower the air born fiber levels. All cost incurred by the HMAC for the decontamination work shall be borne by the HMAC.

C. Inspections shall be conducted by the Owner's Consultant throughout the progress of the abatement project. Inspections shall be conducted in order to document the progress of the abatement work as well as the procedures and practices employed by the HMAC. The Asbestos Abatement Project Monitor shall perform the following inspections during the course of abatement activities.

1. Precommencement Inspection: Precommencement inspections shall be performed at the time requested by the HMAC. The Asbestos Abatement Project Monitor shall be informed 24 hours prior to the time the inspection is needed. During the course of the precommencement inspection, the Asbestos Abatement Project Monitor shall inspect the containment. This shall include, but not be limited to, inspection of barrier integrity, the worker decontamination, facility, negative air filtration equipment etc. If during the course of the precommencement inspection, deficiencies are found, the HMAC shall perform the necessary adjustments in order to obtain compliance.
2. Work Area Inspections: Work area inspections shall be conducted on a daily basis at the discretion of the Asbestos Abatement Project Monitor. During the course of the work area inspections, the Asbestos Abatement Project Monitor shall observe the HMAC removal procedures, verify barrier integrity, monitor negative air filtration devices, assess project progress, and inform the HMAC of specific remedial activities if deficiencies are noted.
3. Presealant Inspection: Upon the request of the HMAC, The Asbestos Abatement Project Monitor shall conduct a presealant inspection. The presealant inspection shall be conducted after completion of the initial final cleaning procedures, but prior to work area encapsulation. The presealant inspection shall verify that all ACM and residual debris have been removed from the work area. If, during the course of the presealant inspection, the Asbestos Abatement Project Monitor identifies residual dust or debris, the HMAC shall comply with the request of the Asbestos Abatement Project Monitor, in order to render the area is free of visible residue.
4. Final Visual Inspection: Following receipt of acceptable reoccupancy air monitoring results and concurrent with removal of the work area containment, the Asbestos Abatement Project Monitor shall conduct a final visual inspection. If residual dust or debris is identified during the course of the final inspection, the HMAC shall comply with the request of the Asbestos Abatement Project Monitor, in order to render the area free of

visible residue.

END OF SECTION 020800

SECTION 020820 – UNIVERSAL WASTE RECLAMATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”.

1.2 SUMMARY

A. Section includes the requirements for the proper procedural and submittal requirements for the removal and reclamation of universal wastes from the Site building.

B. Related Sections:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 011600:	Hazardous Materials Scheduling and Phasing
3.	Section 012200:	Hazardous Materials Unit Prices
4.	Section 017701:	Hazardous Materials Contract Closeout
5.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
6.	Section 020800:	Asbestos Abatement
7.	Section 020900:	Lead Paint Awareness
8.	Section 021100:	PCB Remediation

1.3 GENERAL PROVISIONS

A. The Edgewood Pre-K Academy located at 345 Mix Street in Bristol, CT (the “Site”) consists of an approximately 44,500 square foot single story steel framed masonry building. The original building was constructed in 1956-1957 with two additions added to the original structure in 1963-1965 and 1985-1987. The building will be renovated under a State of Connecticut Office of School Construction Grants & Review (OSCG&R) grant.

B. The reclamation of universal waste products as defined by the State of Connecticut Department of Energy and Environmental Protection (CTDEEP) will be performed in conjunction with the renovation project within the building.

1.4 PROJECT DESCRIPTION

A. The Hazardous Materials Abatement Contractor (HMAC) shall furnish all labor, materials, facilities, equipment, services, employee training and testing, permits and agreements, and waste transport, incineration, and reclamation necessary to perform the work required for universal waste removal and reclamation in accordance with these specifications; EPA, OSHA, NIOSH, State of Connecticut regulations, and other applicable federal, state and local government regulations. Whenever there is a conflict or overlap of the above references, the most stringent provisions are applicable.

B. Collection and reclamation of inert gases in lamp products: The HMAC is responsible for disassembling all interior and exterior light fixtures and removing the associated lamps from the fixtures for proper reclamation. All straight fluorescent light tubes, U-shaped fluorescent light tubes and compact fluorescent light bulbs that will be impacted by the renovation project within the building shall be properly removed, packaged, and transported for reclamation. Remove for reclamation approximately 5,644 linear feet of fluorescent light tubes, 42 U-shaped fluorescent tubes, and 2 compact fluorescent light bulbs.

C. Collection, reclamation and incineration of light ballasts and capacitors: The lighting ballasts within the building are primarily electronic ballasts and may be recycled. The HMAC shall include the collection, reclamation, and incineration of approximately 287 PCB or DEHP lighting ballasts and 1 capacitor identified within the building. The HMAC is responsible for removing ballasts and capacitors that are assumed to contain PCB or DEHP. All ballasts and capacitors that will be impacted by the renovation project shall be properly removed, packaged and transported for disposal.

D. Collection and recycling of lead-acid batteries from emergency light systems, fire alarms and exit signs: The HMAC shall remove and dispose/recycle approximately 94 batteries that will be impacted by the renovation project within the building.

E. Collection and reclamation of refrigerants: The HMAC is responsible for removing the Freon tanks from approximately 20 portable air conditioning units, refrigeration units, water fountains, and roof top HVAC units that will be impacted by the renovation project and shall be properly removed and reclaimed.

F. Collection and recycling of used electronics: The HMAC shall remove and dispose/recycle all remaining used electronics within the building. Used electronics shall include, but not be limited to: computers, televisions, monitors, printers, smart boards, projectors, electronic clocks, server panels, and other electronic devices.

G. Work under this project may be performed in phases to accommodate Owner's requirements and construction phases. Coordinate reclamation schedule and operations with the Construction Manager and Owner's Consultant, and other trades.

1.5 APPLICABLE CODES

A. State Regulations
1. Section 22a-449(c)-113 - Regulations of Connecticut State Agencies (RCSA) for disposal of ballast.
2. Section 22a-465 – Regulation of Connecticut State Agencies for remediation of PCB Bulk Remediation Waste.

B. Federal Regulations
1. 29 CFR 1910.120 – Hazardous Waste Operations and Emergency Response
2. 29 CFR 1910.134 – Respiratory Protection
3. 40 CFR 263 – Standards applicable to Transporters of Hazardous Waste
4. 40 CFR 264 – Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
5. 40 CFR 268 – Land Disposal Restrictions
6. 40 CFR Part 700 - Toxic Substance Control Act (TSCA)
7. 40 CFR Part 761 – PCB Manufacturing, Processing, Distribution in Commerce and Use Prohibition.

1.6 DEFINITIONS: WHERE APPLICABLE OR STATED, TERMS SHALL HAVE THE FOLLOWING DEFINITIONS:

A. Universal Waste shall mean batteries, Mercury-containing thermostats, certain pesticides, lamps (including but not limited to fluorescent, neon and mercury vapor lamps), and used electronics.

B. Large Quantity Generator means a handler can accumulate 5000 kilograms or more of universal waste at any time.

C. Small Quantity Generator means a handler can accumulate not more than 5000 kilograms or more of universal waste at any time.

D. Handler means the Generator of the universal waste product.

1.7 GENERAL REQUIREMENTS

A. The HMAC is subject to approval by the Owner's Consultant and all regulatory agencies with jurisdiction over this work, and may be rejected based on criteria established.

B. The Owner's Consultant requires that documentation be provided for all aspects of work detailing the bidder's qualifications and prior experience on the following criteria:

C. Workers handling universal waste must be informed by their employer of the proper handling and emergency procedures appropriate to the type(s) of universal waste handled at the facility.

PART 2 - PRODUCTS

2.1 TRANSPORTATION AND STORAGE CONTAINERS AND LABELING

A. All containers for universal waste must be closed, structurally sound, compatible with the contents of the universal waste, and must be capable of preventing leakage, spillage or damage that could cause leakage.

B. All universal waste products must be stored in a container and the container shall be properly labeled. Appropriate labeling is as follows.
1. Universal waste lamps (each lamp) or the container or package in which such lamps are contained must be labeled or marked clearly with any of the following: "Universal Waste - Lamp(s)" or "Waste Lamp(s), or "Used Lamp(s)".
2. Universal waste used electronics (each piece of equipment) or the container; package or pallet in which the used electronics are contained must be labeled or marked clearly with any of the following: "Universal Waste - used electronics" or "Waste Used Electronics, or "Used Electronics".

PART 3 - EXECUTION

3.1 BALLAST AND CAPACITOR REMOVAL

A. The HMAC shall retrieve light ballasts and capacitors and immediately package for reclamation.

B. If the ballasts are found to be leaking, contaminated light fixtures shall be disposed of as DEHP contaminated materials.

C. Workers shall don chemically resistant gloves as exterior surfaces may contain trace quantities of DEHP or PCB.

D. If a leaking ballast or capacitor is detected during removal, workers shall immediately don chemically resistant protective suits, (i.e. Tyvek), to reduce skin contact with DEHP or PCBs.

E. HMAC shall have on hand spill containment and absorbent materials in the event a spillage of DEHP-containing fluids occurs. Provide appropriate polyethylene sheeting to protect concrete floor and other surfaces from any spillage.

F. All protective equipment (gloves, suits) and materials contaminated during cleanup of ballasts

shall be disposed of as DEHP contaminated waste along with the ballast.

G. All protective equipment (gloves, suits) and materials contaminated during cleanup of capacitors shall be disposed of as PCBs contaminated waste along with the capacitor.

H. All ballasts and capacitors shall be placed in DOT-approved barrels for subsequent transport immediately upon removal. Barrels shall be properly labeled to identify contents and handling hazards.

I. Use new 17C 55-gallon open head steel drums that have been approved for transporting hazardous materials. Used or reconditioned drums may be used only if they have been properly cleaned, tested, and labeled.

J. Drums shall be prepared by placing one to three inches of absorbent material in the bottom of the drum.

K. Drums shall be packed so as to not exceed a total weight of 900 pounds. If proper handling equipment is not available, half fill the drums so that manual handling is possible.

3.2 INERT GAS RECLAMATION

A. All lighting shall be packaged and transported in accordance with the reclamation facilities requirements.

B. Provide Reclamation Certificates following work.

3.3 RECYCLING OF LEAD ACID BATTERIES

A. Disassemble fixtures and remove lead acid batteries.

B. Package, store and ship batteries in approved containers from recycling facility.

C. Provide Reclamation Certificates following work.

3.4 RECLAMIMNG FREON REFRIGERANT

A. Disassemble the fixture and remove the refrigerant tanks

B. Package, store and ship the tanks to facility to reclaim Freon.

C. Provide Reclamation Certificates following work.

END OF SECTION 020820

SECTION 020900 – LEAD PAINT AWARENESS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. The work specified herein covers the proper worker protection, work area preparation, removal and disposal, and post renovation cleaning of lead-based paint coated building components associated with the renovation work at the Edgewood Pre-K Academy located at 345 Mix Street in Bristol, Connecticut (Site). Work covered under this Section does not constitute lead-based paint abatement in accordance with the State of Connecticut Department of Public Health (CTDPH) Lead Poisoning Prevention and Control Regulation.

B. Related Sections:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 011600:	Hazardous Materials Scheduling and Phasing
3.	Section 012200:	Hazardous Materials Unit Prices
4.	Section 017701:	Hazardous Materials Contract Closeout
5.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
6.	Section 020800:	Asbestos Abatement
7.	Section 020820:	Universal Waste Reclamation
8.	Section 021100:	PCB Remediation

C. Lead-based paint screening of the building has identified lead-based paint on certain components and surfaces, which will be affected by this project. Lead-based paint is a paint or surface coating containing equal to or greater than 1.0 mg/cm2 of lead.

D. All contractors performing paint disturbing tasks where surface coatings with any measurable amount of lead shall also comply with the OSHA Lead in Construction Standard 29 CFR 1926.62.

E. This building will be occupied by pre-kindergarten aged children under the age of six (6) years old. All contractors performing work on confirmed lead-based painted surfaces shall be certified by the United States Environmental Protection Agency (USEPA) as a Renovation, Repair and Painting (RRP) contractor.

F. All lead-based paint disturbing task shall be performed in accordance with the USEPA RRP Rule 40 CFR 745 subpart E.

1.3 PROJECT DESCRIPTION

A. The Edgewood Pre-K Academy located at 345 Mix Street in Bristol, CT (the "Site") consists of an approximately 44,500 square foot single story steel framed masonry building. The original building was constructed in 1956-1957 with two additions added to the original structure in 1963-1965 and 1985-1987. The building will be Renovated As New into the Pre-K Edgewood Academy.

B. The Hazardous Materials Abatement Contractor (HMAC) performing work that disturbs painted

surfaces identified in this Section shall be in compliance with the USEPA Renovation, Repair and Paint Rule as prescribed by Title 40 CFR Part 745.80 Subpart E, including but not limited to USEPA RRP Firm Certification, USEPA RRP Renovator Certification, Disclosure and Notification, Placement of Warning Signs, Lead-Safe Work Practice, Cleaning and Post-Remediation Dust Clearance.

C. Certain building components were determined to contain levels of lead in paint that may cause worker exposure during renovation and demolition work. Any disturbance to paint coatings with any measurable amount of lead resulting from manual demolition or work necessary to facilitate the renovations shall be conducted in accordance with this Specification and all applicable OSHA regulations.

D. Components within the original building that were determined to contain high levels of lead-based paint (>1.0 mg/cm^2) include but are not limited to the following:
1. Ceramic wall tile
2. Metal columns
3. Metal panels in window walls
4. Concrete masonry units (CMU)
5. Metal door stops
6. Wood soffits/fascia boards

E. Components within the 1963-1965 addition that were determined to contain high levels of lead-based paint (>1.0 mg/cm^2) include but are not limited to the following:
1. Ceramic wall tiles and glazed block

F. The list of leaded components is not intended to provide a comprehensive inventory of leaded surfaces in the school but rather to give the HMAC information to support preparation of an OSHA lead compliance plan for the project. OSHA does not set a numerical value for lead concentrations in surface coatings to which the OSHA Lead in Construction Standard would not apply. Rather they rely on exposure monitoring during tasks that disturb paint with any measurable amount of lead to determine if that specific task will create exposure above OSHA's defined Action Level (AL) or Permissible Exposure Limit (PEL).

G. Any painted surfaces that were not tested but will be impacted shall be assumed to be coated with lead-based paint.

H. The personnel performing lead-based paint removal work shall be trained in accordance with the Department of Labor's Occupational Safety and Health Administration (OSHA) Title 29 CFR 1926.62. Lead in Construction Standard. This Specification is intended to provide general information pertaining to lead in surface coatings at the site and to assist the HMAC in complying with applicable worker protection and disposal laws. It is the sole responsibility of the HMAC to comply with all OSHA worker protection laws and disposal laws.

I. All painted, varnished, shellacked, stained, primed or otherwise coated surfaces should be assumed to contain lead above 0.0 mg/cm^2. Trades performing work that impact any painted, varnished, shellacked, stained, primed or otherwise coated surface must comply with the requirements of OSHA Title 29 CFR 1926.62 Lead in Construction Standard.

J. The HMAC should assume that building components that were not tested but that are like in color and construction date have similar lead paint levels as the components that were tested in that room. In accordance with OSHA Title29 CFR 1926.62, the HMAC must assume certain exposure levels for certain tasks in the absence of testing or personal exposure monitoring data. It is the sole responsibility of the HMAC to comply with OSHA Title 29 CFR 1926.62 for all tasks that disturb paint, varnish, shellac, stain, or other surface coatings.

K. All components and surfaces with a surface coating that will be impacted by the work of this project shall be covered by this Specification.

L. Metal components removed from the building must be recycled in an approved recycling facility that accepts metal coated with lead-based paint.

M. All painted wood components specified for removal and disposal in this Specification and on Plans HM-1 through HM-3 shall be disposed of as hazardous lead waste (D008).

N. Toxicity Characteristic Leachate Procedure (TCLP) testing of the 1956-1957 Original Building wood soffit/fascia board demolition waste stream was 13.8 mg/L characterizing the painted wood as hazardous lead waste. The Owner's Consultant shall perform TCLP testing of ceramic wall tile and CMU coated with lead for disposal characterization. For the purpose of this Specification, ceramic wall tiles and CMU shall be disposed of as non-hazardous solid waste. The HMAC shall comply with all applicable requirements regarding disposal and recycling of metal components coated with lead-based paint.

1.4 SCOPE OF WORK

A. The HMAC shall properly remove and dispose of all lead-based painted surfaces and components that will be impacted by the work of this project. Refer to drawings HM-1 through HM-3 for additional information on the scope and locations of the work.

LOCATION	COMPONENTS/SURFACE	TASK	SHEET NO.
Exterior Facades	Wood Soffit and Fascia	Remove and Dispose as Hazardous Lead Waste	HM-3
1-08 and Exterior at Entry	Steel Columns	Liquid Encapsulate	HM-2
1-04,1-06	CMU Walls (Side A – Corridor Side)	Remove and Dispose as Non-Hazardous Solid Waste	HM-2
1-63	CMU Walls	Remove and Dispose as Non-Hazardous Solid Waste	HM-2
1-53, 1-57, 1-76, 1-77	Ceramic Wall Tile and Glazed Block Walls	Remove and Dispose as Non-Hazardous Solid Waste	HM-2
1-04	Metal Door Frames	Remove and Recycle	HM-2
Exterior Facades	Metal Panels in Window Walls	Remove and Recycle	HM-2

B. The HMAC shall remove all wood soffit and facia boards from the exterior facades located under metal enclosures and dispose of as hazardous lead waste. Exterior work area preparation as identified within this Section shall be in place prior to the removal of any metal or wood components on the exterior of the building.

C. The HMAC shall liquid encapsulate all exposed portions of interior and exterior steel columns with a CT DPH approved encapsulant.

D. The HMAC shall remove all painted masonry walls and ceramic wall tiles identified within bathrooms and dispose of as non-hazardous solid waste.

E. The HMAC shall remove all metal panels associated with perimeter window walls and recycle at

a facility that will accept metal coated with lead-based paint.

1.5 EPA RENOVATE, REPAIR AND REPAINTING RULE

A. The HMAC must apply, pay the fee, and become an EPA Certified HMAC/RRP firm.

B. The HMAC must ensure that all renovators working on the project are EPA certified renovators or trained by a certified EPA renovator. Renovators can become certified by successfully attending an Eight (8) hour HMAC/RRP EPA accredited training course.

C. The HMAC must provide the administration with a copy of EPA's Renovate Right: Important Lead Hazard Information for Families, Child Care Providers and Schools pamphlet no earlier than sixty (60) days prior to the date renovation activities are to be performed.

D. The HMAC must assume that all painted surfaces contain toxic levels of lead-based paint unless inspected by a licensed lead inspector/risk assessor and proven otherwise. Surfaces described in Section 1.2 of this Specification are known surfaces painted with lead-based paint.

E. The HMAC is required to ensure renovators minimize lead paint/dust exposure by performing activities in a lead safe manner.

F. The HMAC shall ensure all sub-contractors performing renovation activities on known or assumed lead-based paint above the EPA de minimus level are EPA RRP certified firms and employees are EPA certified renovators or trained by a certified EPA RRP renovator. The HMAC shall document the firm's and renovator's certification numbers.

G. The HMAC shall provide the Owner's representative with documentation to include:
1. The RRP Contractor's EPA Contractor Firm Certification Number.
2. The RRP Contractor's EPA Renovator's Certification Number.
3. Documentation that all other non-certified employees have been trained in RRP practices by an EPA RRP Certified Renovator.

H. The HMAC is required to keep all documents for a minimum of three (3) years.

1.6 APPLICABLE CODES

A. The HMAC shall be solely responsible for conducting this project and supervising all work in a manner which will be in conformance with all federal, state, and local regulations and guidelines pertaining to lead paint abatement. Specifically, the HMAC shall comply with the requirements of the following:
1. Occupational Safety and Health Administration: OSHA

a. Title 29 CFR 1910 General Industry Standards
b. Title 29 CFR 1910.1025 Lead Standard for General Inventory
c. Title 29 CFR 1910.134 Respiratory Protection
d. Title 29 CFR 1910.1200 Hazard Communication
e. Title 29 CFR 1910.245 Specifications for Accident Prevention (Sign and Tags)
f. Title 29 CFR 1926.62 Lead in Construction Final Rule

2. State of Connecticut Department of Energy and Environmental Protection: DEEP

a. Guidance for the management and disposal of lead contaminated materials generated in the renovation and demolition industries.

b. All applicable hazardous solid waste disposal regulations.

3. USEPA

a. Title 40 CFR 745.100 - .119 Final Rule
b. Title 40 CFR 745 Subpart E
c. Title 40 CFR Part 261 United States Environmental Protection Agency

1.7 DEFINITIONS

A. “Action level” means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air (30 ug/m (3)) calculated as an 8-hour time-weighted average (TWA).

B. "Biological monitoring" means the analysis of a person's blood and/or urine, to determine the level of lead contamination in the body.

C. “Competent person” means one who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

D. “Containment” means the process of erecting polyethylene barriers to control dust and debris emissions which is intended to keep adjacent areas and environment free of contamination.

E. "HMAC" means the primary hazardous materials abatement contractor and all sub-contractors performing the lead removal work.

F. “Exposure assessment” means the process of collecting and analyzing personal air samples to determine a worker’s potential to be exposed to contaminants and to determine the level of respiratory and personal protective equipment that would be suitable to prevent exposure from occurring.

G. HEPA (High Efficiency Particulate Air) means a type of filtering system capable of filtering out particles of 0.3 microns or greater diameter from a body of air at 99.97% efficiency or greater.

H. "High phosphate detergent" is detergent that contains at least five (5%) percent tri-sodium phosphate (TSP).

I. “Lead” means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

J. PEL (Permissible exposure limit) means the maximum allowable airborne concentration a worker can be exposed to over an eight (8) hour work shift without having to don respiratory and personal protective equipment. The OSHA PEL is 50 ug/m^3.

K. RCRA (Resource Conservation Recovery Act): The EPA enforced act, which establishes regulatory levels for hazardous chemicals. There are eight (8) heavy metals of concern for disposal: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

L. Standard means the OSHA Lead in Construction Standard Title 29 CFR 1926.62.

M. Toxicity Characteristic Leachate Procedure: Is the EPA required sample preparation and analysis for determining the hazard characteristic of a waste generated at a lead removal site.

1.8 FEES, PERMITS AND LICENSES

A. The HMAC shall comply with the provisions of all permits or applications required by the work specified, as well as make all submittals required under those auspices.

B. The HMAC shall make notifications to the local Police Department and Fire Department regarding the project.

1.9 SEQUENCING AND SCHEDULING

A. The HMAC shall extend full cooperation to Owner in all matters involving the use of Owner's facilities. At no time shall the HMAC cause or allow to be caused conditions that may cause risk or hazards to the general public or conditions that might impair safe use of the facility.

B. This project shall be performed under several construction phases while the school is unoccupied. All lead renovation activities shall be strictly coordinated with each phase of work and the HMAC shall ensure that unsafe conditions do not arise out of the performance of their work.

C. The HMAC shall submit a time-line schedule, not date specific, to Owner and Owner’s Consultant for integration into the overall project schedule. Coordinate the work of this section with the needs of the Owner and Construction Manager. The phasing and scheduling of this project will be at the discretion of the Construction Manager and shall not proceed in any area without the express consent of the Construction Manager.

D. The HMAC shall coordinate their work with the progress of the work of other trades so that the work shall be completed as soon as conditions permit. Work under this project may be performed in phases to accommodate Owner’s requirements and construction phases. Coordinate schedule and operations with the Construction Manager and Owner’s Consultant and other trades.

E. Schedule initial assessment work in areas where the work will not cause an exposure potential to unprotected individuals.

1.10 SUBMITTALS

A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work.

B. The HMAC shall provide the following pre-project submittals prior to initiating work at the Site:
1. Copies of all notifications, permits, applications, licenses and like documents required by federal, state and local regulations obtained or submitted in proper fashion.
2. Copies of medical records for each employee to be used on the project.
3. Record of successful respirator fit testing performed by a qualified individual within the previous year, for each employee to be used on this project.
4. Proposed respiratory protection program for employees throughout all phases of the job, including make, model, and NIOSH approval numbers of respirators to be used.
5. Chain-of-Command of responsibility at work site including supervisors, foremen, and competent person, their names, resumes and certificates of training.
6. List of all supervisors and workers intended to be assigned to the project.
7. Disposal facility permits for hazardous lead waste.
8. Safety Data Sheets (SDS) on all materials and chemicals to be used on the project.

C. The HMAC shall provide the following post-project submittals at the completion of the work on site:

1. Copies of completed hazardous and non-hazardous waste manifests.
2. Copies of work area access logs.
3. Copies of supervisor log
4. Copies of all OSHA Compliance air sampling results.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to job site with factory label indicating 6 mil.

D. Polyethylene disposable bags shall be six (6) mil with pre-printed label. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.

E. Tape shall be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

F. Impermeable containers are to be used to received and retain any lead containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with EPA and DOT standards.)

G. HEPA filtered exhaust systems shall be used during any dust generating deleading operations.

H. Other materials such as lumber, nails and hardware necessary to construct and dismantle the decontamination enclosures and the barriers that isolate the work area shall be provided as appropriate for the work.

PART 3 - EXECUTION

3.1 INITIAL EXPOSURE ASSESSMENT

A. In order to comply with the requirements of OSHA Title 29 CFR 1926.62 Lead in Construction regulation, an initial exposure assessment must be performed for each activity that disturbs lead paint covered building materials. If the results of the initial exposure assessment are less than the “Action Level” for lead dust exposure of 30 micrograms per cubic meter of air, the employer is not obligated to comply with most requirements of the regulation. If the results of the initial exposure assessment are greater than the Action Level for lead dust exposure, all requirements of the Standard apply.
   1. The Scope of this Section applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from the general industry standard for lead Title 29 CFR 1910.1025(a) (2) is covered by this section. This includes but is not limited to the following.

      a. Demolition or salvage of structures where lead or materials containing lead is present;

b. Removal or encapsulation of materials containing lead;
c. New construction, alteration, repair, or renovation of structures, substrates, or portions thereof that contain lead, or materials containing lead;
d. Lead contamination cleanup; and
e. Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed.

B. The HMAC shall assume that the employee is being exposed above the Permissible Exposure Level (PEL) until an initial exposure assessment has been completed for each lead related task being performed.

C. For the purpose of the initial exposure assessment, employee exposure is that exposure which would occur if the employee were not using a respirator.

D. The employer shall collect personal air samples representative of a full shift including at least one sample for each job classification in each work area for each shift or for the shift with the highest exposure level.

E. Until the employer performs an initial exposure assessment as required by the Standard, the employer shall provide appropriate respiratory protection, appropriate personal protective equipment, clean change areas, hand washing facilities, biological monitoring, training under Title 29 CFR 1926.59, Hazard Communication; Title 29 CFR 1926.62 – Lead, Title 29 CFR 1926.21, Safety Training and Education.

F. Where the employer has objective data, demonstrating that a particular product or material containing lead or a specific process, operation or activity involving lead cannot result in employee exposure to lead at or above the Action Level during processing, use or handling, the employer may rely upon such data instead of implementing initial monitoring.

3.2 LEAD-BASED PAINT COMPLIANCE PLAN

A. The HMAC shall be required to submit a lead-based paint compliance plan to the Owner detailing how the HMAC will maintain compliance with this Specification.

B. The HMAC shall describe the work procedures within the compliance plan that will be utilized to prevent contamination to the work site and surrounding environment.

C. The HMAC shall describe the work procedures and engineering controls that will be implemented to ensure that workers are not exposed above OSHA's PEL for lead dust exposure.

D. The HMAC shall describe how compliance with the hazardous waste disposal regulations will be met.

3.3 WORKER HYGIENE PRACTICES

A. Workers shall don protective gear prior to entering work area including respirators, disposable coveralls, and footwear. No street clothes shall be permitted to be worn under protective clothing. The HMAC shall provide a clean area for workers to store street clothes and personal belongings.

B. Eye protection, head protection, and ear protection shall be provided to each worker.

C. While leaving respirators on, workers shall remove all gross contamination, debris, and dust from disposable coveralls and remove coveralls and footwear and place in hazardous waste disposal

bag prior to leaving work area.

D. The HMAC establish a wash station in close proximity to the work area where workers shall decontaminate their person. The wash station shall be supplied with warm water and soap and an ample supply of drying towels. Wash water shall be tested for proper disposal.

E. All equipment used by workers inside the work area shall be wet wiped or bagged for later decontamination before removal from the work area.

F. The HMAC is responsible for using safe procedures to avoid electrical hazards. All temporary electrical wiring will be protected by GFIs.

3.3 DUST GENERATING ACTIVITIES – COMPONENTS REMOVAL WORK AREA PREPARATION

A. Refer to Section 020800 Asbestos Abatement for additional work area preparation requirements where asbestos-containing materials will be abated concurrently with lead-related work.

B. The HMAC shall establish a clean area outside the lead demolition work areas for workers to change into protective clothing and store personal belongings.

C. When dust generating activities are undertaken, the work area shall be isolated from other trades by double flapped curtain doorways. The HMAC shall utilize double flapped curtain doorways for separation of the work area from the non-work area. All ingress to the work area shall be through the double flapped curtain doorways.

D. All HVAC vents and grills shall also be sealed with a single layer of six (6)-mil polyethylene sheeting sealed with duct tape.

E. Windows to the outside of the building shall remain shut during demolition activities. Window openings and penetrations to the outside of the building shall be sealed with a single layer of six (6)-mil polyethylene sheeting.

F. Floors shall be covered with two (2) layers of six (6)-mil polyethylene sheeting.

G. Install six (6)-mil polyethylene drop cloths on the exterior of the building to catch paint chips dislodged during component removal. Drop cloths shall extend a minimum of ten (10) feet from the base of the building.

H. Regulate exterior work areas with orange construction fencing to prevent unauthorized access.

I. The HMAC shall post lead hazard warning signs in accordance with OSHA Title 29 CFR 1926.62. It shall be the sole responsibility of the HMAC to ensure that only authorized personnel are permitted to enter the work area. A work area access log shall be maintained at the entrance to the work area. Authorized personnel shall sign in and out of the work area containment.

3.4 NON-DUST ACTIVITIES – WORK AREA PREPARATION

A. The HMAC shall establish a clean area outside the abatement areas for workers to change into protective clothing and store personal belongings.

B. When activities are undertaken that do not readily create dust, the work area shall be isolated from other trades by barrier caution tape. A buffer zone of a minimum of ten (10) feet is recommended between lead demolition activities and general trades work.

C. The HMAC shall post lead hazard warning signs in accordance with OSHA Title 29 CFR 1926.62. It shall be the sole responsibility of the HMAC to ensure that only authorized personnel are permitted to enter the work area. A work area access log shall be maintained at the entrance to the work area. Authorized personnel shall sign in and out of the work area containment.

D. Install a six (6)-mil polyethylene drop cloths under non-dust generating work activities.

3.5 PERSONAL PROTECTION

A. Eye protection, head protection, and ear protection shall be provided to each worker.

B. Workers shall utilize disposal protective coveralls while performing lead disturbing tasks. Street clothes shall not be permitted to be worn under their protective coveralls.

C. The HMAC's Competent Person shall assign respiratory protection to each work area based on personal exposure monitoring data. Workers shall utilize respiratory protection in accordance with the HMAC's Respiratory Protection Program.

D. Disposable gloves shall be utilized during all lead disturbing tasks, waste packaging and waste management activities.

E. Shoe coverings shall be utilized while working in the regulated work area.

F. The HMAC shall establish a wash station in close proximity to the work area where workers shall decontaminate their person. The wash station shall be supplied with warm water and soap and an ample supply of drying towels. Wash water shall be tested for proper disposal.

G. All equipment used by workers inside the work area shall be wet wiped or bagged for later decontamination before removal from work area.

H. The HMAC is responsible for using safe procedures to avoid electrical hazards. All temporary electrical wiring will be protected by GFIs.

3.6 PROHIBITED ACTIVITIES

A. The HMAC shall be prohibited from the following:
1. Sanding lead-based painted components without HEPA dust collection devices and appropriate engineering controls.
2. Open flame paint removal.
3. Torch cutting steel components without removing the paint and primer
4. Welding to steel components without removing the paint and primer.
5. Rivet busting without appropriate engineering controls.
6. Creating visible dust or fumes during lead-based paint disturbance.
7. Eating, drinking, smoking, or applying cosmetics within the work area.

3.7 COMPONENT REMOVAL

A. Prior to any component removal, the HMAC shall perform work area preparation in accordance with Part 3.3 DUST GENERATING ACTIVITIES – COMPONENT REMOVAL WORK AREA PREPARATION.

B. The HMAC shall perform the work in a careful manner to avoid damaging surfaces scheduled to

remain.

C. The HMAC shall remove components in whole parts to the best extent feasible. The HMAC shall refer to other Specification Sections affecting the work of this Section.

D. Use hand tools and pry bars to carefully remove wood chair rails and door stops attached to walls. Place removed components directly into hazardous waste storage containers.

E. Remove all trim components, chalkboards, whiteboards, cabinets, shelving, mechanical, electrical, plumbing equipment, etc. where necessary to access walls for removal.

F. Segregate lead-contaminated waste for proper disposal.

G. Wet components to control visible dust emissions during removal.

H. The HMAC shall confirm all plumbing disconnects have been made prior to the removal of any ceramic sink, toilet, or fountain.

I. HEPA vacuum and wet clean work area at the completion of component removal activities. Each work area will be subject to a final visual inspection by the Owner's Consultant.

3.8 LIQUID ENCAPSULATION

A. Components containing lead coatings, and which are scheduled to remain, shall be prepared for liquid encapsulation by the HMAC.

B. Degloss surface by cleaning with a lead cleaning detergent to remove dirt, grime, grease, etc.

C. Remove all loose paint by wet scraping surface utilizing manual scraping techniques. Do not gouge, mar, or otherwise damage surfaces to remain.

D. Feather raised edges by lightly sanding with appropriate grit sandpaper.

E. Apply a CT DPH approved liquid encapsulant to the surface. Apply in accordance with manufacturer recommendations.

F. Final clean entire work area in accordance with Part 3.9 CLEANING.

3.9 FINAL CLEANING

A. The HMAC shall ensure that all tools and materials are adequately cleaned at the completion of each shift.

B. The HMAC shall remove all gross waste from the work area prior to conducting final cleaning operations.

C. All small debris shall be picked up, placed in clear polyethylene disposal bags, and transported to the appropriate waste container.

D. The HMAC shall thoroughly HEPA vacuum all flat surfaces and components including polyethylene sheeting within and or adjacent to the work area.

E. The HMAC shall remove polyethylene sheeting from floors and non-moveable objects following

the initial cleaning. Polyethylene sheeting shall be folded inwards from the corners and folded upon itself.

F. The following final cleaning shall be conducted following removal of polyethylene sheeting:

1. HEPA vacuum floors and horizontal surfaces.
2. Wet clean floors and horizontal surfaces with a lead cleaning detergent.
3. Conduct second HEPA vacuuming on floors and horizontal surfaces.
4. Repeat steps 1 through 3.

G. The HMAC shall dispose of the polyethylene sheeting. The Owner's Representative shall perform a visual inspection of the polyethylene sheeting to determine adequacy of cleaning procedures prior to removal.

H. The HMAC shall HEPA vacuum all exterior surfaces including ground surfaces, concrete, window sills, concrete walkways, asphalt etc.

I. The HMAC shall continue to clean the work area until the clearance standards are met.

3.10 DISPOSAL OF WASTE MATERIALS

A. All materials, whether hazardous or non-hazardous, shall be disposed of in accordance with all laws and the provisions of any or all applicable federal, state, county, or local regulations and guidelines. It shall be the sole responsibility of the HMAC to assure compliance with all laws and regulations relating to this disposal.

B. The HMAC is responsible for performing and paying for all additional waste characterization testing, waste profiling and all other information required by their selected landfill for each shipment of waste.

C. The HMAC shall dispose of the following waste streams:
1. Painted concrete masonry walls: Non-hazardous solid waste.
2. Ceramic wall tiles and glazed block walls: Non-hazardous solid waste.
3. Metal components: Recycle in an approved facility that accepts lead-based paint.
4. Exterior wood soffit: Hazardous lead waste
5. Paint chips from structural steel and wood soffits: Hazardous lead waste

C. The HMAC shall perform the following:
1. All secondary waste materials generated during lead hazard reduction, i.e. disposable clothing, polyethylene sheeting, wastewater, etc., shall have confirmatory TCLP testing to determine waste characterization. This testing shall be performed and paid for by the HMAC. Results shall be furnished to the Owner's representative.
2. The HMAC shall comply with the requirements for small quantity generators (generates between one hundred (100) kg and one thousand (1000) kg of hazardous waste in a month or accumulates no more than one thousand (1000) kg of hazardous waste on-Site at any one time and stores waste for no greater than ninety (90) days).
3. The HMAC shall ensure that all hazardous waste generated is sent off-Site to permitted hazardous waste treatment, storage, or disposal facilities (TSDF).
4. The HMAC shall use DEEP permitted transporters for transport of hazardous waste.
5. The HMAC shall apply for a temporary EPA identification number. Hazardous waste manifests must be utilized which bear this I.D. number.
6. The HMAC shall comply with hazardous waste containerization requirements including but not limited to maintaining the containers in good condition, keeping containers closed and

locked while in storage, properly labeling and dating containers, and using containers which are DEEP approved for over the road use.

7. The HMAC shall develop a written inspection schedule to inspect any containers of hazardous waste at least weekly.
8. The HMAC shall designate an emergency coordinator who will be responsible for coordinating emergency response measures. Basic emergency information must be listed in writing, and posted next to the on-Site telephone. This information must include the name and number of the emergency coordinator.
9. The HMAC shall develop a written contingency plan for the Site, which describe actions personnel will take in response to fires or other emergencies that may result in a release of hazardous waste constituents. The plan must meet certain content requirements and copies of the plan must be submitted to certain local emergency response officials.
10. The HMAC must provide written notification to local fire departments and/or police regarding the location, nature, and duration of the lead-removal project, and regarding the type and quantity of hazardous waste that may be stored at the Site.
11. The HMAC must train their employees in hazardous waste management. They must maintain certain documentation regarding their training program, including the names, job titles, and job descriptions of the employees involved with hazardous waste management, a written description of the training that is given, and records documenting that employees have been trained. Annual updates of training must also be given.
12. The HMAC may not store hazardous waste on-Site for greater than ninety (90) days without a TSDF permit.
13. Before leaving the Site for the last time, the HMAC must remove any remaining hazardous waste and must decontaminate any equipment, storage areas, structures, soil, etc. contaminated as a result of the removal or storage of the hazardous waste generated at the Site.

3.11 REOCCUPANCY INSPECTION AND CLEARANCE SAMPLING

A. A visual inspection by Eagle's CT DPH licensed lead inspector shall be conducted at the completion of lead removal work to determine compliance with this Specification. The HMAC shall notify Eagle Environmental, Inc. a minimum of forty-eight (48) hours before the visual inspection.

B. One (1) dust wipe sample shall be collected from the floor, a representative window sill and window well in each room or area where lead hazard reduction work was conducted.

C. One (1) dust wipe sample shall be collected from outside each work area.

D. The following criteria must be met for final clearance dust wipe samples where lead hazard reduction work and interim control work is performed:
   1. Floors: < 5 µg/ft²
   2. Window Sills: < 10 µg/ft²
   3. Window Well: < 100 µg/ft²

E. The initial sampling costs shall be incurred by the Owner. Additional sample collection and analysis costs shall be incurred by the HMAC or for failed sample results.

END OF SECTION 020900

SECTION 021100 – PCB REMEDIATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. The work specified herein covers the proper worker protection, work area preparation, removal procedures, disposal requirements, and post abatement visual inspections for the removal of materials presumed to contain polychlorinated biphenyls (PCB) greater than fifty parts per million (>50 ppm) associated with the demolition work at the Edgewood Pre-K Academy located at 345 Mix Street in Bristol, Connecticut (Site).

B. Related Section:

1.	Section 011001:	Hazardous Materials General Conditions
2.	Section 011600:	Hazardous Materials Scheduling and Phasing
3.	Section 012200:	Hazardous Materials Unit Prices
4.	Section 017701:	Hazardous Materials Contract Closeout
5.	Section 020750:	Selective Demolition for Hazardous Materials Abatement
6.	Section 020800:	Asbestos Abatement
7.	Section 020820:	Universal Waste Reclamation
8.	Section 020900:	Lead Paint Awareness

1.3 GENERAL PROVISIONS

A. The Edgewood Pre-K Academy located at 345 Mix Street in Bristol, CT (the "Site") consists of an approximately 44,500 square foot single story steel framed masonry building. The original building was constructed in 1956-1957 with two additions added to the original structure in 1963-1965 and 1985-1987.

B. A presumptive approach for managing building materials for disposal as presumed Polychlorinated Biphenyl (PCB) Bulk Product Waste >50 ppm is included in the project. The work covered in this section includes the minimum procedures that shall be employed during the remediation of presumed PCB Bulk Product Waste.

C. The project may be separated into phases that are to be coordinated with the overall phasing of the renovation project. Refer to the Construction Manager's phasing plans for additional information. It is the Hazardous Materials Abatement Contractor's (HMAC) responsibility to become familiar with the phasing plan for the project and to include the required remobilization fees to support the phasing. The HMAC shall comply with the overall project schedule established by the Construction Manager. Modifications or changes to the project phasing shall not be grounds for a change order.

D. The HMAC shall remove all specified asbestos containing materials as identified in Section 020800 Asbestos Abatement and on drawings HM-1 through HM-3 and dispose of as regulated asbestos waste and presumed PCB containing waste >50 ppm.

E. The cleanup and disposal of the presumed PCB Bulk Product Waste shall be performed in

accordance with the Toxic Substances Control Act (TSCA) 40 CFR §761.62(b) *disposal in a solid waste* landfill.

F. The suspect materials at the Site have been analyzed for asbestos or lead-based paint only. No PCB testing shall be performed by the HMAC without written authorization from the Owner and the Owner's Consultant. If unauthorized testing is performed, the HMAC accepts all responsibility and costs associated with the removal of additional materials not in the Project Scope of Work if dictated by state and federal regulations.

1.4 PROJECT DESCRIPTION

A. Materials that will be encountered with this Project are defined as presumed PCB Bulk Product Waste.

B. Certain asbestos-containing materials that will be impacted by the renovation project shall be disposed of as combination regulated asbestos waste and presumed PCB Bulk Product Waste >50 ppm. Refer to Section 020800 Asbestos Abatement for scope of asbestos removal and additional requirements for work area preparation, removal, and disposal. The asbestos-containing materials that shall be removed and disposed of as presumed PCB Bulk Product Waste include but are not limited to the following materials:
1. Interior caulk at interior door and partition window frames, steel columns, and masonry wall junctions ~2,155 LF
2. Interior window glazing compound at metal sashes – black (partition windows, sidelights, transom windows) ~178 Each
3. Interior window glazing compound at metal sashes in metal doors ~11 Each
4. 9"x9" Floor tiles and associated mastic - ~24,650 SF
5. Duct flange sealant – black ~10 LF
6. Pipe flange gaskets ~30 Each
7. Pipe valve packing ~12 Each
8. Exterior expansion joint caulks ~130 LF
9. Caulk at wood soffit – beige ~35 LF
10. Top layer edge flashing cement ~1570 SF
11. Tar at roof drain pans ~95 SF
12. Cement board at raised wall (to Roof 2) ~210 SF
13. Silver paint at raised penetrations, skylight bases, expansion joints and roof wall junctions ~1,300 SF
14. Caulk at top of cement board ~65 LF

C. Non-asbestos materials that will be impacted by the renovation project shall be removed and disposed of as presumed PCB Bulk Product Waste >50 ppm. The materials that shall be removed and disposed of as presumed PCB Bulk Product Waste include but are not limited to the following materials:
1. Residual original caulk at door frames and window perimeters under newer window/door systems and newer caulks ~ 310 LF

D. Certain surfaces and components that will be impacted under this scope of work have been coated with lead-based paint. The HMAC shall refer to Section 020900 Lead Paint Awareness for additional requirements for work area preparation, removal, and disposal.

E. PCB remediation that includes asbestos abatement work shall not be performed while students or children under the age of 18 are present within the building.

F. Waste Dispositions:

1. The HMAC shall remove and dispose of the presumed PCB Bulk Product Waste under

§761.62(b)(i), *disposal in a solid waste landfill.* The waste shall be disposed of in a non-hazardous waste landfill permitted by the State in which it is disposed to accept the waste under§761.62(b)(i) and asbestos.

G. Remediation Plans:
1. Hazardous Materials Abatement Plans HM-1 through HM-3.

1.4 GENERAL REQUIREMENTS

A. The HMAC shall furnish all labor, materials, facilities, equipment, installation services, employee training, notifications, permits, licenses, certifications, agreements, and incidentals necessary to perform the specified work. Work shall be performed in accordance with the Contract Documents, the latest regulations from the Occupational Safety and Health Administration (OSHA), the EPA, the State of Connecticut, and all other applicable federal, state, and local agencies. Whenever the requirements of the above references conflict or overlap, the more stringent provision shall apply.

B. All project personnel engaged in the remediation work covered under this section shall be trained with forty (40) hours of hazardous waste operations training.

C. The HMAC shall provide a Project Health and Safety Officer with forty (40) hour OSHA Hazwoper training and an additional eight (8) hours of supervisor training in hazardous waste site operations as described in 29 CFR 1910. The supervisor shall be on site at all times during remediation work.

D. The HMAC shall be required to attend a preconstruction meeting with his/her site supervisor and subcontractor they employ on site for the purpose of reviewing the contract requirements.

1.5 GENERAL SCOPE OF WORK

A. The HMAC shall be responsible for the removal and disposal of presumed PCB Bulk Product Waste where identified materials will be impacted under the overall scope of the demolition project.

B. The HMAC shall be responsible for decontaminating all tools and equipment used in the remediation work. Tools shall be decontaminated using the methods prescribed by 40 CFR 761 Subpart S. The HMAC shall capture all decontamination fluids and handle them in accordance with this Specification.

C. The HMAC shall be responsible for disposal of all disposable clean-up materials (i.e. used PPE, used containment barriers, etc.) in accordance with this Specification.

1.6 SUBMITTALS

The following documents shall be submitted to the Owner’s Consultant prior to the start of the Project:

A. Training Documentation:
1. Documentation of 40- Hour HAZWOPER and 8-Hour Supervisor Training for the designated on-Site Health and Safety Officer and 8-hour PCB Awareness Training for all engaged personnel.
2. Respirator fit-test records of each employee who may be on the project site,
3. Medical records for use of respiratory protection for each employee who may be on the project site.

B. Work Plan: A written work plan that details the means and methods to be used for the removal and disposal of scheduled materials, waste container staging, ground protection, and the HMAC's plan to protect workers and prevent waste migration from work areas. The work plan shall include the following elements:
   1. Floor plans indicating the proposed work areas and containment barriers, and signage for all presumed PCB Bulk Product Waste removal work as outlined in this Specification;
   2. Specific procedures to be used to remove and dispose of scheduled items and decontamination of equipment, and tools;
   3. Detailed plans and procedures for removal of scheduled materials from in situ positions, transport of the materials to waste containers, reduction of waste materials for disposal requirements;
   4. Detailed plans and procedures to ensure that further contamination of the Site does not occur as the result of remediation procedures;
   5. Detailed procedures for personnel and equipment decontamination including procedures for the capture and containment of decontamination fluids.
   6. A detailed proposed schedule for all remediation and disposal activities.

C. Presumed PCB Bulk Product Waste Disposal Plan: A written plan that details the HMAC's plan for transportation and disposal of all wastes generated during the project. The Disposal Plan shall identify:
   1. Waste packaging, labeling, placarding, and manifesting procedures,
   2. A list of anticipated waste profiling procedures and samples and identification of the firms that will collect and analyze the samples.
   3. The name, address, 24-hour contact number, and EPA TSCA Approval (if applicable) for the proposed treatment or disposal facilities to which wastes generated during the project will be transported.
   4. The name, address, contact person(s) and state-specific permit numbers for proposed waste transporters.
   5. A site plan indicating where waste disposal containers will be staged and how they will be labeled and secured.
   6. The route(s) by which the waste will be transported to the designated disposal facility, and states or territories through which the waste will pass if the waste is to be disposed of outside of the State of Connecticut.
   7. Safety Data Sheets: Safety Data Sheets (OSHA Form 174 or equivalent) and manufacturer's information shall be provided for all chemicals and materials to be used during the project including decontamination fluids.

D. Health and Safety Plan
   1. The HMAC is responsible and liable for the health and safety of all on-site personnel and the off-site community affected by the Project. All on-site workers or other persons entering the abatement work areas, decontamination areas or waste handling and staging areas shall be knowledgeable of and comply with the requirements of the site-specific Health and Safety Plan (HASP) at all times. The HMAC's HASP shall comply with all applicable federal, state, and local regulations protecting human health and the environment from the hazards posed by the work to be performed under this project.
   2. The HASP shall carry the endorsement and signature of a health and safety professional.
   3. The HMAC shall not initiate on-site work in the contaminated areas until the HASP has been finalized and reviewed and accepted by the Owner’s Consultant.
   4. Consistent disregard for the provisions of the HASP shall be deemed as sufficient cause for immediate stoppage of work and termination of the Contract or any Subcontracts without compromise or prejudice to the rights of the Owner or the Architect.
   5. Any discrepancies between the HMAC's HASP and these specifications or federal and state regulations shall be resolved in favor of the more stringent requirements that provide the highest degree of protection to the project personnel and the surrounding community and environment, as determined by the Owner’s Consultant.
   6. In addition to exposure concerns of hazardous materials, other health and safety

considerations will apply to the work. The HMAC shall be responsible for recognizing such hazards and shall be responsible for the health and safety of HMAC employees at all times. It is the HMAC's responsibility to comply with all applicable health and safety regulations.

7. The HMAC shall prepare and submit a site-specific HASP to the Owner's Consultant a minimum of ten (10) business days prior to commencement of abatement work. The HASP shall govern all work conducted at the Site during the remediation of caulk; waste handling, sampling, and management; and waste transportation.
8. At a minimum, the HASP shall address the requirements set forth in 29 CFR 1910.120, as further outlined below:

    a. Health and Safety Organization
    b. Site Description and Hazard Assessment
    c. Training (HAZWOPER)
    d. Medical Surveillance
    e. Work Areas
    f. Personal Protective Equipment
    g. Personal Hygiene and Decontamination
    h. Standard Operating Procedures and Engineering Controls
    i. Emergency Equipment and First Aid Provisions
    j. Equipment Decontamination
    k. Air Monitoring
    l. Telephone List
    m. Emergency Response and Evacuation Procedures and Routes
    n. Site Control
    o. Permit-Required Confined Space Procedures (If Applicable)
    p. Spill Containment Plan
    q. Heat and Cold Stress
    r. Record Keeping
    s. Community Protection Plan

9. The HASP shall be reviewed by all persons prior to entry into the abatement, decontamination, or waste staging areas, whether a representative of the HMAC, Owner, Architect/Engineer, Environmental Consultant, sub-HMACs, waste transporter or Federal, State, or local regulatory agency. Such review shall be acknowledged and documented by the HMAC's Health and Safety Officer by obtaining the name, signature and affiliation of all persons reviewing the HASP.
10. The HASP shall be maintained so as to be readily accessible and reviewable by all site personnel throughout the duration of the-abatement project and until all waste materials are removed from the site and disposed of at the appropriate disposal facility.
11. The HMAC's on-site Health and Safety Officer shall be responsible for ensuring that project personnel and site visitors are informed of and comply with the provisions of the HASP at all times during the project.

E. The following documents shall be submitted to the Owner's Consultant within seven (7) calendar days following removal of waste from the Site:
    1. Waste Profile Sheets
    2. Pre-Disposal Analysis Test Results (if testing is conducted)
    3. Manifests signed by the disposal facility
    4. Tipping Receipts provided by the disposal facility
    5. Certification of Final Disposal signed by the responsible disposal facility official.

1.7 APPLICABLE STANDARDS AND REGULATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a conflict or overlap

among regulations and/or these specifications exist, the most stringent requirements shall apply. The Owner's Consultant will determine which requirements are most stringent.

1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

   a. ANSI.Z89.1 Personnel Protective Equipment-Protective Headwear for Industrial Workers-Requirements (Latest Revision)

2. CODE OF FEDERAL REGULATIONS (CFR) U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION(OSHA)

   a. 29 CFR Subpart D Walking -Working Surface
   b. 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
   c. 29 CFR 1910.134 Respiratory Protection Standard
   d. 29 CFR 1910.1200 Hazard Communication
   e. 29 CFR 1926.20 General Health and Safety Provisions
   f. 29 CFR 1926.57 Ventilation
   g. 29 CFR 1926.59 Hazard Communication Program
   h. 29 CFR 1926.62 Lead Exposure in Construction
   i. 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
   j. 29 CFR 1926.95 Criteria for Personal Protective Equipment
   k. 29 CFR 1926, Subpart H Materials Handling, Storage, Use and Disposal
   l. 29 CFR 1926, Subpart L Scaffolding
   m. 29 CFR 1926, Subpart M Fall Protection
   n. 29 CFR 1926, Subpart X Ladders
   o. 29 CFR 1926, Subpart Z Toxic and Hazardous Substances

3. U.S. ENVIRONMENTAL PROTECTION AGANECY (US EPA)

   a. 40 CFR 50.6 National Primary and Secondary Ambient Air Quality Standards for Particulate Matter
   b. 40 CFR 260 Hazardous Waste Management System: General
   c. 40 CFR 261 Identification and Listing of Hazardous Waste
   d. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
   e. 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste
   f. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   g. 40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   h. 40 CFR 268 Land Disposal Restrictions
   i. 40 CFR 700 Toxic Substances Control Act (TSCA)
   j. 40 CFR 761 PCBs Manufacturing, Processing, Distribution in Commerce and Use Prohibitions

4. U.S. DEPARTMENT OF TRANSPORTATION (DOT)

   a. 49 CFR 105 Hazardous Materials Program. Definitions and General Procedures
   b. 49 CFR 171 General Information, Regulations and Definitions
   c. 49 CFR 172 Hazardous Material Tables. Special Provisions, Hazardous Materials Communications Emergency Response Information and Training Requirements
   d. 49 CFR 173 Shippers-General Requirements for Shipments and Packaging
   e. 49 CFR 177 Carriage by Public Highway
   f. 49 CFR 178 Specifications for Packaging

5. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

   a. Publication Number 87-10B Respiratory Decision Logic NIOSH/OSHA Booklet 3142 Lead in Construction
   b. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH Publication 85-115)

6. U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

   a. PUB 3126 Working with Lead in the Construction Industry
   b. 29 CFR 1910, Subpart I, Appendix B-Non-Mandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection

7. REGULATIONS OF CONNECTICUT STATE AGENCIES (RCSA)

   a. Hazardous Waste 22a-449(c)-100 through 119
   b. Hazardous Waste Transporter Permits 22a-449(c)-11
   c. Permit Fees for Hazardous Waste Materials Management 22a-454-1

8. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY GUIDANCE

   a. Polychlorinated Biphenyl (PCB) Site Revitalization Guidance Under the Toxic Substances Control Act

1.8 POSTING AND RECORD MAINTENANCE REQUIREMENTS

A. The following items shall be conspicuously displayed proximate to but outside of abatement work areas. The HMAC shall assure that the posted regulations are not altered, defaced, or covered by other materials.

B. Exit Routes
   1. Emergency exit procedures and routes

C. Emergency Phone Numbers
   1. A list Indicating the telephone numbers and locations of the local hospital(s); the local emergency squad; the local fire department; the local police department; the Poison Control Center; Chemical Transportation Emergency Center (CHEMTREC); the Connecticut State Department of Public Health's office; the HMAC (on-site and after hours numbers); and the environmental consultant (on-site and after hours numbers).

D. Warning Signs
   1. Warning signs shall be posted in English and in the language of any workers on-site who do not speak English, and be of sufficient size to be clearly legible and display the following:

WARNING:
HAZARDOUS WASTE WORK AREA
PRESUMED PCBs-POISON
NO SMOKING, EATING OR DRINKING
AUTHORIZED PERSONNEL ONLY
PROTECTIVE CLOTHING IS REQUIRED IN THIS AREA

E. Items Available On-Site
   1. The HMAC shall maintain the following items on-site and available for review by all employees and authorized visitors:

a. The HMAC's Work Plan
b. The HMAC's Disposal Plan
c. The Project Health and Safely Plan (HASP)
d. Certificates of Training for all workers and the project Supervisor
e. Copies of applicable codes, standards, and publications
f. Safety Data Sheets (SDS) for all chemicals used during the project.
g. Copies of the HMAC's written hazard communication, respiratory protection, and confined space entry programs.

1.9 WORK ZONES

A. The HMAC shall establish and clearly identify work zones in the field. Access by equipment, site personnel, and the public to the work areas shall be limited as follows:
1. Abatement Zone - The Abatement Zone(s) shall consist of all areas where remediation, waste handling and staging activities are ongoing and the immediately surrounding locale or other areas where contamination could occur. Outdoor Abatement Zones shall be visibly delineated with orange construction fencing at a minimum and restricted from access by all persons except those directly necessary to the completion of the respective remediation tasks. Indoor Abatement Zones shall be delineated with one (1) layer of 6-mil polyethylene sheeting isolation barriers, two (2) layers of 6-mil polyethylene sheeting on floors and two (2) layers of 4-mil polyethylene sheeting on walls, maintained under negative pressure with HEPA filtered exhaust systems, posted with warning signs and restricted from access by all persons except those directly necessary to the completion of the respective remediation tasks. The Abatement Zones shall be relocated and delineated as necessary as work progresses from one portion of the project Site to another, to limit access to each remediation area and to minimize risk of exposure to site workers and the general public. Prior to relocation, areas shall be visually inspected by the Owner's Consultant to confirm completion of work. Access shall be controlled at the periphery of the Abatement Zones to regulate the flow of personnel and equipment into and out of each zone and to help verify that proper procedures for entering and exiting are followed. All persons within the Abatement Zones shall have all the required training and wear the appropriate level of protection established in the HASP. Refer to Section 020800 Asbestos Abatement for additional requirements that will affect the Abatement Zone construction and re-occupancy air testing during asbestos-containing material removal performed concurrently with PCB remediation.
2. Decontamination Zone - The Decontamination Zone is the transition zone between the remediation area and the "clean" Support Zone, and is intended to reduce the potential for contaminant dispersal from the Abatement Zone to clean areas of the site. The Decontamination Zone shall consist of a buffer area surrounding each Abatement Zone through which the transfer of equipment, materials, personnel, and containerized waste products will occur and in which decontamination of equipment, personnel, and clothing will occur. The Decontamination Zones shall be clearly delineated with caution tape at a minimum and labeled with signage as provided in Part 1.8 of this Section. All emergency response and first aid equipment shall be readily maintained in these Zones. All protective equipment and clothing shall be removed or decontaminated in the Decontamination Zone prior to exiting the Support Zone.
3. Support Zone - The Support Zone will consist of the area outside the Decontamination Zones and the remainder of the project site. Administrative and other support functions and any activities that by nature need not be conducted in the Abatement or Decontamination Zone related to the project shall occur in the Support Zone. Access to the Abatement and Decontamination Zones shall be controlled by the Health and Safety Officer and limited to those persons necessary to complete the remediation work and who have reviewed and signed the HASP.

1.10 PERSONAL PROTECTIVE EQUIPMENT

A. The HMAC shall be responsible for determining and provide the appropriate level of personal protective equipment in accordance with applicable regulations and standards necessary to protect the HMAC's employees and the general public from all hazards present.

B. The HMAC shall provide all employees with the appropriate safety equipment and protective clothing to ensure an appropriate level of protection for each task, taking into consideration the chemical, physical, ergonomic, and biological hazards posed by the Site and work activities.

C. The HMAC shall establish criteria for the selection and use of personal protective equipment (PPE) in the HASP.

D. The PPE to be utilized for the project shall be selected based upon the potential hazards associated with the project site and the work to be performed. Appropriate protective clothing shall be worn at all times within the Abatement Zone.

E. The HMAC shall provide the appropriate level of respiratory protection to all field personnel engaged in activities where respiratory hazards exist or there is a potential for such hazard to exit.

F. The HMAC shall provide, as necessary, protective coveralls, disposable gloves and other protective clothing for all personnel that will be actively involved in abatement activities or waste handling activities or otherwise present in the Abatement Zones. Coveralls shall be of Tyvek or equivalent material. Should the potential for exposure to liquids exist, splash-resistant disposable suits shall be provided and utilized.

G. Protective coveralls, and other protective clothing shall be donned and removed within the Decontamination Zone and shall be disposed of at the end of each day. Ripped coveralls shall be immediately replaced after appropriate decontamination has been completed to the satisfaction of the Health and Safety Officer. Protective clothing shall not be worn outside of the Decontamination Zone.

H. Hard Hats, protective eyewear, rubber boots and/or other non-skid footwear shall be provided by the HMAC as required for workers and authorized visitors, Safety shoes and hard hats shall be in conformance with ANSI Z89.1 (1969) and ANSI 241.1 (1967), respectively.

I. All contaminated protective clothing, respirator cartridges and disposable protective items shall be placed into proper containers to be provided by the HMAC for transport and proper disposal in accordance with 40 CFR 262.

1.11 EMERGENCY EQUIPMENT AND FIRST AID REQUIREMENTS

A. The HMAC shall provide and maintain at the site, at a minimum, the following Emergency and First Aid Equipment:
   1. Fire Extinguishers-a minimum of one (1) fire extinguisher shall be supplied and maintained at the site by the HMAC throughout the duration of the project. Each extinguisher shall be a minimum of a 20-pound Class ABC dry fire extinguisher with Underwriters Laboratory approval per 29 CFR 1910.157.
   2. First Aid Kit-a minimum of one (1) first aid kit meeting the requirements of 29 CFR 1910.151 shall be supplied and maintained at the site by the HMAC throughout the duration of the project.
   3. Communications (either cellular or radio) shall be provided by the HMAC for use by site personnel at all times during the project.

B. The Health and Safety Officer shall be notified immediately in the event of personal injury, potential exposure to contaminants, or other emergency. The Health and Safety Officer shall then immediately notify the Owner's Consultant of same.

C. If a member of the work crew demonstrates symptoms of heat or cold stress, injury, chemical exposure or other similar issue, another team member present within the delineated Abatement Zone (i.e., suitably equipped with appropriate PPE provisions) should remove the affected person from the delineated work site and signal/communicate to the Health and Safety Officer of the incident. Precautions should be taken to avoid exposure of other individuals to contaminated media.

D. An evaluation of the person's condition shall be made by the Health and Safety Officer, to determine the appropriate course of action to administer first aid or other emergency response provision. The Health and Safety Officer shall assess the seriousness of the injury, give first aid treatment if appropriate, and arrange for appropriate emergency response from outside emergency services, it warranted.

E. If soiled clothing cannot be removed, the injured person will be wrapped in a blanket while transported from the Site.

F. The Health and Safety Officer shall monitor the affected person to determine whether there are symptoms resulting from the exposure or injury. If there is a visible manifestation of exposure such as skin irritation, the affected party shall be referred to a medical facility for treatment and evaluation as to whether the manifestation may be indicative of a delayed or acute exposure, a secondary response to exposure such as skin infection or occupational dermatitis. All incidents of injuries and/or obvious chemical exposure shall be evaluated by the Health and Safety Officer and the Owner's Consultant to determine whether modifications to work practices and/or protective provisions are warranted.

1.12 STANDARD SAFETY AND HEALTH PROCEDURES AND ENGINEERING CONTROLS

A. The following provisions shall be employed to promote overall safety, personnel hygiene, and personnel decontamination:
   1. Each HMAC or subcontractor shall ensure that all safety equipment and protective clothing to be utilized by its personnel is maintained in a clean and readily accessible manner at the Site.
   2. All prescription eyeglasses in use on this project shall be safety glasses conforming to ANSI Standard Z87.1. No contact lenses shall be allowed on the site.
   3. Prior to exiling the delineated Decontamination Zone(s), all personnel shall remove protective clothing, and place disposable items in appropriate disposal containers to be dedicated to that purpose. Following removal of PPE, personnel shall thoroughly wash and rinse their face, hands, arms, and other exposed areas with soap and tap water wash and subsequent tap water rinse. A fresh supply of tap water shall be provided at the site on each working day by the HMAC for this purpose.
   4. All PPE used on site shall be decontaminated or disposed of at the end of each work day. Discarded PPE shall be placed in the appropriate waste stream.
   5. Respirators, if necessary, shall be dedicated to each employee, and not interchanged between workers without cleaning and sanitizing.
   6. Eating, drinking, chewing gum or tobacco, smoking, and any other practice that increases the likelihood of hand to mouth contact shall be prohibited within the delineated abatement and decontamination work zones. Prior to performing these activities, each employee shall thoroughly cleanse their face, hands, arms, and other exposed areas,
   7. All personnel shall thoroughly cleanse their face, hands, arms, and other exposed areas prior to using toilet facilities.

8. No alcohol, tobacco, illegal drugs, weapons, or firearms will be allowed on the Site at any time.
9. All personnel that are on non-prescription (i.e., over-the-counter) or prescription medication of any kind shall notify the Health and Safety Officer prior to conducting work at the site. The Health and Safety Officer will make a determination as to whether such individuals will be allowed to work on the Site, and, if so, in what capacity. The Health and Safety Officer may require signed documentation from the Individual's personal physician stating what limitations may be posed by the medication or condition that may apply to that individual's work activities.
10. Contact with potentially contaminated surfaces should be avoided, if possible. Field personnel should minimize walking through standing water/puddles, mud or other wet or discolored surfaces; kneeling on ground; and placing equipment, materials, or food on ground or other potentially contaminated surface.
11. The use of the "Buddy System"` shall be employed at all times while conducting work at the site. Each employee shall frequently monitor other workers for signs of heat stress or chemical exposure or fatigue; periodically examine others PPE for signs of wear or damage; routinely communicate with others; and notify the Site Safety Officer in the case of an emergency.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All materials shall be delivered in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.

C. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to the job site with factory label indicating six-mil.

D. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

E. All proper labeling and placards for waste receptacles shall be maintained on site in a sufficient quantity to support the project.

F. Pre-printed caution tape shall be maintained on site in a sufficient quantity to support the project.

G. 6-mil polyethylene glove bags.

H. Non-chlorinated organic solvent.

I. Appropriate labels and signage.

J. Appropriate waste containers.

2.2 TOOLS AND EQUIPMENT

A. Provide suitable tools for caulk and glazing removal.

B. The HMAC shall have air monitoring equipment of type and quantity to monitor operations and conduct personnel exposure surveillance per OSHA requirements.

C. The HMAC shall have available sufficient inventory on site for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape, and air filters.

D. The HMAC shall provide temporary electrical power sources such as generators (when required).

E. Vacuum units and negative pressure exhaust fans of suitable size and capacities for project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter or larger.

PART 3 - EXECUTION

3.1 SEQUENCE OF SITE WORK

A. The HMAC shall coordinate all remediation and disposal activities with the Building Owner (or Owner's Representative) and the General Contractor.

B. If there will be changes to the initial schedule or sequencing, the HMAC shall inform the Owner's Consultant in writing and confirm all dates on submitted schedules.

C. The HMAC shall coordinate all work with the General Contractor and confirm weatherization or security requirements of the building following remediation activities.

D. Public access to the building shall not be restricted by the work.

3.2 WORK AREA PREPARATION – GENERAL

A. The HMAC shall isolate Abatement Zones, Decontamination Zones and Support Zones as described in this Section and install appropriate signage to work areas from non-work areas within the building and on the building exterior to prevent air exchange and unauthorized entry into the work areas.

B. Prior to commencement of presumed PCB-containing materials abatement activities at each work area, a containment system shall be constructed by the HMAC to capture and contain all materials removed during the abatement.

C. For exterior abatement areas, install polyethylene drop cloths a minimum of 6-mils thick to protect ground and/or roof from PCB contamination. Drop cloths shall extend a minimum of ten (10) feet in all directions from the location of PCB removal activities, or further as required by Site conditions, to prevent presumed PCB-containing materials from contaminating the ground. Weigh down corners of drop cloths and seal to building below windows to collect all debris. Do not apply spray adhesive to building components scheduled to remain. Install isolation barriers at all openings to the interior of the building to prevent PCB-containing materials from entering the building.

D. For the removal of presumed PCB-containing materials on the interior to the building, establish Interior Abatement Zones, Decontamination Zones and Support Zones as described in this Section. Create pressure differential between work areas and occupied areas by the use of acceptable negative air pressure equipment. The HMAC shall ensure the required negative air pressure is obtained throughout the containment and the total volume of air within the work area is changed every fifteen (15) minutes. Do not apply spray adhesive to building components scheduled to remain.

E. Post all approaches to each work area with PCB warning signs. Warning signs shall be of size and type that are easily readable and are visible from all approaches to the work areas.

F. Establish water to control dust during abatement and demolition activities.

G. All debris generated during operations including but not limited to visible caulks, door casing, block walls, asbestos-containing materials being removed concurrently with PCB remediation, dust and debris shall be HEPA vacuumed continuously throughout the work shift and at the end of the work shift to avoid accumulation. Any tears or rips that occur in polyethylene barriers or ground covers or tarps shall be repaired or removed and replaced with new protections.

H. Ladders, scaffolding, or lifts utilized in the remediation shall be properly decontaminated as addressed in the HMAC's work plan prior to removal from the work area.

I. Abrasive actions performed on contaminated materials and masonry shall not be allowed unless performed within an Interior Abatement Zone negative pressure enclosure.

J. All working surfaces of tools and equipment that contacts contaminated material shall be decontaminated using the methods prescribed by 40 CFR 761 Subpart S prior to removal from the regulated area.

3.3 PREPARATION OF ABATEMENT ZONES

A. For interior work areas, the HMAC shall establish Abatement Zones, Decontamination Zones, and Support Zones in accordance with Part 1.9 of this Specification and the following:
   1. The HMAC shall establish a negative pressure enclosure of sufficient size to contain the work area.
   2. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes. All temporary installations are to be done by a licensed electrician.
   3. Shut down electrical power, including receptacles and light fixtures. Lock and tag out circuits associated with the electrical components in the work area(s).
   4. Shut down and isolate heating, cooling, and ventilation air systems to prevent contamination or particle dispersal to other areas of the structure. Lock and tag out circuits associated with heating and cooling units. During the work, vents within the work area shall be sealed with duct tape and polyethylene sheeting.
   5. Seal off all openings, including but not limited to operable windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with two (2) layers polyethylene sheeting minimum of 6-mils thick sealed with duct tape. In addition to the polyethylene sheeting, place hard barriers at doorways and corridors which will not be used for passage between Abatement Zones and non-abatement areas. Seal all floor drains.
   6. Cover all floors that are not in the scope of remediation within the Abatement Zone with a minimum of two (2) layers of 6-mil polyethylene sheeting or as defined in the approved Alternative Work Practice if removal being performed concurrently with asbestos abatement. Cover all walls that are not in the scope of remediation within the Abatement Zone with a minimum of two (2) layers of 4-mil polyethylene sheeting or as defined in the approved Alternative Work Practice if removal performed concurrently with asbestos abatement.
   7. Maintain emergency and fire exits from the work area, or establish alternative exits satisfactory to fire officials.
   8. Create pressure differential between Abatement Zones and non-abatement areas by the use of acceptable negative air pressure equipment. The HMAC shall ensure required negative air pressure is obtained throughout the containment and the total volume of air within the work area is changed every fifteen (15) minutes.
   9. Post all approaches to each work area with appropriate warning signs. Warning signs shall

be of size and type that are easily readable and are visible from all approaches to the work areas.

10. Install drop cloths to facilitate the cleanup.

B. For exterior work areas, the HMAC shall establish Abatement Zones, Decontamination Zones, and Support Zones in accordance with Part 1.9 of this Specification and the following:

1. Intact or Outdoor Remediation: A Negative Pressure Enclosure (NPE) will not be required in the Abatement Zones for the remediation if the window sashes are removed intact or (isolated) outdoors and for exterior caulk, roofing and flashing material removal utilizing techniques that do not create visible dust.
2. All approaches to work areas shall be restricted with barriers (i.e. orange construction fencing) and properly posted with signage.
3. The HMAC shall establish the Abatement Zone, Decontamination Zone and Support Zone in accordance with Part 1.9 of this Specification. The boundaries of the three (3) zones shall be designated and segregated by orange construction fencing and posted with proper signage at a minimum.
4. To ensure that exterior work will not contaminate interior areas of the building, exterior abatement zones shall be isolated from the interior areas of the building with isolation barriers consisting of two (2) layers of six (6) mil polyethylene sheeting or equivalent to prevent accidental entry and air exchange into the building. Within each exterior Abatement Zone, openings into the building interior such as door and window openings shall be securely sealed. The sheeting shall be sturdy enough to withstand inclement weather conditions. Utilize wood framing or hard barriers as necessary to support the sheeting.
5. Where necessary, weather screens shall be constructed to prevent the dispersion of particulate or debris due to wind or rain. The construction and placement of the weather screens shall be addressed in the HMAC's Work Plan.
6. Where necessary, ground cover and erosion controls shall be established to prevent the migration of remediation dust or debris due to water from rain or remediation activities. The construction and placement of the ground cover and erosion controls shall be addressed in the HMAC's Work Plan.
7. Catch basins within remediation work zones shall be sealed to prevent solids or liquids from entering.

3.4 DECONTAMINATION ENCLOSURE SYSTEMS

A. The HMAC shall establish a personnel and equipment decontamination system contiguous to each work area. Access between the contaminated and uncontaminated areas shall be through this decontamination enclosure only. The decontamination system shall be constructed of two (2) layers of 6-mil polyethylene sheeting.

B. Equipment to be utilized in connection with the presumed PCB-containing materials removal, waste collection or that will or may come in direct contact with the site contaminants shall be decontaminated prior to leaving the Site to prevent migration of the contaminated residues from the project Site.

C. All non-disposable equipment and tools employed in the course of the project will be decontaminated at the conclusion of each work day through the following sequence:

1. Initial tap water rinse, to remove gross debris
2. Tap water and organic solvent (i.e. Hexane) wash
3. Tap water rinse
4. Second tap water and Alconox, or equivalent, wash
5. Second tap water rinse

D. The wash water and decontamination liquids shall be captured and containerized in 55-gallon barrels for off-site disposal.

3.5 REMOVAL OF INTERIOR PRESUMED PCB CONTAINING MATERIALS >50 PPM

A. Prior to the removal of any PCB-containing materials, the HMAC shall ensure that the work areas are established in accordance with this Specification and Section 020800 Asbestos Abatement and the approved Alternative Work Practice (where applicable).

B. Control dust at all times during removal activities. Utilize shrouded equipment with HEPA filtered dust collection devices when feasible. No removal work shall be permitted without required engineering controls in place.

C. PCB containing building materials shall be fully removed from the substrate to which they are attached. Manual and mechanical methods of removal shall be utilized as appropriate for each material.

D. Remove all asbestos-containing materials and immediately containerized for proper disposal as combination regulated asbestos waste and presumed PCB Bulk Product Waste >50 ppm as applicable.

E. Remove all non-asbestos caulks from walls where identified for removal and immediately containerized for proper disposal as presumed PCB Bulk Product Waste >50 ppm as applicable.

F. Remove caulk using manual techniques. Remove all backer rod material in contact with caulk and dispose of as asbestos contaminated waste and presumed PCB Bulk Product Waste >50 ppm. Do not damage substrates scheduled to remain.

G. Floor tile adhesives shall be removed using blastract, manual scraping methods or grinder with a dust collection device fitted with a HEPA filtration system. One (1) worker shall be dedicated to continuously misting work area during blastract and grinder use. The waste captured by blastrac operations and grinders, if used, shall be removed from the blastrac hopper and vacuums, wetted and disposed of as friable asbestos waste and presumed PCB Bulk Product Waste >50 ppm.

H. Manually remove adhesives from all imperfections, seams, cracks, gaps, or other spaces in floor which is not removed during blastrac or grinding operations.

I. Valves, gaskets and ducts flanges shall be removed either intact or utilizing full containment procedures then disposed of as asbestos waste and presumed PCB Bulk Product Waste >50 ppm.

J. Following removal of the materials, final clean the work area in accordance with Part 3.7 FINAL CLEANING.

3.6 REMOVAL OF EXTERIOR PRESUMED PCB CONTAINING MATERIALS >50 PPM

A. Remove all exterior asbestos-containing and presumed PCB-containing door caulk within areas of renovation. Dispose of caulk as asbestos waste and presumed PCB Bulk Product Waste >50 ppm.

B. Remove all exterior asbestos-containing and presumed PCB-containing roofing materials including edge flashing cements, tar at roof drain pans, and silver paint from roofs. Dispose of roofing materials as asbestos waste and presumed PCB Bulk Product Waste >50 ppm.

C. Remove all exterior non-asbestos and presumed PCB-containing door caulk and window caulk within areas of renovation. Dispose of caulks as presumed PCB Bulk Product Waste >50 ppm.

D. Minimum specific requirements relative to the removal of exterior caulk and glazing compounds are as follows:
   1. Establish Exterior Abatement Zones, Decontamination Zones and Support Zones as defined in this Section. Refer to Section 020800 for additional requirements for asbestos-

containing caulk and roofing material removal.

2. Prior to any caulk removal, HEPA vacuum all loose caulk from caulk lines and window panes.
3. Continuously mist the caulk and roofing materials with amended water, removal encapsulant, or detergent solution, so that entire surface is wet. Do not allow wetting agent to puddle, or run off to other areas. If removal encapsulant is used, use in strict accordance with the manufacturer's instructions.
4. Do not damage any masonry scheduled to remain.
5. Remove all caulk from wood soffits prior to the removal of wood for disposal as hazardous lead waste. Wood shall be decontaminated per Part 3.4 DECONTAMINATION ENCLOSURE SYSTEMS prior to proper packaging and disposal as hazardous lead waste. Decontaminated components shall be visually inspected by the Owner's Consultant prior to removal from work area.
6. Remove all caulk and caulk residues from wood and masonry surfaces in its entirety.
7. Remove all roofing materials and residues from substrates.
8. Containerize caulk, roofing, and all associated debris in a minimum of two (2) layers of 6-mil polyethylene sheeting and label according to proper waste profile.

E. Abrasive actions performed on caulks, roofing and masonry shall not be allowed unless performed within an Interior Abatement Zone negative pressure enclosure.

F. Following removal of all caulk and roofing materials, final clean the work area in accordance with Part 3.7 FINAL CLEANING.

3.7 FINAL CLEANING

A. Following the gross removal of all presumed PCB-containing materials and debris, each work area shall be final cleaned. Final cleaning shall include all tools, equipment, polyethylene sheeting and exposed substrates within the work area.

B. Final cleaning of floor, roof, horizontal edges, brick mortar joints, and ground surfaces shall also be required ten (10) feet in all directions from exterior of the contiguous decontamination facility.

C. Following exterior removal activities, all ground surfaces shall be thoroughly cleaned at the completion of the demolition work. Asphalt and concrete walk ways and the sections of concrete flooring shall be HEPA vacuumed.

D. Final cleaning shall include vacuuming of all surfaces within each work area with a High Efficiency Particulate Air (HEPA) filtered vacuum.

E. Following HEPA vacuuming of the work area, the HMAC shall utilize a non-chlorinated solvent cleaner such as but not limited to Hexane, Naphtha or Terpene to wipe all surfaces including but not limited to tools, equipment, polyethylene sheeting, masonry walls, concrete floors and sidewalks, metal components and exposed substrates.

F. Perform a second cleaning utilizing Alconox cleaner or equivalent.

G. Within Interior Abatement Zones, remove all pre and secondary HEPA filters and properly dispose of as PCB remediation waste.

H. Upon completion of the final work area cleaning, a visual inspection of each work area shall be conducted by the HMAC's Site Supervisor for visible evidence of residual caulk, dust, and debris. Following the Site Supervisor's visual inspection, the Owner's Consultant shall perform a thorough final visual inspection of the work area. The visual inspection shall provide verification that remediation work has been completed in accordance with this specification. Work areas

shall remain regulated until successful completion of final visual inspection by Owner's Consultant.

I. Any surface exhibiting evidence of contamination, dust or debris, or incomplete abatement of specified components or materials shall be re-cleaned by the HMAC at no cost to the Owner. Visible residue, dust, debris, incomplete cleaning, or removal will be cause for the HMAC to continue performing removal work or cleaning within the work area.

J. Post remediation verification sampling to be performed at the Owner's discretion.

3.8 ON-SITE WASTE MANAGEMENT

A. It is incumbent upon the HMAC to select the appropriate landfill that will accept the waste stream(s) of this Project. Disposal under this option does not require EPA approval. In the case that PCB Bulk Product Waste >50 ppm is disposed of at a non-hazardous waste landfill permitted by a state, the generator of the waste will send written notice to the landfill at least 15 days prior to shipment of the waste stating that the waste contains PCBs at concentrations greater than 50 ppm as described in 40 CFR 761.62(b)(4)(ii) and leaches PCBs at <10 ug/L as described in 40 CFR 761.62(b)(1)(ii).

B. The HMAC shall comply with their selected landfill's requirement(s) for other disposal characterization at their own cost.

C. Waste Storage Zones will be established to provide a secure location for temporary waste storage. Transport Zones will be established to provide a route from Work Zones to Storage Zones. Waste Storage Zones will be isolated with six (6) foot chain link fence. Waste Storage Zones will be strategically located to minimize waste transport from the Work Zones.

D. Wastes generated during decontamination activities will also be properly disposed of at an off-Site facility. Non-liquid cleaning materials and PPE waste at any concentration, including rags, mops, gloves, Tyvek suits, respirator cartridges and similar materials resulting from cleanup activities, must be disposed of in an appropriate waste facility (i.e., state municipal solid waste, state non-municipal non-hazardous waste, federal hazardous waste landfill, or a federally approved PCB disposal facility. Waste water produced during the work from wet cleaning or misting may also be regulated for disposal. Water confirmed to contain PCBs will be managed in accordance with 40 CFR part 761.61(a)(4)(iv). Water not confirmed to contain PCBs (because not tested) will be disposed of at a TSCA approved facility (40 CFR part 761.61(b)(1)) following filtration for asbestos.

E. The HMAC will maintain an on-site waste tracking log that records information related to each shipment of waste from the Site. The waste tracking log will include at a minimum the following components:
1. Shipment number
2. Waste shipment record number
3. Shipment date
4. Estimated volume in cubic yards
5. Landfill name

F. Copies of waste shipment records shall be maintained on site in the HMAC's log book. Executed waste shipment records (signed by the landfill accepting the waste) shall be returned to the Consultant for inclusion into the final report. Copies of these forms will be maintained in accordance with 40 CFR 761 subpart K (PCB Waste Disposal Records and Reports).

G. Solid Hazardous Wastes
1. All solid waste material containment system components, used personnel protective equipment, and other solid wastes generated during the work, shall be placed directly in

appropriate waste receptacles immediately upon removal from its in-situ position. Suitable waste receptacles may consist of roll-off containers or CTDOT-approved 55-gallon barrels.

2. If roll-off containers are to be utilized for containerization of the abatement wastes, the following shall apply:

    a. All roll off containers or other similar vessels utilized shall be leak-tight and lined with 6-mil polyethylene sheeting or equivalent impermeable lining, and equipped with a secured and impermeable cover.
    b. The impermeable cover shall remain securely in place at all times when material is not being actively placed in the vessels. The HMAC shall be responsible for ensuring that the cover remains securely intact until the container is removed from the site.

3. If 55-Gallon barrels are to be utilized for waste containerization, the barrels shall consist of suitable DOT-approved 55-gallon barrels that are leak-tight and free of corrosion, perforations, punctures, or other damage. All barrels shall be securely covered and sealed at the conclusion of each work day. The waste containers shall remain staged at the Site with a secure impermeable cover in place until the materials are transported from the Site to be delivered to the designated disposal facility.
4. A waste roll off and barrel staging area shall be designated prior to initiation of the abatement work, and approved by the Owner's Consultant.

H. Decontamination Fluids and Liquid Waste Materials

1. All working surfaces of tools and equipment that contacts contaminated materials shall be decontaminated using the methods prescribed by §40 CFR 761 Subpart S.
2. Under no circumstances shall decontamination fluids or liquid wastes be discharged to the ground surface or subsurface at the site.
3. Liquid materials, including equipment or personal decontamination fluids or similar liquids generated during excavation work at the site shall be placed directly into appropriately sized and sealed vessels immediately upon generation.
4. Acceptable vessels for the storage of groundwater or liquid wastes may include DOT approved 55-gallon barrels, steel or polyethylene tanks, fractioning tanks, or tank trucks. All proposed vessels shall be compatible with the intended liquid contents.
5. Container staging areas shall be designated prior to initiation of the removal work and approved by the Owner's Consultant.
6. All storage vessels to be used in the containerization and transportation of liquid waste materials shall be free of corrosion, perforations, punctures, or other condition that may impair its ability to securely contain liquid.
7. Temporary staging of liquid waste vessels at the site shall be in a manner that will prevent freezing of contained liquids. Should the potential exist for liquid containers to freeze during exterior storage at the site, arrangements shall be made with the Owner's Consultant to identify and utilize an appropriate alternate storage location acceptable to the Owner's Consultant.
8. All liquid storage vessels utilized and staged at the site shall be stored in an area on the property that will not interfere with facility operations or normal flow of vehicle or pedestrian traffic, and in a manner that will minimize the potential for tipping, vandalism, or damage by vehicular traffic.
9. Liquid Wastes generated as a result of the remediation work and equipment or personnel decontamination shall be profiled and if necessary, burned in a high temperature incinerator in accordance with §761.60 or managed (treated) in accordance with §761.60 if necessary.
10. All characterization of waste, testing, analytical fees for disposal purposes shall be borne by the HMAC.

I. Labeling of Waste Containers

1. All waste containers and temporary waste storage areas shall be labeled in accordance with §761.40 and §761.45.

2. All waste containers must be labeled with the name of the waste contained; the date on which the first material was placed in the vessel; and the last date at which addition of waste occurred.
3. All waste containers containing presumed PCB-containing materials, presumed PCB-containing debris, containment system components, used personnel protective equipment, personal and equipment wash water and decontamination fluids, or other wastes generated during the abatement work shall be labeled as follows:

   HAZARDOUS WASTE-Federal law prohibits improper disposal.
   If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
   Generator's Name: _____
   _____
   _____
   _____
   Manifest Document No.:

4. Such marking must be durable, in English and printed on or affixed to the surface of the package or on a label, tag or sign; displayed on a background of sharply contrasting color; unobscured by labels or attachments and located away from any other marking (such as advertising) that could substantially reduce its effectiveness.

3.9 WASTE TRANSPORTATION AND DISPOSAL

A. All waste packaging, labeling and transportation activities shall be performed in accordance with applicable State of Connecticut and US Department of Transportation Regulations at 49 CFR Parts 171. 172, 173, 177, and 178, and any and all other applicable federal, state, and local laws and regulations.

B. All hazardous wastes shall be shipped using state-specific standard manifest documents. The HMAC shall supply and complete the manifest documents in accordance with all applicable state and federal regulations. All manifest documents shall be signed by a representative of the Owner and appropriate copies shall be provided to the Owner's Consultant prior to removing the waste from the Site.

C. All Connecticut Regulated Waste shall be shipped using state-specific waste shipment records.

D. The HMAC or their designated waste disposal subcontractor providing waste transportation services shall possess a valid Waste Hauler's Permit issued by the State of Connecticut Department of Energy and Environmental Protection (CTDEEP). In addition, if the waste is to be transported and disposed of out of Connecticut State, applicable permits for those states or territories through which the waste will be transported and for where it will be disposed will be required. It is the responsibility of the HMAC to identify the appropriate disposal facility and associated travel route(s) and to identify the pertinent permits that will be required and to provide copies of the applicable permits to the Owner’s Consultant prior to removing the waste from the site.

E. The HMAC is responsible for all testing, analytical fees or other services required by their designated landfill necessary to generate waste profiles.

F. The waste disposal classifications for PCB materials generated during this project are as follows:
   1. All thermal system insulation and dust captured by blastrac and vacuums shall be disposed of as presumed PCB Bulk Product Waste > 50 ppm and friable asbestos waste.
   2. All remaining asbestos-containing materials shall be disposed of as presumed PCB Bulk Product Waste > 50 ppm and non-friable asbestos waste.

3. All non-asbestos caulks shall be disposed of as presumed PCB Bulk Product Waste > 50 ppm.
4. All HMAC PPE shall be segregated and disposed of as PCB Remediation Waste.
5. All liquid wastes generated as a result of the remediation work and equipment or personnel decontamination shall be profiled and if necessary, burned in a high temperature incinerator in accordance with §761.60 or managed (treated) in accordance with §761.60 if necessary.

3.10 CERTIFICATION OF ABATEMENT WORK

A. The HMAC shall certify in writing to the Owner's Consultant that all remediation work and waste disposal has been completed in accordance with this specification and all applicable federal and state regulations.

B. The HMAC shall certify in writing to the Owner's Consultant that each piece of equipment used in the Abatement Zones, or which has come in or potential come into contact with caulk and window glazing compounds has been decontaminated in accordance with 40 CFR 761 Subpart S prior to removal from the Site.

3.11 OWNER'S CONSULTANT POST ABATEMENT CERTIFICATION

A. At the completion of abatement work, the Owner's Consultant will perform visual inspections within each work area.

B. The Consultant may perform surface verification wipe sampling and substrate sampling as necessary. Surface wipes and substrate sampling shall be collected in random locations from the interior surfaces. The frequency of such samples shall be determined by the Consultant. Containment barriers shall remain in place until successful verification sampling is performed, and clearance criteria is achieved.

C. Areas that do not meet the required clearance criteria shall be re-cleaned and or resealed at no additional cost to the owner. Clearance criteria for wipe samples shall be < 1 µg tested surfaces. Clearance criteria for substrate core samples on porous materials shall be <1.0 ppm. Clearance sampling will be performed at the Consultant's discretion.

END OF SECTION 021100

SECTION 023219 – EXPLORATORY EXCAVATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. Excavation of test pits where it may be necessary to locate or examine soils, groundwater, drains, pipes, rock, utilities, subsurface structures, or any other obstacles or subsurface conditions.
2. Stockpiling, management, and disposal of surplus or unsuitable material.
3. Backfilling and compacting of test pits with suitable material.

B. Exploratory excavations shall be conducted where shown on the Drawings, where directed or approved by Engineer, and as Contractor may deem necessary to locate or examine subsurface conditions as part of his work.

C. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

D. Contractor is responsible for all health and safety.

1.3 PAYMENT

A. Exploratory excavation work conducted by Contractor for his use shall be considered incidental work and shall be included in Contractor’s base price for the project. Contractor shall be responsible for any required backfilling with suitable materials, disposal of unsuitable excavated materials, and restoration of the excavation area.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. United States Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

1.6 SAFETY

A. Contractor shall conduct all excavation activities in conformance with applicable regulations, including those relating to warning signs, excavation safety, sheeting, shoring, and stabilization.

B. Contractor shall provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Temporary barricades, etc. shall conform all applicable codes and regulations, and shall be lighted at night with lanterns, flares and reflectorized paint as required for safety. Adapt barricades, signs, lights, etc. to evolving site conditions throughout the progress of the work.

C. Provide other safety devices as required, including adaptation of such safety devices to changing site conditions, to prevent unauthorized entry to construction areas and open excavations. Provide warning signs and other temporary construction safety devices necessary for proper completion of the work in compliance with applicable safety regulations.

D. Contractor shall properly design and furnish all labor, materials, equipment, and tools necessary to construct permanent or temporary excavation support systems, including, but not necessarily limited to, sheet piling, trench shields, trench boxes, timber trench shoring, pneumatic/hydraulic shoring, steel sheeting or sheeting using other materials, sloping, and benching.

E. Any time an excavation is to remain open, at a minimum, provide full enclosure with safety barriers and fencing, warning signs, and additional safety control measures as appropriate for the condition.

1.7 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

B. Utility Mark-out

1. Prior to commencing work, comply with utility mark-out requirements of the Call-Before-You-Dig System (1-800-922-4455).
2. Verify the location of all subsurface utilities marked through the Call-Before-You-Dig System.
3. Not all subsurface facilities or structures will be identified through the Call-Before-You-Dig System. Confirm the location of other subsurface utilities and other subsurface facilities or structures prior to commencing work. Field-mark utilities as required.

C. Utility Coordination

1. Inform all utility owners of the necessity of test pit work. Prove reasonable advance notice to allow for coordination.
2. Coordinate the excavation of all test pits with the respective utility owners having facilities in the vicinity of the test pit location.
3. If so desired by the respective utility owners, all or part of the work under this Section may be accomplished by their crews and/or supervised by them.

D. Utility Protection

1. Safeguard and protect from damage any utility to remain in service. Before excavating near any utility, notify the utility owner, coordinate protective work, and comply with the utility owners' requirements.
2. Where utilities are encountered, notify Engineer and document location and type of utility before proceeding with work in such area.
3. When uncharted or incorrectly charted piping or utilities are encountered during excavation, stop work and notify Engineer immediately. Cooperate with the utility owners in maintaining their utilities in operation prior to resuming work.

E. Retaining Structures

1. Provide bracing, shoring, sheeting, sheet piling, underpinning or other retaining structures necessary to guard against any movement or settlement of existing or new construction, utilities, paving, light standards, piping or conduit. Assume responsibility for the strength and adequacy of retaining structures, and for the safety and support of construction, utilities or paving, and for any movement, settlement or damage thereto.

1.8 SEQUENCING

A. If test pits are required during the work to evaluate unforeseen conditions, notify Engineer as soon as the need for such work is known.

B. Notify Engineer and/or utility companies of any conflicts or other conditions observed which may require design revisions, relocations, and/or adjustment. No work shall be started within areas

where conflicts or other conditions are observed which require design revisions, relocations, and/or adjustment until authorized by Engineer.

PART 2 - PRODUCTS – NOT USED

2.1 SOILS

A. Refer to Section 31 2310 – Earthwork.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Test pit excavation and backfill shall comply with applicable provisions of earthwork and excavation as indicated in other applicable Specification Sections.

B. Excavation of test pits shall be accomplished by such means as are required to ensure that underground utilities or structures which may be encountered are not damaged.

C. Contractor shall measure and record the size, configuration, exact horizontal and vertical location of all utilities, pipes or other conditions/obstacles encountered.

D. Contractor shall be solely responsible for any damages incurred during excavation operations. Any such damages shall be repaired or replaced by Contractor to the satisfaction of the facility owner/operator, responsible/administering agency, and/or Engineer. Whether repair and/or replacement is Conducted by Contractor or must be conducted by owner/operator or responsible/administering agency, any and all costs thereof, including those costs associated with planning, coordination and owner/operator or responsible/administering agency personnel, shall be borne by Contractor.

E. Where an existing pavement has been removed for test pit excavation, the surface shall be restored in accordance with the Drawings and Specifications. In all other areas, the surface of test pit areas shall be backfilled and the surface restored to a condition equal to original, unless otherwise indicated by Engineer.

END OF SECTION 023219

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes, excluding removal of hazardous materials and toxic substances.

B. Salvage of existing items to be reused or turned over to Owner.

C. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

A. Section 003100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 020750 - Selective Demolition for Hazardous Materials Abatement.

C. Section 020800 - Asbestos Abatement.

D. Section 020820 - Universal Waste Reclamation.

E. Section 020900 - Lead Paint Awareness.

F. Section 021100 - PCB Remediation.

G. Section 023219 - Exploratory Excavations.

H. Section 024123 - Site Demolition: Selective demolition of existing site elements.

I. Section 042000 - Unit Masonry : Salvage and reuse of existing facing brick.

1.3 DEFINITIONS

A. Demolition (Demo): Dismantle, raze, destroy or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Site Plan:

1. Indicate vegetation to be protected.
2. Areas for temporary and permanent placement of removed materials.
3. Location of dumpsters and traffic pattern for waste hauling.
4. Proposed site access.

C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.

1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
2. Demolition firm qualifications.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.7 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

1. Minimum of five years of documented experience.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fill Material: As specified in Section 312310 - Earthwork.

PART 3 EXECUTION

3.1 DEMOLITION

A. Remove portions of existing buildings as indicated on Drawings.

B. Remove other items as specifically indicated on Drawings.

C. Remove items specifically indicated for salvage, relocation, and recycling.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until existing elements to be salvaged or relocated have been removed.

D. Protect existing structures and other elements to remain in place and not removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. Hazardous Materials - Comply with the following requirements:

1. 29 CFR 1926 and state and local regulations.
2. Section 020750 - Selective Demolition for Hazardous Materials Abatement.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. Salvage and Reuse of Existing Paving: If existing concrete and asphalt paving is to be salvaged for use in earthwork, separate usable paving materials from other foreign and deleterious materials and stockpile for processing and reuse as specified in 312300.

3.3 EXISTING UTILITIES

A. Protect existing utilities to remain from damage.

B. Do not disrupt public utilities without permit from authority having jurisdiction.

C. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

D. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

E. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

F. Unused underground piping may be abandoned in place, provided it is completely drained and capped; remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

G. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.

1. Verify construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

C. Maintain building security; take care to prevent unauthorized entry.

D. Remove existing work as indicated and required to accomplish new work.

1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
2. Remove items indicated on drawings.
3. Core Drilling: Core drill slabs as required to install new items as detailed on Drawings. If required based on existing slab conditions, employ methods of detecting existing tensioned and un-tensioned reinforcing, and other embedded items, so as not to damage existing facilities and equipment.
4. Powder-Actuated Fasteners and Post-installed Anchors: Verify existing slab conditions employing methods of detection specified for core drilling; locate fasteners and anchors to avoid structural damage to existing slabs and existing tensioned reinforcing.

E. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

F. Protect existing work to remain.

1. Prevent movement of structure. Provide shoring and bracing as required.
2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch to match new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Remove from site all materials not to be reused on site; do not burn or bury.

C. Leave site in clean condition, ready for subsequent work.

D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 024123 – SITE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. General Site Demolition.
2. Demolition of site structures, retaining walls, signage, light standards, foundations and appurtenances, pavement, curbing, and similar site improvements.
3. Filling of voids and excavations resulting from site demolition.

B. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. State of Connecticut.

1. State of Connecticut Solid Waste Management Regulations, Section 22a-209 including any amendments thereto.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DEFINITIONS

A. Demolition: Any operation including the dismantling or wrecking of a structure, assembly, appurtenance, or any portion thereof, including major and minor components, parts, and systems. Demolition shall be inclusive of the removal, handing, processing, segregation, loading, and proper off-site disposition of materials. Demolition shall be interpreted as complete and total removal unless otherwise indicated. The term Remove shall be synonymous with Demolition.

B. Bulky Waste: Land clearing debris and non-contaminated or hazardous waste material resulting directly from demolition activities other than Clean Fill, including such materials as tree stumps, tree tops, concrete, wood, brick, plaster, roofing materials, wallboard, metals, carpeting, insulation, furniture, and furnishings. Bulky Waste shall include Construction and Demolition Debris and Construction and Demolition Waste.

1.6 SAFETY

A. Conduct the work of this Section in conformance with applicable regulations, including those relating to warning signs, excavation safety, sheeting, shoring, and stabilization.

B. Provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Temporary barricades, etc. shall conform all applicable codes and regulations, and shall be lighted at night with lanterns, flares and reflectorized paint as required for safety. Adapt barricades, signs, lights, etc. to evolving site conditions throughout the progress of the work.

C. Provide other safety devices as required, including adaptation of such safety devices to changing site conditions, to prevent unauthorized entry to construction areas and open excavations. Provide warning signs and other temporary construction safety devices necessary for proper completion of the work in compliance with applicable safety regulations.

D. Contractor shall properly design and furnish all labor, materials, equipment, and tools necessary to construct permanent or temporary excavation support systems, including, but not necessarily limited to, sheet piling, trench shields, trench boxes, timber trench shoring, pneumatic/hydraulic shoring, steel sheeting or sheeting using other materials, sloping, and benching.

E. Any time an excavation is to remain open, at a minimum, provide full enclosure with safety barriers and fencing, warning signs, and additional safety control measures as appropriate for the condition.

1.7 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

A. Utility Mark-out

1. Prior to commencing work, comply with utility mark-out requirements of the Call-Before-You-Dig System (1-800-922-4455).
2. Verify the location of all subsurface utilities marked through the Call-Before-You-Dig System.
3. Not all subsurface facilities or structures will be identified through the Call-Before-You-Dig System. Confirm the location of other subsurface utilities and other subsurface facilities or structures prior to commencing work. Field-mark utilities as required.

B. Utility Coordination

1. Inform all utility owners of the necessity of test pit work. Provide reasonable advance notice to allow for coordination.
2. Coordinate the excavation of all test pits with the respective utility owners having facilities in the vicinity of the test pit location.
3. If so desired by the respective utility owners, all or part of the work under this Section may be accomplished by their crews and/or supervised by them.

1.8 REGULATORY REQUIREMENTS

A. Comply with all applicable federal, state, and local safety and health requirements regarding all aspects of the work. Do not proceed until all permits or other approvals are secured.

B. Contractor is bound to comply with any project-related permits or approval obtained by Owner, including all requirements of such permit and representations contained in permit application as though Contractor were the permittee. Requirements and conditions set forth in Owner-obtained project-related permits and permit applications shall be binding on Contractor just as any Specification would be.

C. Do not close or obstruct roadways, sidewalks, hydrants, or other infrastructure without permits or authorization from local municipal authorities or other authorities having jurisdiction.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 IDENTIFICATION OF EXISTING FEATURES

A. Prior to commencing construction activities, Contractor shall identify and delineate those areas or specific improvements that are not to be disturbed. Areas or specific improvements within the Limits of Work/Contract Limits and general work areas which are not to be disturbed shall be clearly marked or fenced. Monuments and markers shall be protected before construction operations commence. Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting designated areas, specific improvements, monuments, and markers at the Project Site.

3.2 PROTECTION OF EXISTING FEATURES

A. General

1. All areas or specific improvements, including but not limited to vegetation, utilities, poles, wires, fences, curbs, monuments/property-line markers, and other structures, which must be preserved in place without being temporarily or permanently relocated shall be carefully supported and otherwise protected from damage by Contractor.
2. As excavation/demolition work approaches underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools.

B. Pavements

1. On paved surfaces to remain, Contractor shall not use or operate heavy equipment, other power-operated equipment, or store tools, equipment, or materials which may mar, cut, or otherwise damage such surfaces. If there is no alternative to the operation of heavy equipment, other power-operated equipment, or storage of tools, equipment, or materials on paved surfaces to remain, Contractor shall take all measures necessary to protect such surfaces.
2. All surfaces, which have been damaged by Contractor's operations, shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of construction operations. Such restoration shall meet the approval of Engineer and may include repair or complete replacement at Contractor's expense.

C. Planted Areas

1. All planted areas, including lawn/turf areas and landscaped areas, which have been damaged by Contractor's operations, shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of construction operations.

D. Utilities

1. Locate and identify existing utilities that are to remain and protect them from damage. Provide protection as required such as marking, blocking, bracing, stabilizing, supporting, and retaining.
2. Before excavating near any utility, notify the utility owner, coordinate protective work, and comply with the utility owners' requirements.

3. All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs.
4. Where known utilities are encountered, notify Engineer and document location and type of utility before proceeding with work in such area.
5. When uncharted or incorrectly charted utilities are encountered, stop work and notify Engineer. Cooperate with the utility owners in maintaining their utilities in operation prior to resuming work.

E. Retaining Structures: Provide bracing, shoring, sheeting, sheet piling, underpinning or other retaining structures necessary to guard against any movement or settlement of existing or new construction, utility systems, paving, or other improvements. Contractor assumes responsibility for the strength and adequacy of retaining structures, and for the safety and support of construction, utilities or paving, and for any movement, settlement or damage thereto.

3.3 SITE DEMOLITION

A. Conduct site demolition as shown on the Drawings.

B. Conduct site demolition operations in a manner that will prevent damage to adjacent structures, utilities, pavements and other facilities to remain.

C. Remove from the site and properly dispose of all materials resulting from site demolition operations.

3.4 DUST CONTROL

A. Implement fugitive dust suppression to prevent unacceptable levels of dust resulting from site demolition operations or other activities required by the Contract Documents. It shall be the Contractor’s responsibility to supervise fugitive dust control measures and to monitor airborne particulate matter. Comply with applicable provisions of Section 01 5714 – Temporary Dust Control.

3.5 REPLACEMENT

A. In case of damage, Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done. When the Owner does not wish to make the repairs themselves, all damage shall be repaired by Contractor, or, if not promptly done by him, Engineer may have the repairs made at the expense of Contractor.

B. Contractor shall patch, repair and/or replace all adjacent materials and surfaces damaged through the prosecution of work at no expense to Owner. All repair and replacement work shall match the existing in-kind. Final acceptance of said work shall be at the sole judgment of Owner.

END OF SECTION 024123

SECTION 026123 – HANDLING, TRANSPORT AND DISPOSAL OF EXCAVATED SOIL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SUMMARY

A. Section includes the following:
1. Furnish all labor, materials, equipment, and incidentals necessary to properly excavate, segregate, handle, dewater (if needed), stabilize, load, transport and dispose of excavated soil/sediment materials located within the Limits of Work. The scope of work for excavation of soils includes excavation of utilities associated with building upgrades. Decontamination stations shall be capable of eliminating the dispersion of dust and mud caused by vehicles exiting the site. Project activities anticipated to result in excavation and handling of soil. Decommissioning of the transformer room is not covered under this scope of work and would be addressed by the utility as part of decommissioning of the transformer room.
2. Project activities anticipated to result in excavation of soil/sediment covered under this Section includes, but are not limited to installation of sub-surface stormwater drainage, site utilities, driveway, parking lot area, trenching for below grade mechanical/plumbing piping systems within the boiler room and hallways, site grading, and restoration. Removal of existing pavement and associated base material are not covered by this Section.
3. Environmental soil quality will be classified into three (3) categories for the purpose of this Project[1] and the soil classification terminology is used throughout this Specification. It is incumbent upon the Contractor to handle, manage, transport, place, stockpile and dispose of soil in accordance with the soil classifications and requirements of this Section and associated Specifications referenced in Part 1.2 (B) RELATED SECTIONS. The soil classifications are as follows:
a. Contaminated Soil[1,2]: Soil exhibiting detectable concentrations of contaminants, above pertinent release based clean-up criteria (RCBR) limits
b. Polluted Soil[1]: Soil exhibiting detectable concentrations of contaminants and metals concentrations above typical background levels, but at concentrations below pertinent current RCBR criteria limits.
c. Uncontaminated/Clean Soil[1]: Soil exhibiting no detectable concentrations of contaminants or detectable concentrations of contaminants, including metals concentrations, below typical background levels

[1]Note: The classifications provided above were developed for this Project. The Project-specific classifications differ from classifications for contaminated soil, polluted soil and clean fill used by the Connecticut Department of Energy and Environmental Protection (CTDEEP) and shall not be used interchangeably with Project-specific terminology.
[2] Includes uninvestigated soils with no testing. With appropriate analytical testing/ characterization, soils may be re-classified as polluted or uncontaminated with the approval of the Owner / Environmental Consultant.

4. Limited soil sampling was completed within the proposed utility trench in selected areas on the exterior of the Site to collect initial data to assess the environmental soil quality of soil that may be impacted during the Work. Refer to Drawings REM-1A and REM-1B for identification of soil classifications. A copy of soil preconstruction soil testing information is provided.

5. The Contractor shall include in their Base Bid the removal and disposal of 565 tons of polluted soils from exterior trenching throughout the Site.
6. The Contractor shall include in their Base Bid the removal and disposal of 15 tons of contaminated soils from the boiler room below the slab.
7. The Contractor shall include in their Base Bid the removal and disposal of 20 tons of polluted soils from below the slabs in the corridors.
8. Dispose of excess polluted and contaminated soil beyond quantities provided (if identified) utilizing unit prices for each soil classification at licensed and permitted disposal facilities per this specification.
9. The Contractor could encounter asphalt, concrete and other bulky debris during excavations and general site work. Asphalt and bulky debris including but not limited to masonry and other miscellaneous debris shall be segregated from soil for solid waste disposal. The Contractor shall account for segregation and disposal of solid waste in their Bid. Volumes of waste disposed by the receiving facility will be documented and provided to the Consultant/ Owner's Representative.
10. If groundwater is encountered and required to be removed to complete construction activities, the Contractor shall perform all dewatering and temporarily store in a frac tank(s) and sampled by the Owners Representative/ Consultant. Water not meeting applicable discharge criteria shall be trucked for treatment and disposal. Sampling data shall be used to determine appropriate processing of dewatering liquids. If significant amount of water is encountered, then water may be discharged to sanitary sewer under a Dewatering and Remediation Wastewater to Surface Water and Groundwater (D2R GP) with approval of the Owner/ Owner's Representative and once agency approval is issued.
11. If encountered, all dewatering and discharging of uncontaminated water shall be included in the Contractor's Base Bid. Trucking and disposal of contaminated water, if encountered, will be compensated at the corresponding unit price. Adjustments to the Contract will be made with an add/deduct unit price for actual quantity of contaminated water disposal.
12. The Contractor shall perform disposal characterization sampling and analytical testing of the excavated material, including dewatering liquids, as required by the permitted disposal facility at no additional cost to the Owner.
13. The Owner will be the Generator and will sign all disposal facility waste profiles for Material Shipping and Hazardous, Non-Hazardous Waste Manifests (manifest), and/or Material Shipping Record Log (MSRL) as the Generator. All paperwork required for work under this Section shall be prepared by the Contractor and approved by the Owner's Representative/Consultant.
14. The Contractor shall coordinate truck traffic (staging, queuing, and transportation) with the City of Bristol prior to the start of excavation.

B. Related Sections:
1. Section 01 57 05: Environmental Protection
2. Section 01 57 13: Temporary Erosion & Sedimentary Controls
3. Section 01 57 14: Temporary Dust Control
4. Section 31 23 10: Earthwork

C. Related Drawings
1. REM-1A and REM-1B

1.3 RESPONSIBILITIES

A. The Contractor shall be responsible for the following:
1. Performing all disposal characterization sampling of all materials to be disposed of.
2. Submitting the daily logs summarizing excavating activities to the Owner's Representative/Consultant.

3. Identifying and providing a list of proposed treatment, recycling, and disposal facilities for all excavated material to be reviewed and approved by the Consultant and Owner prior to shipment of excavated materials.
4. Dewatering excavated material to reduce the weight/moisture content as necessary to meet or exceed treatment/recycling/disposal facility acceptance criteria.
5. Management of storm and ground water through the temporary placement into frac tank(s) for disposal/discharge testing (if needed).
6. Discharging of all un-contaminated water in accordance with project specifications.
7. Collection, transport and disposal of all contaminated storm and groundwater (if encountered).
8. Stabilizing, as necessary, the excavated soil/sediment with materials that do not increase the weight of the soil/sediment by more than 10 percent.
9. Transporting excavated material to the approved soil/sediment treatment, recycling, or disposal facility.
10. Transporting excavated material for on-site placement (if specifications permit)
11. Stockpiling soil in approved Waste Storage Areas (WSA), as necessary, for further disposal characterization.
12. Furnishing, operating, and maintaining equipment decontamination stations for the duration of soil excavation work.
13. Developing and implementing site-specific emergency response and health and safety protocols and procedures.
14. Demonstrating to the Owner's Representative/Consultant for each shipment of material transported to a treatment/recycling/disposal facility that the Contractor has selected the least costly means of disposal. This demonstration shall be made prior to shipment.
15. Submitting weight slips, completed MSRLs, manifests and other shipping documents to the Owner's Representative/Consultant within fourteen (14) calendar days of shipment to a treatment/recycling/disposal facility.
16. Advising the Owner's Representative/Consultant at least three (3) working days in advance of the schedule for off-site disposal of excavated material.
17. Preparing the necessary documents to transport and dispose of excavated material. These documents include, but are not limited to, waste profiles, MSRLs and manifests.
18. Submitting the executed transportation and disposal documents to the appropriate local, State and Federal agencies as well as the Owner's Representative/Consultant.
19. Keeping records, including daily logs and photographs, of all waste streams, stockpiles, and excavated materials for the purposes of tracking points of origin.
20. Developing and implementing dust/odor control measures and air monitoring in accordance with applicable state regulations (e.g.22a-174-18 and 22a-174-23).

B. Owner's Responsibilities:
1. The Owner will review and approve the proposed facilities selection of off-site treatment/recycling/disposal facilities.
2. The Owner will be the designated Generator for excavated material identified for off-site treatment/recycling/disposal.
3. The Owner will review and approve all paperwork and manifests.
4. The Owner's Representative/Consultant will perform visual inspection of excavated soil to evaluate the limits of excavation and may collect confirmation samples to confirm remediation limits. The Owner's Representative/Consultant shall collect and have analyzed samples collected from stormwater and groundwater within the frac tank (if needed)
5. If impacted groundwater is encountered, the Owner's Representative/Consultant shall collect and have analyzed samples collected from stormwater and groundwater within the frac tank. The Owner's Representative/ Consultant will complete sampling for discharge to sanitary sewer under Dewatering and Remediation Wastewater to Surface Water and Groundwater (D2R GP) obtained.

1.4 SUBMITTALS

A. Submit to the Owner's Representative/Consultant, for review, and in accordance with the requirements of the general specifications, the information required by Paragraph 1.4 B., no more than one (1) calendar day after issuance of the Notice to Proceed.

B. The Contractor shall submit the following information in an Excavated Materials Management Plan (EMMP):
   1. A schedule detailing the proposed sequence of work.
   2. The Contractor shall develop a stockpile disposal characterization sampling program to facilitate the direct loading of excavating material following dewatering.
   3. All pertinent information relating to the transport of excavated material. The information, at a minimum, shall include.
      a. Name and address of all transporters.
      b. Transporter identification number (USEPA) and expiration date.
      c. Proof of permit, license, or authorization to transport excavated material in all affected states.
      d. Details of containers to be used for transporting excavated material. Refer to Paragraph 2.1 B. of this Section
      e. Dust control measures.

   4. The Contractor shall identify each waste stream and propose an appropriate permitted disposal facility that will accept the excavated material and dewatering liquids. The Contractor shall submit to the Owner's Representative/Consultant, approvals or letters of intent and facility information for each facility proposed, within fourteen (14) calendar days of issuance of the Notice to Proceed. For each facility, the Contractor shall submit the following information:
      a. General Information
         a. Facility Name
         b. Facility Address
         c. Name of Contact Person
         d. Title of Contact Person
         e. Telephone Number of Contact Person
         f. Permit Number

      b. The Contractor shall provide information from the facility specifying the volume of material that can be accepted from the site on a weekly and a total basis. Dewatering liquids volumes will be estimated and coordinated with the sewage treatment system operator (as applicable).
      c. The Contractor shall provide written confirmation from the facility that they are permitted to accept and will accept the classified material of the general quality and quantity described by these Specifications.
      d. The Contractor shall provide a listing of all current and valid facility permits, licenses, letters of approval, and other authorizations to operate that they hold, pertaining to the receipt and management of the soils, dewatering liquids or materials specified in this contract.
      e. The Contractor shall submit a complete list of the disposal facility's permitted allowable contaminant levels and physical characteristic requirements for excavated material and list any required regulatory approvals for individual waste streams.
      f. Copies of pre-characterization analytical testing results.
      g. The Contractor shall submit the facility approval(s) for the specified volumes of waste from the disposal facility once received.

C. Laboratory results for all samples collected and/or analyzed by the Contractor shall be tabulated and compared to applicable permitted facility acceptance standards by the Contractor and

subsequently submitted to the Owner's Representative/Consultant within two (2) working days of receipt. The results shall include all Chain-of-Custody forms and all documentation provided by the laboratory.

1.5 REFERENCES

A. All regulations cited and those of other governing agencies in their most recent version are applicable. This Section refers to many requirements found in these references, but in no way is intended to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations and common practices. Other provisions contained in these references may from time to time during the execution of this Contract be enforced by the Owner's Representative/Consultant. In the event of a conflict, the most stringent regulations shall govern. The following documents and/or publications are made part of this Section by reference herein::

1. "Hazardous Waste Operations and Emergency Response," Federal Occupational Safety and Health Act (OSHA), 29 CFR 1910.120.
2. "General Regulations for Hazardous Waste Management," EPA, 40 CFR 260.
3. "Regulations for Identifying Hazardous Waste, Hazardous Waste Generators and Hazardous Waste Transporters," EPA, 40 CFR 261, 262 and 263.
4. "Standards for Management of Specific Hazardous Wastes and Facilities," EPA, 40 CFR 266.
5. Local regulations governing dust control, soil handling, and health & safety (see Section 312500, Erosion and Sediment Controls).
6. Connecticut Hazardous Waste Management Regulations (22a-149 (c) 100 through 119, and 22a-454-1).
7. Connecticut Regulations for Solid Waste Management (22a-208a-1(a), 22a -209-1, and 22a-209-3; 22a-209-18 and 22a-209d-1).
8. Connecticut Air Pollution Regulations (22a-174-1 through 44 and 22a-174-200).
9. Connecticut "Remediation Standard Regulations" 22a-133k-1 through 22a-133k-3 effective through February 28, 2026.
10. Connecticut Release Based Clean-up Regulations (22a134tt-1 to 22a-134tt-13) effective March 1, 2026
11. Connecticut "Contaminated Soil and/or Sediment Management (Staging and Transfer" General Permit (DEEP-SW-GP-001)- expired September 19, 2018.
12. Connecticut "Dewatering and Remediation Wastewater to Surface Water and Groundwater (D2R GP) effective March 1, 2026.
13. Connecticut "Application for an Emergency or Temporary Discharge Authorization" (DEEP-WPED-APP-202).
14. Connecticut "Stormwater and Dewatering Wastewaters from Construction Activities" (DEEP-WPED-GP-015).
15. Connecticut " National Pollutant Discharge Elimination System General Permit for the Discharge of Stormwater Associated with Industrial Activities Permit No. CTR050000 dated October 1, 2025.
16. Connecticut Water Pollution Control Regulation 22a-430 of Chapter 446k
17. Clean Water Act ("CWA"), Section 402(b) as amended, 33 USC 1251, et. seq., and pursuant to an approval dated September 26, 1973
18. Connecticut Underground Storage Tank Regulations 22a-449(d)-101 through 114
19. Connecticut Guidelines for Soil Erosion and Sediment Control, Connecticut Council, DEP Bulletin 34, ISBN 0-942085-10-8 on Soil and Water Conservation in cooperation with CTDEEP dated May 2002.
20. Connecticut "General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (construction stormwater general permit)" effective December 31, 2020.
21. General Permit to Act as a Contractor to Contain or Remove or Otherwise Mitigate the Effects of Certain Releases (Registered Existing Release Response Contractor) Effective

October 20, 2025, expires October 20, 2029
22. Waste Facility/ Environmental Spill Response Contractor Program CGS 22a-454
23. Release Reporting RCSA 22a-450-1 to 6
24. Connecticut Call-Before-You-Dig Regulations, Section 16-345 to 357.

1.6 DEFINITIONS

A. Contaminated Soil[1,2]: Soil exhibiting exceedances of pertinent contaminant concentration limits in the current RBCRs.

B. Excavated Material: All soil/sediment excavated from within the Limit of Work.

C. Excavated Debris: All asphalt, brick, concrete, rock, trash, and all other debris material excavated from within the Limit of Work.

D. Polluted Soil[1]: Soil exhibiting detectable concentrations of contaminants, including metals concentrations above typical background levels, but at concentrations below current RBCR criteria limits.

E. Uncontaminated/Clean Soil[1]: Soil exhibiting no detectable concentrations of contaminants or detectable concentrations of contaminants, including metals concentrations, below typical background levels.

F. Uninvestigated Soil[2] Soil within areas that have not been investigated. These soils are considered contaminated for bidding purposes.

[1]Note: The classifications provided above were developed for this Project. The Project-specific classifications differ from classifications for contaminated soil, polluted soil and clean fill used by the CTDEEP and shall not be used interchangeably with Project-specific terminology.
[2] Includes uninvestigated soils with no testing. With appropriate analytical testing/ characterization, soils may be re-classified as polluted or uncontaminated with the approval of the owner / environmental consultant.

PART 2 - PRODUCTS

2.1 GENERAL

A. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection for this Work as provided in the Contractor's Health and Safety Plan.

B. Containers used for hauling the excavated material shall be constructed of steel, in good condition and designed for the intended purpose of safe, secure storage of materials during loading and transport to an approved facility. The containers shall have a secure cover, which will prevent the release of material from the truck during transportation. The container and covers shall be approved by the Owner's Representative/Consultant prior to mobilization of trucks/containers. The containers shall be approved by and labeled in accordance with the U.S Department of Transportation (DOT). The containers shall be sift proof and water resistant in accordance with the DOT regulation

2.2 STOCKPILE SHEETING

A. Minimum 6-mil polyethylene sheeting shall be used for short-term covering of stockpiles. For stockpiles anticipated to remain in place for greater than 30 days, stockpile cover sheeting shall be nylon-reinforced polyethylene (NRPE) or minimum 20-mil polyethylene sheeting.

B. NRPE sheeting shall conform to the following specifications:
   1. The membrane shall be manufactured of new, first quality product designed and manufactured specifically for the intended use.
   2. The material shall be 10-mil polyethylene reinforced with a non-woven grid of high strength nylon cord.
   3. The material shall be ultra-violet resistant and cold crack resistant to -40 degrees Fahrenheit.
   4. The materials shall be manufactured in a minimum 12-foot seamless width. Labels on the roll shall identify the thickness, length width and manufacturer's mark number.

2.3 EQUIPMENT AND VEHICLE DECONTAMINATION PAD

A. A decontamination pad shall be constructed of reinforced concrete or bituminous concrete to withstand an HS-20 loading. The decontamination pad shall be of minimum length to accommodate one 18-wheel dump truck, and a minimum area to accommodate the largest piece of equipment to be used in the excavation. The pad shall have a six-inch containment berm and provisions for collection, storage, and disposal of decontamination water.

2.4 DEWATERING PAD

A. If required, Dewatering of excavated soil shall be performed by stockpiling excavated saturated soil/sediment on a 10-mil NRPE or a 20-mil (minimum) HDPE lined and bermed pad to facilitate gravity drainage of water to a lined collection sump.

B. Complete dewatering (if required for construction) in accordance with project specifications.

2.5 EQUIPMENT STAGING AREAS

A. Equipment staging areas shall be constructed of 8-oz. non-woven geotextile fabric over existing ground surface followed by twelve (12) inches of compacted base course.

PART 3 - PRODUCTS

3.1 GENERAL

A. The Contractor shall handle and convey all materials to perform the site work described in this Contract.

B. The Contractor shall perform disposal characterization sampling and analytical testing of the excavated material and dewatering liquids as required by the permitted disposal facility at no additional cost to the Owner.

C. The Owner shall have final approval over all disposal options.

3.2 DEWATERING/STABILIZATION

A. Contractor shall dewater excavated material to reduce the weight/moisture content and to meet treatment/recycling/disposal facility acceptance criteria (e.g., paint filter test). Soil/sediment dewatering shall be performed by stockpiling excavated soil on a HDPE lined and bermed pad in accordance with Paragraph 2.4. Collected water shall be conveyed to an on-Site frac tank for testing prior to discharge or disposal. The Contractor is responsible for determining and obtaining the applicable General Permit based on site construction activities.

B. The Contractor shall stabilize, if necessary, the excavated material to pass the paint filter test for transport. Stabilization agents shall not be allowed, which increase the weight of the material by more than 10 percent.

C. The Contractor shall perform any additional disposal characterization sampling and analytical testing of the excavated material as required by the permitted disposal facility at no additional cost to the Owner.

D. Based upon all analytical results, transport and dispose of the excavated material as specified in this Section.

E. The Owner shall have final approval over all disposal options.

F. Complete dewatering (if required for construction) in accordance with project specifications.

3.3 STOCKPILE DISPOSAL CHARACTERIZATION SAMPLING

A. The Contractor shall be responsible for sampling and characterizing stockpiles of dewatered excavated material for the purpose of obtaining approvals from the disposal facility. The Contractor shall provide the Owner's Representative/Consultant with a minimum of two (2) working days' notice prior to sampling and shall not sample unless Owner's Representative/Consultant's approval is received.

B. Submit a copy of all chemical analyses and a tabulated summary of the data in final laboratory report in PDF and (Excel format) to the Owner's Representative/Consultant within two (2) working days of receipt of the laboratory report.

C. Take samples in such a manner as not to cause any cross-contamination. All sampling equipment shall be decontaminated between usage.

D. All analyses shall be performed by a laboratory certified for such analyses by the State in which the material is to be disposed of and in accordance with the disposal facility operating permit requirements.

E. The Owner's Representative/Consultant may stop the Contractor's work in a particular location at any time in order to have samples taken and analyzed. If necessary, the Contractor shall assist the Owner's Representative/Consultant in collecting samples. The work shall not resume in that area until required by the Owner's Representative/Consultant. Stoppage of work for this reason, or until laboratory results are delivered to the Owner's Representative/Consultant, shall not be a cause for the Contractor to request additional compensation or an extension of time to the Contract or to other intermediate Contract deadlines.

F. The Contractor shall not backfill an excavation until the Owner's Representative/Consultant has given approval to do so.

3.4 TEMPORARY STOCKPILING OF EXCAVATED MATERIALS

A. All excavated material shall be stored in a secure manner to prevent exposure to humans and the environment.

B. Stockpiled or consolidated excavated material shall not be placed near sensitive human health receptors such as public and private water supply wells or sensitive environmental receptors.

C. All excavated material shall be stored at the Site of generation. The material shall be placed entirely on sheeting as defined in Section 2.2 and shall be covered at the end of each day's work with the same material or so as to minimize the infiltration of precipitation, volatilization of contaminants and erosion of the stockpile. Any sheeting used shall be properly secured and possess the necessary physical strength to resist being torn by the wind and other elements.

D. The stockpiles shall be bermed around the edges to minimize infiltration of stormwater or exfiltration of leachate.

E. Any failure of materials or procedures used in employing the base layer or cover layer shall be immediately repaired, replaced, or re-secured so as to minimize precipitation infiltration, volatilization, and erosion/runoff of the excavated material.

F. Movement and/or aeration of excavated material shall be limited to those activities that are necessary to manage such stockpiles.

G. Disposal of material that is contaminated as a result of careless handling or use of unauthorized procedures shall be at the Contractor's expense. Delays of Work resulting from temporary storage of excavated material, regardless of the classification, shall be at no additional cost to the Owner.

H. Excess excavated material shall be disposed of site within 90 calendar days of excavation and in accordance with the CTDEEP timeframes provided in the Contaminated Soil and/or Sediment Management (Staging and Transfer" General Permit).

I. The stockpiles shall be clearly labeled and securely barricaded from contact with workers and the general public.

3.5 MANAGEMENT OF EXCAVATED MATERIAL

A. The Contractor shall provide a soil management system to manage material between excavation, stockpiling, sampling, testing and final disposition.
   1. Include in the system the identification of the source of material (i.e., station, offset), depth, date of excavation and stockpile identification and location.
   2. Submit to the Owner's Representative/Consultant for review of the management plan. This plan shall include all proposed daily log sheets.
   3. Provide to the Owner's Representative/Consultant, on a daily basis, copies of field records documenting the location of stockpiled material in the system and stockpile identification data.
   4. Each stockpile shall be identified with a suitable weatherproof sign attached to a stake driven into or directly adjacent to each pile.

B. The contractor shall take all measures necessary to avoid comingling different classifications of soil. Were polluted soil or contaminated soil is located on the top horizon, strip polluted soil and stockpile prior to performing deeper excavations where contaminated or uncontaminated soil is present at a deeper horizon.

C. Isolate pockets of solid waste and/or other environmentally impacted material, where identified, and remove and stockpile or relocate to WSA for characterization sampling. Solid waste materials such as brick, concrete, metal, wood shall be segregated from soils and disposed of as solid waste.

3.6 DEBRIS DECONTAMINATION

A. As required by designated disposal facilities, the Contractor shall be responsible for decontaminating any debris shown to be contaminated by sampling at no additional cost to the Owner. The decontamination means and methods shall be included in the EMMP submitted to the Owner's Representative/Consultant 14 calendar days after issuance of Notice to Proceed.

3.7 DISPOSAL FACILITY CATEGORIES

A. The Contractor shall transport the material for off-site reuse, recycling, or disposal at a permitted facility based on the following categories:

1. Soil Reclamation Facility: Excavated material that meets the definition of "polluted soil" and/ or "contaminated soils" in the Connecticut Remediation Standard Regulations shall be submitted to a site that has received State approval to accept the materials.
2. Authorized Beneficial Use Material: Excavated material that meets the definition of "polluted soil" in the Connecticut Remediation Standard Regulations and is shipped to a site that has received State approval to accept such material under a Beneficial Use Determination. Approval from the Owner's Representative/Consultant and Owner are required prior to use of this disposal option.
3. Non-RCRA In-State Landfill: Excavated material (if encountered) that meets the destination state's solid and hazardous waste regulations and the receiving facility's operating permit(s). This includes material shipped for reuse as daily cover, intermediate cover, and pre-cap contouring material or material shipped for disposal. This also includes material designated as a "special solid waste". Approval from the Owner's Representative/Consultant and Owner are required prior to use of this disposal option
4. Thermal Desorption Facility: Excavated material (if encountered) that meets the destination facility requirements for petroleum impacted soils or soils amenable to thermal desorption technology.
5. Non-RCRA Out-of-State Unlined and Lined Landfill Material: Excavated material (if encountered) that meets the destination state's solid and hazardous waste regulations and the receiving facility's operating permit(s). This includes material shipped for reuse as daily cover, intermediate cover, and pre-cap contouring material or material shipped for disposal. This also includes material designated as a "special solid waste". Approval from the Owner's Representative/Consultant and Owner are required prior to use of this disposal option.
6. RCRA Hazardous Waste Facility: Excavated material (if encountered) that is identified as characteristic hazardous waste shall be shipped to a permitted waste disposal facility using licensed waste haulers. Approval from the Owner's Representative/Consultant and Owner are required prior to use of this disposal option.

B. Material shall be transported under an MSRL or a non-hazardous waste Bill of Lading. If hazardous waste is encountered, a Uniform Hazardous Waste Manifest will be used.

C. Material shipped to any recycling/disposal facility shall meet the selected facility's chemical and physical acceptance criteria. Selected facilities shall be established, fully operational, appropriately insured, and be operating in compliance with all applicable local, State, and Federal regulations.

3.8 WEIGHT AND MEASUREMENT

A. The Contractor shall provide certified tare and gross weight slips for each load received at the accepted Facility and these shall be attached to each returned manifest.

3.9 WASTE PROFILES AND MANIFESTS

A. The Contractor shall prepare and submit to the Owner's Representative/Consultant for review all waste profile applications and questionnaires and coordinate with disposal facilities and all Federal and State Environmental Agencies.

B. The Contractor shall prepare all Hazardous Waste Manifests, MSRLs, and non- Hazardous Waste Manifests, Bill of Lading and shipping records with all applicable analytical backup, notification, and control forms

C. The Contractor shall also provide certified tare and gross weight slips for each load received at the designated facility which shall be attached to each returned manifest.

D. The Contractor shall furnish all Generator copies of each Hazardous Waste Manifest or Bill of Lading to the Owner for submittal to the appropriate regulatory agencies and to retain for the Owner's records.

E. The Contractor shall submit to the Owner's Representative/Consultant, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility. The documentation shall include the following, as a minimum.
   1. Documentation shall be provided for each load from the site to the disposal facility, including all manifests, MSRLs and any other transfer documentation as applicable
   2. All documentation for each load shall be tracked by the original manifest/ MSRL document number that was assigned by the Owner's Representative/Consultant at the site.

F. EPA ID number shall be provided by the Owner if transport of material characterized as RCRA hazardous waste becomes necessary.

3.10 TRANSPORT OF EXCAVATED MATERIAL/DEBRIS

A. The Contractor shall not be permitted to transport materials off-site until all storage, disposal, or recycling facility documentation has been received, reviewed, and approved by the Owner's Representative/Consultant

B. The Contractor shall transport materials from the site to the storage, disposal, reuse or recycling facility in accordance with all United State Department of Transportation (DOT), USEPA, and applicable State and local regulations

C. The Hauler(s) shall be licensed in all states affected by transport

D. The Contractor shall be responsible for ensuring that free liquid is properly transported. "Wet material" shall not be loaded for transport. The Contractor shall dewater "wet material", and properly dispose of collected liquid from dewatering, in accordance with local, State, and Federal regulations. The Contractor shall dispose of any free liquids that may result during transportation at no additional cost to the Owner.

E. All excavated material transported upon public roadways shall be covered to minimize fugitive dust, and where necessary truck tire and undercarriage decontamination shall be employed to minimize tracking of soils onto public roadways

F. The Contractor shall coordinate truck traffic (staging, queuing, and transportation) with the City of Bridgeport prior to the start of excavation.

3.11 DISPOSAL

A. Dispose of excavated materials at an approved facility in accordance with all Federal, State and local regulations

B. The Contractor shall perform analyses on the material as necessary to fulfill any disposal testing requirements of the approved Facility.
   1. The Contractor shall bear all costs incurred in sampling and analyses for those tests required by the facility in excess of those performed by the Owner's Representative/Consultant
   2. The Contractor shall submit a copy of all sampling analyses to the Owner's Representative/Consultant within two (2) calendar days of receipt of the laboratory report. Analytical data shall be kept confidential, distributed to the Owner's Representative/Consultant and Owner only

C. The Contractor shall provide to the Owner's Representative/Consultant copies of all weight slips, both tare and gross, for every load weighed and disposed of at the approved facility. The slips shall be tracked by the original manifest document number that was assigned by the Owner's Representative/Consultant at the site. The Owner's Representative/Consultant shall make progress payments after receipt of these weight slips.

D. Dispose of impacted soils within timeframes provided by applicable regulatory guidance.

3.12 ON-SITE PLACEMENT OF SOIL

A. On-site reuse of soils shall be limited to soils that are determined to be geotechnically suitable for reuse and meet the definition of polluted and/or uncontaminated/clean/ natural soil in the RSRs/ RBCRs. No on-site soil reuse is permitted without prior approval and authorization from the Owner

B. The Contractor shall strip, excavate, or otherwise remove soil for stockpiling into designated soil classifications. Stockpiles shall be identified and labeled based on soil classification in accordance with this Specification.

C. Location(s) of stockpiles shall be coordinated with the Owners Representative/Consultant and Construction Manager and shall be maintained in accordance with this Section.

D. Place soil on-Site at locations designated by the Architect and in accordance with the soil classifications. Grade, level, pitch and compact in accordance with project Specifications.

E. Placed soil shall be free of brick, masonry, rocks, metal, etc. and shall meet CTDEEP RBCR and background metals concentration criteria.

F. Place soil in designated areas and develop soil horizon to specified depth

END OF SECTION 026123

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.2 RELATED DOCUMENTS

A. The general provisions of the contract, including General and Supplementary Conditions and Division 1, General Requirements apply to the work specified in this section. Note also all Addenda.

1.3 DESCRIPTION OF WORK

A. A. Provide all labor, materials, equipment and appliances to furnish and install all concrete formwork.

1.4 RELATED REQUIREMENTS

A. Section 032000 - Concrete Reinforcing.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 051200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.5 REFERENCE STANDARDS

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.

B. ACI 301 - Specifications for Concrete Construction.

C. ACI 318 - Building Code Requirements for Structural Concrete.

D. ACI 347R - Guide to Formwork for Concrete.

1.6 QUALITY ASSURANCE

A. All materials and work shall conform to the requirements of all standards, codes, and recommended practices required in this section. In conflicts between standards, required standards, and this specification, the more stringent requirements shall govern.

PART 2 PRODUCTS

2.1 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

2.2 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

B. For unexposed surfaces and rough work, undressed lumber may be used. Lumber once used in forms shall have nails withdrawn, and surfaces to be I contact with concrete shall be thoroughly cleaned before being used again.

2.3 FORMWORK ACCESSORIES

A. Form ties and spreaders shall be of such type as to leave no metal closer than ¾” from exposed concrete surfaces and 1 ½” from unexposed surfaces, below grade.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

1. Do not use materials containing diesel oil or petroleum-based compounds.

2. Composition: Colorless, reactive, water-based compound.

C. Dowel Sleeves: Plastic sleeve and nailable plastic base for smooth, round, steel load-transfer dowels.

D. Expansion joints - premolded expansion joint filler shall conform to one of the following:

1. ASTM D 1751 “Standard Specificaions for Preformed Expansion Joint Fillers for Concrete paving and Structural Construction” (Nonextruding and resilient bitumious types).

2. ASTM D 1752 “Standard Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural construction” (Nonextruding and resilient nonbituminous types).

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

F. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 051200.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Construction Joints, when not shown on working drawings, shall be made and located to least impair the strength of the structure.

1. All reinforcement shall be continued across joints and keys shall be provided.

D. Expansion Joints - premolded expansion joint filler shall be placed along edges of slab on grade where abuttng foundation walls, and at all other locations as detailed.

E. Control joints shall be as shown on the working drawings and as directed by the Architect.

1. Contraction joints may be formed, tooled or sawed approximately equal to ¼ the thickness of the member.

F. Forms shall be erected with sufficient strength, bracing and ties as to remain in correct position during and after depositing of concrete. They shall be substantially free from surface defects and sufficiently tight to prevent leakage of mortar.

G. Forms, if oiled, shall be coated with a non-staining mineral oil or other approved material and allowed to dry before placing of reinforcing steel.

H. Erect formwork to produce concrete members conforming to the following dimensional tolerances:

1. Variation in cross-sectional dimensions of columns and beams and in thickness of slabs and walls shall not exceed minus ¼", nor plus ½".

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.4 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

C. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

1. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. All forms, except permanent metal forms, shall be removed when he concrete is thoroughly hardened. Forms for walls shall be left in place for a minimum of three days.

C. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

D. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.2 DESCRIPTION OF WORK

A. Furnish and erect in place all reinforcing steel and welded wire fabric as indicated on Drawings. In-clude all splices, ties, supports, and other accessories required to properly place and secure all reinforc-ing during placing of concrete.

1.3 RELATED REQUIREMENTS

A. Section 031000 - Concrete Forming and Accessories.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 042000 - Unit Masonry: Reinforcement for masonry.

1.4 REFERENCE STANDARDS

A. ACI 301 - Specifications for Concrete Construction.

B. ACI 318 - Building Code Requirements for Structural Concrete.

C. ACI SP-66 - ACI Detailing Manual.

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

E. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

F. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

H. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

1. Contractor shall prepare detailed drawings showing dimensions, bar schedules, bending details and placing diagrams and details, for all reinforcement. Drawings shall be submitted for approval and no reinforcement shall be placed before drawings are approved.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.

C. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.

D. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.2 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

2.3 FABRICATION

A. Welding of reinforcement is permitted only with the specific approval of Engineer. Perform welding in accordance with AWS D1.4/D1.4M.

PART 3 EXECUTION

3.1 FABRICATION AND SITE STORAGE

A. Reinforcing shall be accurately formed to dimensions on drawings details, and schedules within the following tolerances:

1. Sheared Length ….……+ or - 1 inch

2. Stirrups, Ties and Spirals…….....+ or - ½ inch

3. All other bends……..+ or - 1 inch

B. Fabrication shall not commence until details and schedules have been approved by the Architect.

C. Reinforcement shall be bent cold and shall not be straightened or rebent in a manner than will injure the materials. Bars with bends or kinks not shown on Drawings shall not be used. Bars shall be stored on site, off of the ground and separated by individual groups that shall be tagged for ease of identification. Bundles shall be securely wrapped to prevent separation prior to placement.

3.2 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Welded wire fabric shall be lapped 8” at ends and sides and the upper layer shall be placed within 1” of the top of the slab and to be held in place by high chairs at 4’-0” o/c maximum, this includes welded wire fabric in slabs-on-grade.

E. Metal reinforcement shall have a protection of concrete not less than the following:

1. Three inches (3”) at sides and on bottoms of footings.

2. Two inches (2”) where concrete is exposed to weather or to the ground after removal of forms for bars larger than #5 and one and one-half inches (1 ½”) for #5 bars and smaller.

3. One and one-half inches (1 ½”) in columns, beams and girders not exposed to the weather.

4. Three fourths inch (3/4”) in slabs, joists and walls not exposed to the weather.

3.3 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 014000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION 032000

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. Note also all Addenda.

1.2 DESCRIPTION OF WORK

A. This contract includes all labor, materials, equipment and appliances necessary to complete all cast-in-place concrete as indicated on the drawings or hereinafter specified.

B. Anchor bolts, leveling plates, sleeves, inserts, hangers, etc. furnished under other divisions and required to be cast into the concrete shall be set by this Contractor where required.

C. Provide all concrete bases, curbs, mats, pads, trenches, slots, openings, etc., as required by any or all of the drawings; Architectural, Site, Structural, Plumbing, Heating and Ventilating, and Electrical, and to accommodate equipment or work of all the divisions of these specifications.

1.3 RELATED REQUIREMENTS:

A. Section 031000 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 032000 - Concrete Reinforcing.

C. Section 079200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.4 REFERENCE STANDARDS

A. ACI 117 - Specification for Tolerances for Concrete Construction and Materials.

B. ACI 211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide.

C. ACI 301 - Specifications for Concrete Construction.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

F. ACI 306R - Guide to Cold Weather Concreting.

G. ACI 308R - Guide to External Curing of Concrete.

H. ACI 318 - Building Code Requirements for Structural Concrete.

I. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

K. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

L. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

M. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

N. ASTM C33/C33M - Standard Specification for Concrete Aggregates.

O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.

Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.

R. ASTM C150/C150M - Standard Specification for Portland Cement.

S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

T. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete.

U. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete.

V. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete.

W. ASTM C476 - Standard Specification for Grout for Masonry.

X. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.

Y. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.

Z. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

AA. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

BB. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars.

CC. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

DD. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete.

EE. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

FF. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

GG. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

HH. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

II. COE CRD-C 513 - Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops.

1.5 ACTION SUBMITTALS

1.6 SUBMITTALS

A. Mix Design: Submit proposed concrete mix design.

1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.

2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

B. Submit copies of fine and coarse aggregate sieve analysis showing conformance to this specification.

C. Submit copies of specifications for each product proposed for use as listed in Part 2 of this section.

D. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials and aggregates

2. Admixtures

3. Form materials and form-release agents

4. Steel reinforcement and accessories

5. Curing compounds

6. Bonding agents

7. Vapor retarders

8. Joint-filler strips

1.7 QUALITY ASSURANCE

A. Materials and work shall conform to the requirements of all standards, codes, and recommended practices required in this section. In conflicts between standards, required standards and this specification and the local building code, the more stringent requirements shall govern.

B. Perform work of this section in accordance with ACI 301 and ACI 318.

C. Testing and Inspection:

1. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Architect for final acceptance.

2. The following testing services shall be performed by the designated agency, paid for by the Owner:

a. Secure composite samples in accordance with “Method of Sampling Fresh Concrete” ASTM C172/C172M.

b. Test Specimens in accordance with “Method of Test for Compressive Strength of Cylindrical Concrete Specimens” ASTM C39/C39M . Two specimens shall be tested at 28 days for acceptance and one shall be tested at 7 days for information.

c. Determine slump for each strength test and whenever consistency of concrete appears to vary, using “Method of Test for Slump of Portland Cement Concrete” ASTM C143/C143M.

d. Determine total air content of normal-weight concrete sample for each strength test in accordance with “Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method” ASTM C231/C231M.

D. Evaluation and Acceptance:

1. The strength level of the concrete will be considered satisfactory if 90% of the strength test results and the averages of all sets of three consecutive strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.1 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 032000.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

1. Type: Deformed billet-steel bars.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A706/A706M, deformed

D. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M, unless otherwise indicated.

E. Plain-Steel Welded Wire Fabric: ASTM A185/A185M, fabricated from galvanized steel wire into flat sheets.

F. Deformed-Steel Welded Wire Fabric: ASTM A497/497M, flat sheet.

2.2 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, gray/white, Type I - Normal.

B. Blended Hydraulic Cement: ASTM C595/C595M.

C. Fly Ash: ASTM C618, Class C or F.

D. Calcined Pozzolan: ASTM C618, Class N.

E. Silica Fume: ASTM C1240, amorphous silica, proportioned in accordance with ACI 211.1.

F. Ground Granulated Blast-Furnace Slag: ASTM C989/C989M , Grade 100 or 120.

G. Fine and Coarse Aggregates: ASTM C33/C33M.

H. Normal-Weight Aggregate: ASTM C33/C33M, uniformly graded, and as follows:

I. Lightweight Aggregate: ASTM C330/C330M.

2.3 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Chemical Admixture: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete.

C. Air Entrainment Admixture: ASTM C260/C260M, MB-AE 10 or MB-VR.

D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

H. Accelerating Admixture: ASTM C494/C494M Type C.

I. Retarding Admixture: ASTM C494/C494M Type B.

J. Plasticizing and Retarding Admixture: ASTM C1017/C1017M Type II

K. Water Reducing Admixture: ASTM C494/C494M Type A.

2.4 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.

1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

2. Joints shall be lapped a minimum of 6 inches, and all breaks or holes shall be patched prior to pouring the concrete.

3. Manufacturer of selected product must provide documentation that clearly illustrates submitted water vapor retarder product meets or exceeds the above requirements in accordance with ASTM E1745 and ASTM F710 .

2.5 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic emulsion or styrene butadiene, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:

1. Complying with ASTM C881/C881M and of Type required for specific application.

2. Adhesive: Two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

a. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete

C. Waterstops, Chemical-Resistant: Thermoplastic elastomer rubber waterstops, , for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes. No recycled or reclaimed material or pigments allowed.

D. Waterstops: Synthetic rubber; swells to 1000 percent of original size in clean water.

1. Configuration: As indicated on drawings.

2. Size: As indicated on drawings.

E. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip

1. Butyl rubber with sodium bentonite or other hydrophilic material for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2. Bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete. 3/8 by 3/4 inch (10 by 19 mm).

3. Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:

   a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.

   b. Conseal CS-231; Concrete Sealants Inc.

   c. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.

   d. Hydrotite; Greenstreak.

   e. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.

   f. Adeka Ultra Seal; Mitsubishi International Corporation.

   g. Superstop; Progress Unlimited Inc.

F. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

G. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.6 CURING MATERIALS

A. Evaporation Reducer: Waterborne, monomolecular-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309. Type 1, Class B.

2.7 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301. Required average strength above specified strength shall be determined in accordance with ACI 318 “Building Code Requirements for Structural Concrete” and evaluations of compressive strength results of field concrete shall be in accordance with ACI 214R “Guide to Evaluation of Strength Test Results of Concrete”.

1. Trial mixtures:

    a. When the ready-mix producer does not have a record of past performance, the combination of materials and the proportions selected shall be selected from trial mixes having proportions and consistencies suitable for the work based on ACI 211.1 (Latest Edition), using at least three different water-cement ratios which will produce a range of strengths encompassing those required.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.

2. Maximum Water-Cement Ratio:

    a. 0.50 for concrete required to have low water permeability.

    b. 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist.

    c. 0.40 for corrosion protection of steel reinforcement in concrete exposed to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater, or spray from these sources.

3. Maximum Aggregate Size: Shall not exceed 1/3 the thickness of slabs and 1/5 the narrower dimension between form.

2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa at 28 days.

2. Slump Limit: 5 inches (125 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

3. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

B. Foundation Walls:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa at 28 days.

2. Slump Limit: 4 inches (100 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

3. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.

4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.

C. Slabs-on-Grade:

1. Minimum Compressive Strength: 3500 psi (24.1 MPa) at 28 days.

2. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

D. Suspended Slabs (Tunnel Slab Replacement):

1. Minimum Compressive Strength:4000 psi (27.6 MPa at 28 days.

2. Minimum Cementitious Materials Content: 470 lb/cu.yd. (279 kg/cu.m)

3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.9 MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M and ASTM C1116/C1116M, and furnish batch ticket information.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1 PREPARATION

A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

2. Use latex bonding agent only for non-load-bearing applications.

3.2 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Cold-Weather Placement: Comply with ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40ºF (4.4ºC) for three successive days, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature at not less than 50ºF (10ºC) and not more than 80ºF (27ºC) for the required curing time.

a. Water heated to above 100ºF shall be combined with the aggregates before cement is added. Cement shall not be added to water or aggregated having a temperature greater than 100ºF.

b. Temperature of concrete delivered at the job site shall conform to the following minimum:

Air Temperature	Concrete Temperature
30 to 45ºF	55 to 90ºF
0 to 30ºF	60 to 90ºF
Below 0ºF	65 to 90ºF

F. Hot-Weather Placement: Comply with ACI 301 (ACI 301 SI), ACI 305R, and as follows:

1. Maintain concrete temperature below 90ºF (32ºC) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.3 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Rough-Formed finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections 1/4 inch or more in height.

C. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections 1/4 inch or more in height.

D. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive until producing a uniform color and texture, not more than 24 hours after form removal. Do not apply cement grout other than that created by the rubbing process.

3.4 FINISHING FLOORS AND SLABS

A. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

3.5 CURING AND PROTECTION

A. Comply with requirements of ACI 308R, ACI 306R, for cold-weather protection, and ACI 301 (ACI 301 SI) for hot-weather protection during curing. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Curing Methods:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than 7 days using water ponding, water-saturated sand, water-fog spray, saturated burlap, polyethylene film, or waterproof curing paper.

a. Polyethylene Film or Curing Paper: Cover surface immediately after finishing. Joints shall be lapped 12 inches and all joints taped securely. Repair all rips and tears until end of curing period.

3.6 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.

2. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

3. Repair or replacement of defective concrete will be determined by the Engineer. Remove and replace concrete that cannot be repaired and patched. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

4. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.7 FIELD QUALITY CONTROL

A. A qualified independent testing and inspecting agency will perform field quality control tests and prepare test reports, as specified in Section 014000 - Quality Requirements.

B. Inspections:

1. Steel reinforcement placement.

2. Steel reinforcement welding.

3. Verification of use of required design mixture.

4. Concrete placement, including conveying and depositing.

5. Curing procedures and maintenance of curing temperature.

6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Slump: Perform one slump test at each point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change. Follow procedures of ASTM C143/C143M.

2. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

3.8 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

B. Concrete shall be protected from damage. Damaged concrete shall be replaced at the Contractor's expense.

END OF SECTION 033000

SECTION 033200 – SITE CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes

1. Site cast-in-place concrete, including but not necessarily limited to, pavements, slabs, decorative surfaces, sidewalks, ramps, driveways, curbing, pads, bases, retaining walls, and thrust blocks.
2. All facilities, labor, materials, tools, equipment, appliances, transportation, supervision, and related work necessary to complete the Work shown on the Drawings and as specified herein.

B. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. ASTM International (ASTM)

1. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
2. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
3. ASTM A767 – Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
4. ASTM A775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
5. ASTM A996 – Standard Specification for Rail-Steel and Axle-Steel Deformed Bars or Concrete Reinforcement.
6. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

7. ASTM C29 – Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
8. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
9. ASTM C33 – Standard Specification for Concrete Aggregates.
10. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
11. ASTM C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
12. ASTM C70 – Standard Test Method for Surface Moisture in Fine Aggregate.
13. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
14. ASTM C117 – Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
15. ASTM C127 – Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
16. ASTM C128 – Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
17. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
18. ASTM C138 – Standard Test Method for Density (“Unit Weight”), Yield, and Air Content (Gravimetric) of Concrete.
19. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
20. ASTM C150 – Standard Specification for Portland Cement.
21. ASTM C156 – Standard Test Method for Water Retention by Concrete Curing Materials.
22. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
23. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.
24. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
25. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
26. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
27. ASTM C233 – Standard Test Method for Air-Entraining Admixtures for Concrete.
28. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
29. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
30. ASTM C311 – Standard Methods of Sampling and Testing Fly Ash and Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.
31. ASTM C387 – Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
32. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
33. ASTM C566 – Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying.
34. ASTM C595 – Standard Specification for Blended Hydraulic Cements.
35. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
36. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
37. ASTM C685 – Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
38. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
39. ASTM C803 – Standard Test Method for Penetration Resistance of Hardened Concrete.
40. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
41. ASTM C979 – Standard Specification for Pigments for Integrally Colored Concrete.
42. ASTM C989 – Ground Granulated Blast-Furnace Slag for Use in Concrete Mortars.

43. ASTM C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
44. ASTM A1078 – Standard Specification for Epoxy-Coated Steel Dowels for Concrete Pavement.
45. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
46. ASTM D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
47. ASTM D2628 – Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
48. ASTM D4397 – Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
49. ASTM D5249 – Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints.
50. ASTM D5893 – Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.
51. ASTM E329 – Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

D. Concrete Reinforcing Steel Institute (CRSI).

1. CRSI Manual of Standard Practice, latest edition.

E. State of Connecticut

1. 2016 Connecticut State Building Code, including all Amendments, Supplements, and Errata.

F. American Concrete Institute (ACI)

1. ACI 224R – Control of Cracking on Concrete Structures.
2. ACI 224.3R – Joints in Concrete Construction.
3. ACI 301 – Specifications for Structural Concrete.
4. ACI 302.1R – Guide for Concrete Floor or Slab Construction.
5. ACI 304R – Guide for Measuring, Mixing, Transporting, and Placing Concrete.
6. ACI 305R – Guide to Hot Weather Concreting.
7. ACI 306R – Guide to Cold Weather Concreting.
8. ACI 308R – Guide to Curing Concrete.
9. ACI 330 – Guide for Design and Construction of Concrete Parking Lots

G. American Welding Society (AWS).

1. AWS A5.1/A5.1M (2004; Errata 2004) Carbon Steel Electrodes for Shielded Metal Arc Welding.
2. AWS D1.4/D1.4M (2005; Errata 2005) Structural Welding Code – Reinforcing Steel.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.

2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. For each type of specially furnished concrete provide a description of methods and the sequence of placement.
B. Manufacturer’s catalog data for the following items shall include printed instructions for admixtures, bonding agents, epoxy-resin adhesive binders, waterstops, and liquid chemical hardeners:
   1. Concrete Aggregates.
   2. Portland Cement.
   3. Ready-Mix Concrete.
   4. Form Facing Materials.
   5. Reinforcement Materials.
   6. Joint Materials.
   7. Water-Vapor Barrier Subgrade Cover.
   8. Bonding Materials.
   9. Finish Materials.
   10. Concrete Curing Materials.
   11. Form release agent.
   12. Concrete coloring additive.
   13. Elastomeric joint sealant.
   14. Preformed joint filler

C. Submit samples of the following:

   1. Preformed joint filler.
   2. Manufacturer’s color charts showing full range of colors available.
   3. Cured samples of elastomeric join sealants in the color(s) selected.
   4. Stamping pattern samples.
   5. Color samples and mock-ups for decorative concrete.

D. Design Data

1. Mix Design data for each class of Ready-Mix Concrete shall be submitted at least 15 calendar days prior to start of specified work.
2. Mix Design data for each type of integrally-colored concrete mix called-for shall be submitted at least 15 calendar days prior to start of specified work.

E. Test Reports

1. Submit test reports for all testing conducted under this Section.

F. Certificates

1. Submit certificates for the following:

   a. Concrete Design Mixes.
   b. Concrete Aggregates.
   c. Welding Procedures. Welding Procedures shall be in accordance with AWS D1.4/D1.4M. Certificates for Welder Qualifications shall be in accordance with the paragraph entitled, “Qualifications for Welding Work,” of this section.
   d. Mill certificates for Steel Bar.

2. Certificates for concrete shall contain project name, title/number, date, name of Contractor, name of concrete testing service, source of concrete aggregates, material manufacturer, brand name of manufactured materials, material name, values as specified for each material, and test results.

G. Manufacturer’s Instructions

1. Installation instructions shall indicate the manufacturer’s recommended method and sequence of installation for the following items:

   a. Admixtures
   b. Bonding Materials
   c. Waterstops
   d. Liquid Chemical Hardener

1.6 QUALITY ASSURANCE

A. Dimensions, locations, and details of equipment pads, anchors, supports, and similar features indicated on the Drawings are approximate. Manufacturer’s approved shop drawings of equipment to be supported, anchored, or contained thereby shall be consulted for exact location, size and details.

B. Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.

C. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

D. Welder qualifications: Welder qualifications shall be verified in accordance with AWS D1.4/D1.4M or under an equivalent qualification test approved in advance. Welders shall be permitted to do only the type of welding for which each is specifically qualified.

E. Concrete testing: Concrete testing shall be performed by an approved Testing Agency/Testing Laboratory experienced in sampling and testing of concrete. Testing Agency/Testing Laboratory shall meet the requirements of ASTM E329.

1.7 MOCKUPS

A. Where mockups are called-for, comply with the following:

1. At location on the Project Site selected by Engineer, place and finish 100 square foot mockup section for examination. Mockup to be constructed by the installer who will actually perform the work for the Project.
2. For accurate color, the quantity of concrete mixed to produce the sample should not be less than 3 cubic yards (or not less than 1/3 the capacity of the mixing drum on the ready-mix truck) and should always be in full cubic yard increments. Excess material shall be discarded according to local regulations.
3. For colored concrete, record the amount of integral colorant, dray colorant, or chemical stain needed per square foot of application to establish coverage rates for the work.
4. Provide a mockup sample panel for each type of colored and stamped concrete.
5. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control construction, and expansion joints in sample panels.
6. Retain samples of cements, sands, aggregates and color additives used in mockup for comparison with materials used in remaining work.
7. Accepted mockup provides visual standard for all work.
8. Mockup shall remain through completion of work for use as a quality standard for finished work.
9. Provide suitable protections to preclude damage to mockup.
10. Remove mockup when directed.

1.8 TESTING

A. Owner will retain a testing entity to perform observation and testing of the work under this Section. The testing entity’s presence does not constitute supervision or direction of Contractor’s work. Neither the presence of the testing entity nor any observations and testing performed by him, nor any notice or failure to give notice shall excuse Contractor from conformance with these Specifications or from defects discovered in his work.

B. Testing shall include sampling and testing concrete materials proposed for use in the work and testing the design mix for each class of concrete.

C. Tests will be required to determine whether the concrete being produced complies with the standard of quality and strength as specified.

D. Concrete Replacement: Failure of any test or to follow proper installation procedures will require that the concrete be removed and properly replaced at the Contractor’s expense.

1.9 DELIVERY, STORAGE AND HANDLING

A. Schedule delivery of concrete to provide consistent mix times from batching until discharge. Mix times shall meet manufacturers’ written recommendations.

B. Packaged materials shall be delivered to the project site in their original, unopened package or container bearing label clearly identifying manufacturer's name, brand name, material, weight or volume, and other pertinent information. Packaged materials shall be stored in their original, unbroken package or container in a weather-tight and dry place until ready for use in the work.

C. Unpackaged aggregates shall be stored to avoid excessive segregation, contamination with other materials or other size aggregates, or freezing.

D. Reinforcement and other metal items shall be protected from corrosion and shall be kept free from ice, grease, and other coatings that would destroy or reduce bond.

E. Colored Admixture: Comply with manufacturer's instructions. Deliver colored admixtures in original, unopened packaging. Store in dry condition.

1.10 PROJECT CONDITIONS

A. Environmental Requirements

1. Avoid placing concrete if rain, snow, or frost is forecast within 24-hours.
2. Protect fresh concrete from rain, moisture, and freezing.
3. Schedule placement to minimize exposure to wind and hot sun before curing materials are applied.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT

A. Cement: ASTM C 150. One brand and type of cement shall be used for formed concrete having exposed-to-view finished surfaces.

B. Unless otherwise specified, cement shall be Type IA.

2.2 READY-MIX CONCRETE

A. Ready Mix Concrete: Portland Cement Concrete, air-entrained, ASTM C94.

1. Compressive Strength:

a. Unless otherwise indicated, minimum compressive strength at 28 days shall be 4,000 psi minimum.
b. Sidewalks, stairs and landings, pedestrian and vehicle ramps, and curbing: Minimum compressive strength at 28 days shall be 4,500 psi minimum.

2. Water/cement ratio: Maximum 0.45.
3. Air content by volume: 6 percent ± 1 percent, ASTM C231 (primary method) or ASTM C173 (secondary method).
4. Slump: no less than 2 inches, not greater than 4 inches, ASTM C143.
5. Standard Color: Natural grey.
6. Colored Concrete: See the Article "Integral Colorant" herein if applicable.

B. Aggregate
   1. Coarse aggregate: ASTM C33. Broken stone or gravel consisting of clean durable fragments of uniform quality throughout. It shall be free from soft, disintegrated pieces, mud, dirt, organic or other injurious material. Coarse aggregate of a size retained on a 1-inch square opening sieve shall not contain more than 8% of flat or elongated pieces, whose longest dimension exceeds five times their maximum thickness.
   2. Fine aggregate: ASTM C33. Sand consisting of clean, hard, durable, uncoated particles of quartz or other rock, free from lumps of clay, soft or flaky material, loam, organic or other injurious material. Fine aggregate shall contain not more than 3% of material finer than a #200 sieve, ASTM C117.

C. Water: Potable quality.

D. Admixtures

   1. Concrete shall contain a water reducing agent, ASTM C494, to minimize cement and water content of the concrete mix at the specified slump.
   2. Air-Entraining Admixtures: ASTM C260.
   3. Pozzolan: Fly ash or other pozzolans used as admixtures shall conform to ASTM C618, Class C or Class F with 4 percent maximum loss on ignition. Pozzolan may be used to replace a maximum of 15 percent (15 %) of cement by weight.
   4. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of Engineer in each case.
   5. Integral color admixture: Mineral oxide pigments per manufacturer.

2.3 FORMS

A. Forms shall be substantially built and adequately braced so as to withstand the liquid weight of concrete without deforming. All linings, studding, walling and bracing shall be such as to prevent bulging, spreading, or loss of true alignment while pouring and displacement of concrete while setting.

B. All edge forms for sidewalk pavements, curbs and gutters shall be of sufficient rigidity and adequately braced to accurately maintain line and grade. Form work shall be designed so that sections may be fastened together to prevent vertical or horizontal movement of ends.

C. Forms for curved sections shall be so constructed and placed that the finish surface of walls and edge of sidewalks, curbs and gutters will not deviated appreciably from the arc of the curve.

D. Exposed vertical and horizontal edges of the concrete in structures shall be chamfered as indicated on the Drawings by the placing of moldings in the forms.

E. Forms for Exposed Finish: Plywood, metal, metal-framed plywood faced, or other acceptable panel materials. Form work materials shall produce a smooth, continuous, straight, and level surface.

   1. Plywood shall be APA A-A, A-B or A-C, Class 1, Exterior Grade. Thickness shall be as required to prevent movement or deformation but shall not be less than 5/8″ thick.

F. Forms for Non-Exposed Finish: Plywood, metal, metal-framed plywood faced, or other acceptable panel materials. Form work materials shall produce a generally smooth, continuous, straight, and

level surface. Grain patterns or similar imperfections are acceptable. Lumber shall be dressed on at least two edges and one side.

1. Plywood shall be at least B-B, Class 1, Exterior Grade. Thickness shall be as required to prevent movement or deformation but shall not be less than 5/8″ thick.

G. Cylindrical Forms: Sonotube Fibre Forms, wax-impregnated strippable forms or ABS or PVC plastic reusable forms.

H. Form Ties: Provide prefabricated, adjustable length galvanized steel snap-off ties, with brackets, cones, corner locks and other accessories as necessary.

I. Form Release Agent: Commercial formulation compounds that will not bond with, stain or adversely affect concrete.

2.4 REINFORCEMENT MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60 unless otherwise indicated.

B. Galvanized Reinforcing Bars: ASTM A 767, Class II with galvanizing before fabrication.

C. Weldable Reinforcing Bars: ASTM A 706, Grade 60 unless otherwise indicated. Maximum carbon content shall be 0.55 percent.

D. Epoxy-Coated Reinforcing Bars: ASTM A 775, Grade 60 unless otherwise indicated.

E. Steel Wire: ASTM A 82, 16 gauge or heavier black annealed wire.

1. Ties for epoxy-coated bars shall be vinyl-coated or epoxy-coated.
2. Ties for zinc-coated bars shall be zinc-coated.

F. Welded Wire Reinforcement (WWR)

1. Sidewalks: Plain wire, ASTM A1064 as indicated on the Drawings.
2. Concrete Pavement: Plain wire, ASTM A1064 as indicated on the Drawings.

G. Supports for Reinforcement

1. Supports shall include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire reinforcement in-place. Conform with CRSI Manual of Standard Practice for corrosion-resistant, plastic-protected wire, epoxy-coated, or stainless-steel supports.
2. For exposed-to-view concrete surfaces and where support legs are in contact with forms, provide supports with plastic protection (CRSI, Class1) or stainless steel protection (CRSI, Class 2).

H. Dowel Bars: Plain (smooth) high-chrome steel bar, ASTM A615 Grade 60 with full-length plastic sleeve as a combined unit, dimensions as indicated on the Drawings.

1. Where epoxy-coated dowels are called for: ASTM A1078.

I. Bar/Dowel Adhesive: Two component (1:1 ratio), 100% solids, high modulus, moisture-insensitive structural epoxy gel designed specifically for bonding bars, dowels, and bolts in concrete.

2.5 JOINT MATERIALS

A. Preformed Joint Filler Strips

1. Where no joint sealant is called-for: Nonextruding and resilient bituminous type conforming to ASTM D 1751, 1/2 inch thick, one piece for the full depth and width of the joint.
2. Where joint sealant is called-for: Nonextruding and resilient nonbituminous type conforming to ASTM D 1752, Type I (sponge rubber) or Type II (cork), 1/2 inch thick, allowance for sealant at top and extending for the full depth and width of the joint.

B. Joint Sealant Compound, ASTM C920

1. Self-Leveling (Type SL; Grade “P”)

a. Cold-applied and self-leveling, Type S or Type M elastomeric polymer sealant.

2. Gun-Grade (Non-Sage; Grade “NS”)

a. One-component (Type S) high-performance moisture-curing polyurethane sealant specifically formulated for bonding to masonry and concrete.

3. Traffic Bound areas: T sealant.
4. Non-Traffic Bound areas: NT sealant.
5. Color: As approved by Engineer.
6. Backer material: ASTM D5249, closed cell.

2.6 DETECTABLE WARNING PANEL

A. Surface-mount, UV-stabilized, polymer composite panel as indicated on the Drawings. Fasteners, adhesives, and sealants per manufacturer’s requirements. Panel shall comply with Connecticut Building Code/ADA Guidelines.

1. Color: As approved by Engineer.

B. Duralast Detectable Warning Plate with Black Asphaltic Coating, Product Number 00700570 as manufactured by East Jordan Iron Works, 301 Spring Street, East Jordan, MI or approved equal.

2.7 CONCRETE BONDING MATERIALS

A. Aqueous-phase, film-forming, nonoxidizing, freeze and thaw-resistant compound suitable for brush or spray application conforming to ASTM C 932.

B. Epoxy-Resin Adhesive Binder: Two-component, penetrating high solids, epoxy-based primer/bond coat, 100% solids, moisture-tolerant, ASTM C-881, Types I, II, and V, Grade-2, Class C and AASHTO M-235.

2.8 CONCRETE CURING MATERIALS

A. Curing shall be by moist curing (preferred) or by use of curing compound. Sodium Silicate curing compounds shall be used where required by the weather, approved construction schedules and construction that is not adaptable to damp curing.

B. Curing compound shall be a resin-base, white pigmented compound, ASTM C309, Type 2.

C. Curing compounds shall contain a fugitive dye or when hot weather conditions dictate, a fugitive heat reflecting pigment.

D. Moisture-Retaining Cover:

1. Waterproof paper, ASTM C 171, regular or white.
2. Polyethylene sheeting, ASTM C 171.
3. Polyethylene-coated burlap consisting of a laminate of burlap and a white opaque polyethylene film permanently bonded to the burlap. Burlap: ASTM C 171, Class 3. Polyethylene film: ASTM C 171.
4. When tested for water retention in accordance with ASTM C 156, weight of water lost 72 hours after application of moisture retaining covering material shall not exceed 0.039 gram per square centimeter of the mortar specimen surface.

E. Water: Potable Quality.

F. Membrane-Forming Curing Compound

1. Liquid type, ASTM C 309, Type 1, clear, Type 2, white, pigmented.

2.9 BOND BREAKER

A. Asphalt felt conforming to ASTM D2626, Type I or 6-mil polyethylene sheeting, ASTM D4397.

2.10 SEALER

A. Consolideck® Saltguard® silane/siloxane water repellent and chloride screen as manufactured by Prosoco, Inc., 3741 Greenway Circle, Lawrence, KS 66046, or approved equal.

2.11 COLORED CONCRETE

A. Integral Colorant

1. Colored, water-reducing admixture containing no calcium chloride with coloring agents that are limeproof and ultra-violet resistant. Admixture shall conform to the requirements of ACI 303.1, ASTM C979 and ASTM C494 and shall be dispensed at the batch plant.
2. Curing and Sealing Compound: ASTM C309. Clear, non-yellowing, solvent-borne, membrane-forming with low-gloss finish.
3. Compound shall be of same manufacturer as colored admixture, for use with integrally colored concrete.

B. Dry Colorants

1. Pigmented Mineral Dry-Shake Color Hardener: ASTM C 979, factory-packaged dry combination of Portland cement, graded quartz aggregate, non-fading finely-ground mineral oxide coloring pigments, and plasticizing admixture.
2. Pigmented-Powder Release Agent: Factory-packaged, nonfading finely-ground, streak free, colored powder that facilitates release of stamps and texture rollers from colored concrete and imparts a secondary accent color.

C. Stains

1. Reactive Chemical Concrete Stain: Reactive, water-based solution of metallic salts which react with calcium hydroxide in cured concrete substrates to produce permanent variegated or translucent color effects. Zero VOC content.

D. Colors

1. Cement: Color shall be white.
2. Sand: Color shall be locally available natural sand.
3. Aggregate concrete producer's standard aggregate complying with specifications.
4. Color of admixture, dry colorant, or stain: As indicated on the Drawings or selected by Engineer.

2.12 STAMPED AND TEXTURED CONCRETE

A. Furnish tools and stamping equipment as recommended by the stamping system manufacturer and as approved by Engineer. Use stamping equipment and materials from a single manufacturer throughout the entire project.

B. Surface-Applied Products
1. Dry-shake color hardener: Blend of cement, fine aggregate, and pigments for surface color and abrasion resistance.
2. Release agent
3. Sealer: Compatible with decorative finish.

C. Stamp Mats: Semi-rigid polyurethane mats with projected texture and ridged underside capable of imprinting texture and joint patterns to plastic concrete.

1. Pattern: As indicated on the Drawings.

D. Stencils: Moisture-resistant paper stencils, designed for use on plastic concrete.

1. Pattern: As indicated on the Drawings.

E. Texture Rollers: Manually controlled, abrasion-resistant polyurethane rollers capable of imprinting texture on plastic concrete.

1. Pattern: As indicated on the Drawings.

F. Accessory Stamp Tools: Aluminum detailing tools capable of imprinting joints and dressing stamped joints of plastic concrete.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify site conditions before proceeding with the work. Field check the accuracy of the Drawings and inspect structures, utilities, and other site features prior to start of work and notify Engineer in writing, of any hazardous conditions and/or discrepancies.

B. Provide construction techniques in accordance with applicable provisions of ACI 224R, ACI 224.3R, and ACI 302.1R-04.

C. Engineer shall be notified of concrete placement sufficiently in advance of start of operation to allow their representative to complete preliminary inspection of the Work, including subgrade, forms, and reinforcing steel, if used.

D. Adjacent work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions at the contractor's expense. No concrete walks shall be poured after 12 noon unless a guard is visibly stationed nearby to prevent graffiti. Contractor shall be responsible for replacing any graffiti if he fails to provide adequate protection.

E. Concrete surface shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect exposed surfaces.

F. Retempering of concrete is not permitted.

G. Contractor is responsible for the protection and resetting of all existing utility covers/castings to finish grade; as well as, setting all new utility covers/castings to finish grade prior to placement of concrete. The repair of any settlement, or protrusion above finish grade, shall be the responsibility of Contractor at no additional cost to Owner.

3.2 PREPARATION OF SUBGRADE

A. Compact and bring area to required subgrade elevation in accordance with Section 31 2310 – Earthwork. Provide for final fine grading, and compaction of areas as required to form a firm, uniform, accurate and unyielding subgrade at required elevations and to required lines.

B. Existing subgrade material, which will not readily compact as required, shall be removed and replaced with satisfactory materials in accordance with Section 31 2310 – Earthwork.

C. Subgrade of areas to receive concrete shall be recompacted as required to bring the top 8 inches of material, immediately below the base course, to a compaction at optimum moisture content of at least 95 percent (95%) of maximum density, as determined by ASTM D1557. Subgrade compaction shall extend for a distance of at least 1 foot beyond pavement edge.

D. Materials shall not be stored or stockpiled on subgrade.

E. Disposal of debris and other material excavated under this section, and material unsuitable for, or in excess of requirements for, completing work of this section shall be disposed of off-site.

F. Prepared subgrade shall be inspected and approved by Engineer Representative before installation of the gravel base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the Specification.

3.3 AGGREGATE BASE COURSE

A. Prepare aggregate base course for concrete in accordance with Section 31 2310 – Earthwork and as shown on the Drawings.

B. Width of base course shall be greater than or equal to the width of concrete surface, if continuous lateral support is provided during rolling. The width of base course shall extend at least 2 x base thickness beyond the edge of the course above, if it is not so supported.

C. Aggregate shall be applied in lifts less than or equal to 6 inches thick, compacted measure. Each lift shall be separately compacted to specified density.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
2. The base shall be wetted and rolled or tamped after the spreading of each lift.
3. Rolling shall begin at the sides and progress to the center of crowned areas, and shall begin on the low side and progress toward the high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
4. Surface irregularities, which exceed 1/2-inch, as measured by means of a 10-foot long straightedge, shall be replaced and properly re-compacted.

D. Density: Base course shall be compacted at optimum moisture content to not less than 95 percent of maximum density as determined by ASTM D1557.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and the area repaired.

F. Portions of subgrade, or of construction above, which become contaminated, softened, or dislodged by the passing of traffic, or otherwise injured, shall be cleaned, replaced, or otherwise repaired to conform to the requirements of this specification before proceeding with the next operation.

3.4 FORMS

A. Forms shall be securely staked, braced and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of mortar. All forms shall be cleaned and oiled or wetted before concrete is placed against them.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Complete and approve formwork. Remove debris and foreign material from interior of forms before start of concrete placing.

D. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

E. The maximum cross slope for sidewalks shall be 2.0 percent, sloped towards the gutter. Verify formwork prior to concrete placement. Make corrections as required and bring discrepancies to attention of Engineer.

3.5 JOINTS

A. Locate joints as located on the Drawings, as shown on Engineer-approved joint plan. Conform with applicable sections of ACI 224.3R.

B. Construction Joints: Effected at the end of a pour, lift, or at the end of a day's concrete placement. This type of joint is a plane surface between two distinct sections of concrete.

1. Construction Joints shall be ½ inch wide and full-depth of slab.
2. Joint filler: Unless otherwise specified, Construction Joints shall be constructed with joint filler. Joint filler shall extend the full depth of the slab and shall extend the full length of the joint. Use of multiple pieces of joint material of lesser dimensions to make up required depth and width of joint will not be permitted.
3. Where joints are to receive filler, recess joint filler 1/4-inch below finish surface or as otherwise indicated on the Drawings.
4. Where called-for on the Drawings, install dowels at Construction Joints.

C. Isolation Joints: Installed at intersections of structures on any type including but not limited to buildings, walks with steps, pre-cast concrete curb, light foundations, walls, pads, slabs at footings, or other structures. Isolation Joints shall not be required where concrete flatwork abuts granite curbing.

1. Isolation Joints shall be ½ inch wide.
2. Joint Filler: All Isolation Joints shall be constructed with joint filler. Joint filler shall extend the full depth of the slab and shall extend the full length of the joint. Use of multiple pieces of joint material of lesser dimensions to make up required depth and width of joint will not be permitted.
3. Where joints are to receive filler, recess joint filler 1/4-inch below finish surface or as otherwise indicated on the Drawings.

D. Control/Contraction Joints: Installed to form a weakened plane in a concrete member to provide a reduction in member thickness for the purpose of controlling shrinkage stresses to that specific area. Control/Contraction Joints shall be synonymous with "Dummy Joints."

1. Control/Contraction Joints shall be tooled or saw-cut.

a. Tooled joints: Tool-form joint into the concrete 1 inch in depth, but in no case less than 25 percent of slab depth. Joint width shall be 1/4-inch. Each side of tooled joint shall be dressed to match final overall slab finish. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before the slab has achieved its final set.

1) Where tooled joints are to receive joint sealant, provide 1/2-inch wide tooled joint and install backer rod material to create 1/4-inch recess below finished surface.

b. Saw-cut joints: Saw-cut joint into concrete 1 inch in depth, but in no case less than 25 percent of slab depth. Joint width shall be 1/8-inch. Cut joint using rotary saw within 4 to 12 hours after the concrete has been finished.

3.6 STEEL REINFORCEMENT

A. Install steel reinforcement as shown on the Drawings.

1. Welded Wire Reinforcement: Where WWR is called-for, install material in the upper 30 to 40 percent (30%–40%) of the overall slab thickness, or at the nearest depth below top of slab as required to achieve a minimum of 2-inches of cover.

B. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material, which may reduce the bond between the concrete and reinforcing. Where there is a delay in placing concrete after reinforcement is in place, bars shall be re-inspected and cleaned when necessary.

C. Any bar showing cracks after bending shall be discarded.

D. Minimum Cover: 2 inches, except where concrete is cast against and permanently exposed to earth minimum cover shall be 3 inches.

E. For slab-type construction, welded wire reinforcement and reinforcing bars shall be elevated off the base material by use of supports as specified herein. Adjacent sheets of welded wire reinforcing shall lap 6 inches.

F. Joints

1. Construction Joints: Reinforcement shall not continue through construction joints. Allow for 2-inches of cover at end of slab. Where called-for on the Drawings, install pins at Construction Joints per detail.
2. Isolation Joints/Expansion Joints: Allow for 2-inches of cover at end of slab.
3. Control/Contraction Joints: Cut at least one-half of reinforcement at joints.

G. Reinforcing shall be securely wired in the position called for, and shall be maintained in that position until concrete is placed and compacted.

3.7 PLACEMENT

A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint, and other material which might tend to reduce bond.

B. Existing concrete, earth, forms, and other water-permeable material against which new concrete is to be placed and shall be thoroughly damp when concrete is placed. There shall be no free water on the surface.

C. Concrete shall arrive at the job site in a timely manner so that no additional water will be required to produce the desired slump. When conditions develop that require the addition of water to produce the desired slump, permission of the Engineer must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

D. Concrete, which has set, or partially set, before placement shall not be employed.

E. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.

F. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

G. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8-inch thick shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

3.8 STAMPED OR TEXTURED CONCRETE

A. Construct concrete as recommended by the stamping system manufacturer. Apply pigmented release agent to tools and forms in accordance with the stamping system manufacturer's specifications. Place concrete and screed to the specified grade. Float the surface and evenly apply dry shake color hardener according to manufacturer's specifications.

B. Imprint the surface of the plastic concrete with the forms to obtain the specified pattern. The pigmented release agent will serve as the curing agent. Do not clean the surface until adequate curing has been obtained, as recommended by the stamping system manufacturer.

C. Saw cut all joints one-quarter inch wide and one-inch-deep, following the joint patterns illustrated in the typical sections, or as directed by the Engineer. Seal all joints, including expansion joints and sawed joints, with color-matched joint sealant, as recommended by the stamping system manufacturer. Apply two coats of low-lustre, matte finish clear surface sealer to the finished decorative concrete as recommended by the stamping system manufacturer.

D. Take steps to avoid the contamination of adjacent surfaces while placing and finishing colored, stamped concrete; clean all surfaces that do get contaminated. Areas that were not properly protected and/or cannot be cleaned to the satisfaction of the Engineer must be removed and replaced. All costs associated with this removal and replacement will be borne by the Contractor.

3.9 FINISHING

A. Concrete flatwork surfaces shall be screened off and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.

1. Finished concrete surface for concrete subbase shall be woodfloated to a slightly rough surface. Surface shall not deviate more than 1/4-inch in 10 feet.
2. Finished concrete surface for concrete pavement, walks, and pads shall be wood-floated and steel troweled to a smooth surface. Surface shall not deviate more than 1/8-inch in 10 feet.

B. Unless otherwise indicated, horizontal surfaces of concrete surfaces, which will be exposed, shall be given a light broomed finish, with direction of grooves in concrete surface perpendicular to length of concrete band, slab or pad. After concrete has set sufficiently to prevent coarse aggregate from being torn from the surface, but before it has completely set, brooms shall be drawn across it to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by the brooming operation.

C. Immediately following finishing operations, arises at edges and both sides of expansion joints shall be rounded to a ¼ inch radius. Control joints to be tooled shall be scored into slab surface with scoring tool. Adjacent edges of control joint shall be same time be finished to a ¼ inch radius.

D. Where finishing is performed before the end of the curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view and to receive a rubbed finish.
2. After repairing and patching, areas to receive spray applied stain finish shall receive one of the following surface preparations;

a. Power washing with a minimum of 3000 psi pressure.
b. Sand blasting to open concrete only, not to the degree of seeing exposed aggregate.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
2. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 CURING

A. Cure in accordance with ACI 308R.

B. Concrete shall be kept continuously damp from time of placement until the end of the specified curing period.

C. Water shall not be applied to curing concrete within 24 hours after initial placement. Any water shall be applied only to maintain damp conditions. Do not add water during floating and troweling operations.

D. Between finishing operations, the surface shall be protected from rapid drying by covering with a material specified herein. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of fine-spray of water, applied as often as necessary to prevent drying after the initial 24-hour cure period.

E. Concrete surfaces shall be cured by completely covering them with curing paper or an application of a curing compound.

1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.
2. If concrete is cured with a curing compound, the compound shall be applied at a rate of 200 square feet per gallon, in two applications perpendicular to each other.
3. Curing period shall be seven days minimum. Full-strength shall be considered after 28 days.

F. Only if additional protection is required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof Kraft curing paper may be used.

G. Integrally Colored Concrete: Cure using a curing compound specific for integrally colored concrete according to manufacturer's instructions using manufacturer's recommended application techniques. Apply curing and sealing compound at consistent time for each pour to maintain close color consistency.

3.12 COLD WEATHER CONCRETING

A. Comply with ACI 306R Guide to Cold Weather Concreting.

B. Materials for concrete shall be heated for concrete, which is mixed, placed or cured when the mean daily temperature is below 40 degrees F or is expected to fall below 40 degrees F within 72 hours. The concrete, after placement, shall be protected by covering, heat, or both.

C. Details of handling and protecting concrete during freezing weather shall be subject to the approval of Engineer.

3.13 HOT WEATHER CONCRETING

A. Comply with ACI 305R: Guide to Hot Weather Concreting.

B. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placement shall be sprinkled with cold water. Every effort shall be made to minimize delays that will result in excessive mixing of the concrete after arrival on the job.

C. During periods of excessively hot weather (95□F, or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305R. Any concrete with a temperature below 95□F, when ready for placement, will not be acceptable, and will be rejected.

D. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the Work so that conditions surrounding the construction of any part of the structure can be ascertained.

3.14 PROTECTION

A. Concrete surface shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, ½ inch thick plywood sheets shall be used to protect the exposed surface.

3.15 CLEAN UP

A. Remove all debris, residuals, and materials at the conclusion of the work. Dispose of all materials in accordance with applicable waste management regulations.

END OF SECTION 033200

SECTION 033511 - CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Low-gloss sealer.

1.3 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 090561 - Common Work Results For Flooring Preparation.

1.4 REFERENCE STANDARDS

A. ANSI A326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

B. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

C. ASTM C1315 - Standard Specification for Liqud Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with concrete floor placement and concrete floor curing.

B. Preinstallation Meeting:

1. Convene one week before starting work of this Section.
2. Conduct a review of procedures required to produce specified results.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Selection Samples: Provide color samples for Architect selection representative of range of colors within installation.

1. Joint filler material.

D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least 3 years of documented experience and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

B. Store materials to comply with manufacturer’s written instructions to prevent deterioration from moisture or other detrimental effects.

1.9 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet above the floor surface over each 20 foot square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F minimum.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Where multiple products are applied to the same concrete surface, verify compatibility with manufacturers.

2.2 COATINGS

A. Low-Gloss Clear Coating: Transparent, nonyellowing, acrylic-polymer-based coating.
   1. Composition: Water-based.
      a. Solids Content: 20 percent, minimum, when measured by volume.
      b. Acceptable Products:
         1) Dayton Superior Corporation; Hydroseal 18: www
         2) Euclid Chemical Company; AQUA-CURE VOX: www.euclidchemical.com/.
         3) Laticrete; L&M LUMISEAL FX: www.laticrete.com/.
         4) Substitutions: See Section 016000 - Product Requirements.

2.3 RELATED MATERIALS

A. Neutralizing Agent: Tri-sodium phosphate.

B. Joint Filler: Semi-rigid, 2 component, self-leveling, 100% solids polyurea:
   1. Durometer Shore A hardness: 80 minimum.
   2. Color as selected by Architect from manufacturer's full range.
   3. Acceptable Manufacturers:
      a. Euclid Chemical.
      b. Hi-Tech Systems.
      c. Metzger/McGuire.
      d. Substitutions: See Section 016000 - Product Requirements.

C. Water: Potable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this Section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

B. Prepare surfaces as required by finishing system manufacturer.

3.3 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

1. Use application materials, methods, and procedures required by coating manufacturer to establish and maintain specified warranty.

3.4 PROTECTION

A. Protect installed concrete floor finishes from subsequent construction operations.

B. Do not permit traffic over unprotected floor surface.

END OF SECTION

SECTION 040100 - MASONRY RESTORATION AND CLEANING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Repair of damaged masonry.

B. Repointing mortar joints. Extent and location of repointing on various locations is as shown on Drawings.

C. Cleaning of existing masonry surfaces. Extent of cleaning on various locations is as shown on Drawings.

1.3 RELATED REQUIREMENTS

A. Section 012100 - Allowances.

B. Section 012200.1 - Unit Prices.

C. Section 042000 - Unit Masonry: New masonry work.

1.4 SUMMARY AND SCOPE OF WORK

A. Work Included:

1. Brick Replacement: Removal of existing brick, cleaning of surrounding area, provision of new brick unit, mortar as needed, and tooling of joint.
2. Repointing: Removal of old mortar, cleaning of joint, addition of new mortar, and tooling of joint.
3. Brick Cleaning: Protection of surrounding non-masonry surfaces from cleaning products, preconditioning of the masonry with clean water, application of chemical cleaning products and working time, manual scrubbing, rinsing with appropriate pressure spray, and neutralization of cleaner products when required.

1.5 PRICE AND PAYMENT PROCEDURES

A. Allowances and Unit Prices:

1. See Sections 012100 - Allowances and 012200.1 - Unit Prices, for additional price requirements.

1.6 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.

B. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

C. ASTM C150/C150M - Standard Specification for Portland Cement.

D. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

E. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

F. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

1.7 DEFINITIONS

A. Extra Low-Pressure Spray:

1. Pressure: Up to 100 psi.
2. Flow Rate: 4 to 6 gpm.

B. Low-Pressure Spray:

1. Pressure: 100 psi to 400 psi.
2. Flow Rate: 4 to 6 gpm.

C. Medium-Pressure Spray:

1. Pressure: 400 to 800 psi.
2. Flow Rate: 4 to 6 gpm.

D. Hot Water: Water heated to a temperature of 140 to 160 deg F.

E. pH Neutral: Materials having a pH value between 6.7 and 7.5.

F. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

1.8 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this Section.

1. Require attendance of parties directly affecting work of this Section. At a minimum, require attendance by Contractor, Architect, Masonry Subcontractor, and Owner's Representative.
2. Review conditions of installation, installation procedures, and coordination with related work.
3. Review methods and procedures related to cleaning masonry.

1.9 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning compounds and cleaning solutions.

C. Selection Samples: For each type of masonry and mortar, submit four samples to illustrate matching color, texture, and extremes of color range.

D. Manufacturer's Instructions: For cleaning materials, indicate special procedures, and conditions requiring special attention.

1.10 MORTAR ANALYSIS

A. Mortar sampling and analysis shall be performed by an approved testing company with at least five years of documented experience in testing of historic mortar.

B. Take at least three samples from each exposure (north, south, east, and west) of every type of masonry that will be re-pointed. Samples shall be taken, to the extent possible, from clean mortar. Samples shall be taken from areas that do not appear, visually, to have been repointed.

C. Provide a written report identifying at a minimum; sample numbers, location, type of joint, hardness, color, aggregate shape, aggregate gradation, color of fines, color of sands, and percentages of lime, fines, sands, cements, and any other materials.

1.11 QUALITY ASSURANCE

A. Work shall be done by qualified skilled masons experienced in preservation masonry and methods having a minimum of three years of documented experience.

B. Comply with ACI 530.1-13. Contractor shall have a copy of this document available for reference on the job site.

C. Warranty: A warranty is required for a period of two years for full installation including mortar and accessories.

1. Obtain masonry and mortar ingredients of uniform quality, including color for exposed materials, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

1.12 MOCK-UP

A. Comply with general mock-up requirements specified in Section 014000.

B. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mock-up area 4 feet by 4 feet.

1. Locate where directed.

2. Acceptable panel and procedures employed will become the standard for work of this Section.

3. Mock-up may remain as part of the Work.

C. Repointing Mock-up: Rake out joints in two separate masonry wall areas, each two joints high by 2 feet wide, for each type of repointing required.

1. Locate where directed.
2. Acceptable panel and procedures employed will become the standard for work of this Section.
3. Mock-up may remain as part of the Work.
4. Repointing shall match existing mortar in color, texture, and tooling, and meeting the properties required in the mortar analysis for each type of historic masonry repair on the project.

D. Masonry Cleaning Mock-up: Clean a 5 ft by 5 ft panel of wall to determine extent of cleaning. Mock-up shall include examples of each type of masonry on the project.

1. Repeat, using different cleaning methods for up to three different panels.
2. Locate where directed.
3. Acceptable panel and procedures employed will become the standard for work of this Section.
4. Mock-up may remain as part of the Work.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

1.14 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

B. Do not blast clean or use process creating dust and dirt when wind is over 10 mph.

PART 2 PRODUCTS

2.1 MASONRY MATERIALS

A. Salvaged Brick: Face brick obtained from this building, resulting form cutting of new openings, and other selective demolition.

B. Replacement and Restoration Masonry Units: Match existing as closely as possible; materials subject to approval of Architect.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II; color as required to produce approved color sample.

1. Not more than 0.60 percent alkali.

2. Hydrated Lime: ASTM C207, Type S.

3. Mortar Aggregate: ASTM C144.

   a. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

   b. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

   c. Provide sand with rounded edges.

4. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.

   a. Acceptable Manufacturers:

      1) Davis Colors.

      2) Lambert Corporation.

      3) Solomon Colors, Inc.

5. Admixtures:

   a. No calcium chloride or admixtures containing calcium chloride shall be used in the mortar.

   b. No air-entraining admixtures or material containing air-entraining admixtures shall be used in the mortar.

   c. No antifreeze compounds or other substances shall be added to the mortar.

   d. No corrosion-promoting admixtures shall be used in the mortar.

   e. Water shall be clean, potable and free of deleterious amounts of acids, alkalis or organic materials.

   f. No admixtures shall be used without written approval.

2.3 MORTAR MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

1. Pointing Mortar: Type N unless otherwise indicated; with cementitious material limited to portland cement and lime. Add mortar pigments to produce mortar colors required.

2. Match existing as closely as possible; materials subject to approval of Architect.

2.4 MANUFACTURED REPAIR MATERIALS

A. Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.

1. Use formulation that is equal to vapor and water permeability of masonry, exhibits low shrinkage, has lower modulus of elasticity than the masonry being repaired, and develops high bond strength to all surfaces.
2. Match colors and textures to masonry being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each type of unit.
3. Acceptable Manufacturers:
    a. Cathedral Stone Products, Inc.
    b. Conproco Corporation.
    c. Edison Coatings, Inc.

2.5 PAINT REMOVERS

A. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation for removing paint from masonry; containing no methanol or methylene chloride.
    1. Products:
        a. American Building Restoration Products, Inc.; Super Bio Strip Gel.
        b. Cathedral Stone Products, Inc.; S-305.
        c. Dumond Chemicals, Inc; Smart Strip Pro.
        d. PROSOCO, Inc; Enviro Klean SafStrip 8.

2.6 SEALANT AND TAR REMOVERS

A. Manufacturer's standard heavy duty solvent Asphalt & Tar Remover for removal of deposits of roofing asphalt, tar and caulking stains.
    1. Products:
        a. American Building Restoration Products, Inc; TR-7 Tar & Mastic Remover
        b. PROSOCO, Inc.; Sure Klean® Asphalt & Tar Remover; Dicone NC9
        c. Dumond Chemicals, Inc; Smart Strip.
        d. Cathedral Stone Products, Inc.; S-301.
        e. American Sealants Inc., ASI 0240 Adhesive Cleaner and Remover

2.7 CLEANING MATERIALS

A. Water: Potable.

B. Select cleaning materials from among the following, to be determined by testing. Select the mildest product in each group that produces the desired cleaning effect.

C. Mild Cleaning Treatments:

1. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

a. Products:

1) Cathedral Stone Products, Inc.; MasonRE B.

2) Price Research, Ltd.; Price Marble Cleaner-Gel.

3) PROSOCO, Inc; ReKlaim Cleaner.

2. Nonacidic Gel Cleaner: Manufacturer's standard gel formulation, with pH between 6 and 9, that contains detergents with chelating agents and is specifically formulated for cleaning masonry surfaces.

a. Products:

1) Cathedral Stone Products, Inc.; MasonRE B.

2) Price Research, Ltd.; Price Marble Cleaner-Gel.

3) PROSOCO, Inc; Sure Klean 942 Limestone and Marble Cleaner.

3. Nonacidic Liquid Cleaner: Manufacturer's standard mildly alkaline liquid cleaner formulated for removing mold, mildew, and other organic soiling from ordinary building materials, including polished stone, brick, aluminum, plastics, and wood.

a. Products:

1) Cathedral Stone Products, Inc.; Bio-

2) D2 Biological Solutions, Inc.; D2 Biological Solution.

3) Diedrich Technologies, Inc.; a Hohmann & Barnard company; 910 PM Polished Marble/Granite Cleaner.

4) Dumond Chemicals, Inc; Safe n' Easy Architectural Cleaner/Restorer; Safe n' Easy Limestone Cleaner.

5) Price Research, Ltd.; Price Non-Acid Masonry Cleaner.

6) PROSOCO, Inc; Enviro Klean 2010 AllSurface Cleaner; Enviro Klean ReVive.

D. Rust Stain Remover:

1. Products:

a. American Building Restoration Products, Inc.; ABR 50 Rust Remover.

b. Dumond Chemicals, Inc.; Safe 'n Easy Masonry Rust Remover.

c. Cathedral Stone Products, Inc.; Light Duty Rust Remover; Heavy Duty Rust Remover.

E. Mold, Mildew, and Algae Remover:

1. Job Mixed: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 5 quarts of 5 percent sodium hypochlorite (bleach), and 15 quarts of hot water for every 5 gal. of solution required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to be cleaned, restored, and repointed are ready for work of this Section.

B. Prior to commencing work, inspect conditions, installations, and verify that the surfaces to receive the work are sound, proper and complete to the point that the work may be properly commenced.

3.2 PREPARATION

A. Protect surrounding elements from damage due to restoration procedures.

B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.

C. Cover existing landscaping with tarpaulins or similar covers.

D. Close off adjacent occupied areas with dust proof and weatherproof partitions.

E. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

3.3 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Cut away loose or unsound adjoining masonry to provide firm and solid bearing for new work.

D. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

E. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units in existing backup, rotted wood, rusted metal, and other deteriorated items.

F. Where bricks can be salvaged and reused, remove in an undamaged condition as many whole bricks as possible. Remove mortar and sealant from surfaces of removed units.

G. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.

H. Replace removed damaged brick with other removed brick in good condition, where possible, matching existing brick. Do not use broken units unless they can be cut to usable size.

I. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Maintain joint width for replacement units to match existing joints.

J. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

K. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours.

3.4 MASONRY PATCHING

A. Patch the following bricks unless another type of repair or replacement is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.

B. Remove all loose mortar and masonry prior to installation of the repair materials. “Sound” masonry with a hammer to verify its integrity. If necessary, cut away an additional 1/2” of the substrate to ensure the surface to be repaired is solid and stable. Remove any sealant residue.

C. Cut the edges of the repair area to provide a minimum depth of 1/4”. The edges of the repair should be square cut. Do not allow any feathered edges in the repair area.

D. Clean all dust from surface and pores of the substrate, using clean water and a scrub brush.

E. Apply the mortar mix using a trowel to place and compress the mortar into the repair ensuring not to leave any voids. Follow manufacturer's written instructions.

F. Finish to match existing masonry finish.

G. Follow manufacturer's curing procedures.

3.5 REPOINTING

A. Perform repointing prior to cleaning masonry surfaces.

B. Cut out loose or disintegrated mortar in joints to minimum of 2-1/2 times the joint width or 1/2 inch, whichever is greater, until sound mortar is reached.

C. Use power tools only after test cuts determine no damage to masonry units will result. Power tools are only allowed when testing is complete, and used only in the presence and under supervision of a qualified preservation architect.

D. Do not damage masonry units.

E. When cutting is complete, remove dust and loose material by brushing.

F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch layers. Form a smooth, compact concave or flush joint to match existing. Mortar shall be pre-hydrated before use, and shall be installed before lapsed time of 1 hour of initial mixing. If temperatures are above 80 degrees, ½ hour is the limit. Discard all dry stiff mortar not used within the limit. Do not re-temper. Dampen the raked joint to a SSD condition to avoid reduction of bond strength of the mortar. Do not allow excessive water in the joint. Install the mortar in 2 or 3 states, compacting mortar of approximately ¼-inch thickness thoroughly into the joint. Allow each compacted layer to stiffen to thumbprint hardness before adding succeeding layers. Match the existing mortar joint profile. Strike joint to profile when final layer is thumbprint hard.

G. Moist cure for 72 hours.

3.6 CLEANING - GENERAL

A. Immediately remove stains, efflorescence, or other excess resulting from the work of this Section.

B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

C. Proceed with cleaning in an orderly manner; work from bottom to top of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

D. Water-Spray Application Method: Unless otherwise indicated, hold spray nozzle at least 6 inches from masonry surface, and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

G. Clean surrounding surfaces.

3.7 CLEANING

A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.

B. Clean surfaces of dirt or other contamination using the gentlest method that is effective.

1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.

2. Clean out cracks and voids using same methods.

C. The following are acceptable cleaning methods, in order from gentlest to less gentle:

1. Vegetation Removal: Remove plant, moss, and vegetation, and, if necessary, scrub surfaces with mild detergents to dissolve and remove roots.
2. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, caulking, asphalt, and tar.
3. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
4. Increasing the water washing pressure to maximum of 400 psi.
5. Adding detergent to washing water; with final water rinse to remove residual detergent.
6. Steam-generated low-pressure hot-water washing.
7. Nonacidic gel or liquid cleaning agent applied for the least amount of time that is effective, followed by low pressure hot water rinse.

D. Do not use any of the following cleaning methods, unless otherwise indicated:

1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
2. Soap or detergent that is not non-ionic.
3. Water washing pressure to over 400 psi.
4. Acidic cleaning agents.
5. Abrasive blasting.

END OF SECTION

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SECTION 042000 - UNIT MASONRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Mortar and grout.

D. Reinforcement and anchorage.

E. Flashings.

F. Lintels.

G. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Loose steel lintels.

B. Section 072100 - Thermal Insulation: Insulation for cavity spaces.

C. Section 079200 - Joint Sealants: Sealing control and expansion joints.

1.4 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

G. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.

H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

I. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

J. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units.

K. ASTM C91/C91M - Standard Specification for Masonry Cement.

L. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.

M. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.

N. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).

O. ASTM C270 - Standard Specification for Mortar for Unit Masonry.

P. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

Q. ASTM C476 - Standard Specification for Grout for Masonry.

R. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements.

S. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

T. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete.

U. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

V. ASTM C1384 - Standard Specification for Admixtures for Masonry Mortars.

W. ASTM C1611 - Standard Test Method for Slump Flow of Self-Consolidating Concrete.

X. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.

Y. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

Z. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

AA. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing.

BB. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls.

CC. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

DD. UL (FRD) - Fire Resistance Directory.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting two weeks before starting work of this section; require attendance by all relevant installers.

1. Required participants:

a. Owner.

b. Architect.

c. Contractor.

d. Project Superintendent.

e. Mason Contractor Foreman.

f. Structural Masonry Special Inspector.

g. Testing Agency.

2. Agenda:

a. Mock-up requirements.

b. Schedule and sequencing.

c. Requirements for testing and special inspections.

d. Hot and cold weather construction procedures.

e. Typical and atypical details.

f. Locations of movement joints.

g. Storage and staging.

h. Temporary bracing.

i. Coordination with other trades.

j. Coordination of foundation dowel locations.

k. Protection of adjacent construction.

l. Compatibility of admixtures.

m. Cleaning procedures.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, mortar, masonry accessories, and reinforcement and anchorage accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, sizes and accessories.

1. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

D. Samples: Submit two samples of each type of decorative masonry unit to illustrate color, texture, and extremes of color range.

E. Samples: Submit two samples of each pigmented mortar color.

F. Mix Designs: For each type of mortar and grout. Include description of types and proportions of ingredients.

G. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1. For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

H. Manufacturer's Qualification Statement.

I. Installer's Qualification Statement.

J. Masonry Cleaning Plan: Include products and techniques for each masonry product of assembly and combined masonry assembly.

1.7 QUALITY ASSURANCE

A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

B. Fire Rated Assemblies: Comply with applicable code for specified requirements for fire rated masonry construction.

1. Fire rated concrete masonry units shall be in compliance when the masonry has been certified through the equivalent thickness method contained in Chapter 3 of ACI 216.1 for concrete masonry and Chapter 5 for effects of finish materials.

C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.8 MOCK-UPS

A. Integrated Exterior Mock-up: Construct an exterior masonry wall demonstrating aesthetics and workmanship with masonry veneers stepped back so that each detail is visible for inspection. Include masonry veneer, mortar, accessories, structural backup, reinforcement, wall openings, flashings (with lap joint, corner, and end dam), weather barrier, and wall insulation in mock-up.

1. Minimum Size: 8 by 8 foot.
2. Locate where directed.
3. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Store materials and accessories on elevated platforms in dry location. Keep materials covered with weatherproof sheeting secured from wind. Minimize condensation in shrinkage-wrapped pallets of units.

1.10 FIELD CONDITIONS

A. During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress. Extend cover a minimum of 24 inches down both sides of walls and hold securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after constructing masonry walls or columns.

C. Hot and Cold Weather Requirements: Compy with TMS 402/602.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMU)

A. Acceptable Manufacturers:
1. Best Block: www.bestblock.com.
2. Cemex: www.cemexusa.com.
3. Fendt Builder's Supply, Inc.: www.fendtproducts.com.
4. Grand Blanc: www.grandblanccementproducts.com.
5. National Block Company: www.nationalblock.com.
6. Superior Block Co. Inc.: www.superiorblock.com.
7. Substitutions: See Section 01 6000 - Product requirements.

B. Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
2. Special Shapes: Provide nonstandard blocks configured for lintels and jambs.
   a. Provide bullnose units for outside corners.
3. Load-Bearing Units: ASTM C90, normal weight.

a. Hollow block, as indicated.

b. Unit Compressive Strength: 2,000 psi minimum.

2.2 BRICK UNITS

A. Manufacturers:

1. Basis of Design: Glen-Gery: www.glengery.com.

B. Other Acceptable Manufacturers:

1. Belden Brick: www.beldenbrick.com/#sle.
2. Endicott Clay Products Co: www.endicott.com/#sle.
3. General Shale Brick: www.generalshale.com/#sle.
4. Substitutions: See section 016000 - Product Requirements.

C. Facing Brick for New Construction:

1. Series and Style: Roman Maximus
2. Color: Black
3. Texture: Manufacturer's standard.
4. Quantity Distribution of Sizes:

a. 70%: Roman Maximus length; 3-5/8” x 1-5/8” x 23-5/8”; solids.

b. 15%: random lengths.

c. 15%: Roman size; 3-5/8” x 1-5/8” x 11-5/8”; cored brick for use on corners when covered headers are needed.

5. Bond Pattern: Sicilian.

D. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.

E. Facing Brick to Match Existing Construction: ASTM C216

1. Series and Style: Hanley Classics; Extruded.
2. Color: Rome Grey.
3. Texture: Wirecut.

F. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.

1. Efflorescence: Provide brick rated “not effloresced” when tested according to ASTM C67/C67M.
2. Surface Coating: Brick with colors or textures produced by application of organic coatings shall withstand 50 cycles of freezing and thawing per ASTM C67/C67M with no observable difference in applied finish when viewed from 10 feet.
3. Provide brick units from single runs and factory blended for specified color range.
4. Color and texture: As indicated on drawings.
5. Actual size: Modular: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

6. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.3 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M.

1. Colored Mortar: Premixed cement as required to match Architect's color sample.

B. Mortar Cement: ASTM C1329.

1. Colored Mortar: Premixed cement as required to match Architect's color sample.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

1. Blended Hydraulic Cement: ASTM C595/C595M, Type IL or Type IIL, except Type IIIL may be used for cold-weather construction.
2. Cement Color: Color as required to produce approved color sample.

D. Hydrated Lime: ASTM C207, Type S.

E. Mortar Aggregate: ASTM C144.

F. Grout Aggregate: ASTM C404.

G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

1. Color(s): As selected by Architect from manufacturer's full range.
2. Manufacturers:

a. Davis Colors, a division of Venator Materials PLC: www.daviscolors.com/#sle.

b. Lambert Corporation: www.lambertusa.com/#sle.

c. Solomon Colors, Inc: www.solomoncolors.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

H. Water: Clean and potable.

I. Admixtures: Comply with ASTM C1384 to enhance set retarding, set accelerating, bond, and workability.

J. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

1. Color: Mineral pigments added as required to produce approved color sample.

K. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

1. Do not use water-repellent materials or admixture or air-entraining admixture when grout will be in contact with reinforcement.
2. Type: Coarse.

2.4 REINFORCEMENT AND ANCHORAGE

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; uncoated.

B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Ladder.
2. Material:
a. Interior Walls: ASTM A1064/A1064M steel wire, mill galvanized to 16 CFR 1201 Class 3.
b. Exterior Walls: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to 16 CFR 1201 Class B.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

C. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Ladder, with adjustable ties spaced at 16 in on center.
2. Material: Same as required for single wythe reinforcement.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 1 1/4 inches.
5. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

D. Ties and Anchors - General: Provide ties and anchors, hot dip galvanized to ASTM A 153/A 153M, Class B, except as follows.
1. Provide stainless steel ties and anchors in swimming pool, seating area, locker room, checmical storage rooms.
2. Provide stainless steel ties and anchors in rooms subject to high humidity or wetting.

E. Flexible Anchors for Connecting to Structure: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.
1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch thick, with trapezoidal wire ties 0.1875 inch thick.

F. Masonry Veneer Anchors for Stud Back-up with Continuous Insulation: 2-piece anchors that permit differential movement between masonry veneer and structural backup.
1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.

3. Vertical adjustment: Not less than 1-1/4 inches.
4. Acceptable Products:
    a. Hohmann & Barnard, Inc.; HB-213.
    b. Blok Lok BL-407 with insulation washers.
    c. Wirebond; 2407 Adjustable Veneer Anchor with insulation washers.
    d. Wirebond; RJ-711 Adjustable Veneer Anchor.
    e. Substitutions: See Section 01 6000 - Product Requirements.

G. Masonry Veneer Anchors for CMU or Concrete Back-up with Continuous Insulation: 2-piece anchors that permit differential movement between masonry veneer and structural backup.
1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 1-1/4 inches.
4. Acceptable Products:
    a. Hohmann & Barnard, Inc.; HB-5213.
    b. Blok Lok BL-407 with insulation washers.
    c. Wirebond; 2407 Adjustable Veneer Anchor with insulation washers.
    d. Wirebond; RJ-711 Adjustable Veneer Anchor.
    e. Substitutions: See Section 01 6000 - Product Requirements.

2.5 FLASHINGS

A. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
1. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet with 8 mil of butyl adhesive and a removable release liner.
    a. Manufacturers:
        1) Hohmann & Barnard, Inc; Mighty-Flash SA: www.h-b.com/#sle.
        2) STS Coatings, Inc; Wall Guardian Self Adhering Stainless Steel Flashing: www.stscoatings.com/#sle.
        3) VaproShield, LLC; Vapro-SS-Flashing: www.vaproshield.com/#sle.
        4) WIRE-BOND; BOND-N-FLASH S.A.: www.wirebond.com/#sle.
        5) York Flashings; York 304: www.yorkflashings.com/#sle.
        6) Substitutions: See Section 016000 - Product Requirements.

B. Termination Bars: Stainless steel; compatible with membrane and adhesives.

1. Type: Provide flanged type for continuous sealant along top edge.

C. Drip Edge: Stainless steel; Type 304, 0.0156 inches thick.

1. Type at Lintels, Shelf Angles, and All Locations Except at Grade: Drip edge extending at least 3 inches horizontally into masonry and 1/2 inch out from exterior face of masonry with outer edge bent down 45 degrees and hemmed.
2. Type at Grade: Drip edge extending at least 3 inches horizontally into masonry and outer edge bent 180 degrees flush with face of masonry.
3. Sealant Between Layers of Sheet Metal: One-part, non-skinning butyl sealant.

D. Adhesives, Primers, Sealants, and Seam Tapes for Flexible Membrane Flashing Systems: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.6 ACCESSORIES

A. Preformed Control Joints: Rubber or polyvinyl chloride material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell rubber, neoprene or polyurethane; oversized 50 percent to joint width; self expanding; in maximum lengths available.

1. Complying with ASTM D1056, Grade 2A1.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

a. Manufacturers:

1) Advanced Building Products, Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.

2) Hohmann & Barnard, Inc.; Mortar Trap: www.h-b.com

3) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.

4) WIRE-BOND; Cavity Net DT: www.wirebond.com/#sle.

5) York Flashings; Weep-Net: www.yorkflashings.com/#sle.

6) Substitutions: See Section 016000 - Product Requirements.

D. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.

E. Weeps:

1. Type: Molded PVC grilles, insect resistant.
2. Color(s): As selected by Architect from manufacturer's full range.
3. Manufacturers:

a. Advanced Building Products, Inc; Mortar Maze Cell Vent: www.advancedbuildingproducts.com/#sle.

b. Blok-Lok Limited; CELLVENT: www.blok-lok.com/#sle.

c. Hohmann & Barnard, Inc; QV Quadro-Vent: www.h-b.com/#sle.

d. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.

e. WIRE-BOND; Cell Vent: www.wirebond.com/#sle.

f. Substitutions: See Section 016000 - Product Requirements.

F. Grout Retainer: Mesh screen, width 1 inch less than masonry unit width. Use at bottom of open bottom unit to retain grout without use of special shaped CMUs and without breaking mortar bond.

G. Cavity Vents:

1. Color(s): As selected by Architect from manufacturer's full range.
2. Manufacturers:

a. Blok-Lok Limited: www.blok-lok.com/#sle.

b. Hohmann & Barnard, Inc: www.h-b.com/#sle.

c. Mortar Net Solutions; CellVent: www.mortarnet.com/#sle.

d. WIRE-BOND: www.wirebond.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.7 LINTELS

A. Steel Lintels: Specified in Section 055000.

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMU matching adjacent CMU in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure lintels before handling and installing. Temporarily support build-in-place lintels until cured.

1. Use masonry lintels in concrete masonry unit walls where lintel is exposed, and as specified in Structural Drawings.

2.8 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

1. Masonry below grade and in contact with earth: Type M.
2. Exterior, loadbearing masonry: Type S.
3. Exterior, non-loadbearing masonry: Type S.

4. Masonry Veneers: Type N.
5. Interior, loadbearing masonry: Type S.
6. Interior, non-loadbearing masonry: Type N.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.
1. Inspect concrete foundations for compliance with tolerances of TMS 602.
2. Verify reinforcing dowels are positioned in accordance with drawings

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare foundation surface for adequate masonry bond.

B. Direct and coordinate placement of metal anchors supplied for installation under other sections.

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 FACE BRICK REMOVAL AND SALVAGE

A. At locations indicated, remove existing face brick and salvage for reuse. Carefully remove entire units from joint to joint, without damaging units or surrounding masonry.

B. Support and protect remaining masonry that surrounds removal area.

C. Remove in an undamaged condition as many whole existing face brick units as possible.
1. Remove mortar, loose particles, and soil from face brick and glazed brick by cleaning with hand chisels, brushes, and water.
2. Store salvaged face brick for reuse, as indicated.

D. Clean surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

3.4 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.5 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.
2. Mortar Joints: Concave.

D. Brick Units:

1. Bond: As indicated for different locations.
2. Mortar Joints: Concave.

3.6 PLACING AND BONDING

A. Use full-size units without cutting where possible. Where cutting is required, provide clean, sharp, unchipped edges. Allow units to dry before laying. Install cut units with cut surfaces concealed.

B. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

C. Lay hollow masonry units with face shell bedding on head and bed joints.

D. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen dampproofing is applied and at locations where required by the work of other Sections.

I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.7 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels, at bottom of walls, and where indicated.

3.8 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.9 REINFORCEMENT AND ANCHORAGE - CMU

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center, except as follows.

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Place continuous reinforcement around corners.

E. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

F. Lap joint reinforcement ends minimum 12 inches.

G. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

H. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 24 inches horizontally and 16 inches vertically.

I. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. At horizontal changes between non-cementitious masonry (clay, natural stone, calcium silicate) and cementitious masonry (CMU) provide horizontal joint reinforcement complying with CMHA TEK 05-02A, unless otherwise detailed with bond break material, slip plane, or thru-wall flashing.

B. Secure veneer anchors to back-up substrates and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally.

3.11 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 2 inches, minimum, to form watertight pan at nonmasonry construction.

a. Remove or cover protrusions or sharp edges that could puncture flashings.

b. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing and extending minimum 6 inches above top of cavity drainage material:

1. Install vertical leg of flashing over air and water-resistive barriers oper manufacturer’s directions.

2. Roll laps in self-adhering flashing, leaving no fish-mouths, and apply manufacturer’s mastic at exposed cut edges.

3. Anchor vertical leg of flashing into backing with a termination bar and continous sealant along top edge.

4. Extend self-adhering flashings to within 3/4 inch of exterior face of masonry and adhere to top of stainless steel drip edge.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound.

3.12 LINTELS

A. Install loose steel lintels over openings where indicated.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.

1. Place reinforcing as indicated on drawings.

2. Do not splice reinforcing bars.

3. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

4. Place and consolidate grout fill without displacing reinforcing.

5. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 8 inch bearing on each side of opening.

3.13 GROUTED COMPONENTS

A. Comply with consolidation requirements and grout pour height and grout lift height limitations of TMS 602.

B. Reinforce bond beams as indicated on drawings.

C. Lap splices minimum 24 bar diameters.

D. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

E. Place and consolidate grout fill without displacing reinforcing.

F. Grout solid all hollow concrete unit masonry located below grade and at other locations indicated.

G. At bearing locations, fill masonry cores with grout for a minimum 8 inches either side of opening.

3.14 CONTROL AND EXPANSION JOINTS

A. Size as indicated on Drawings; if not shown, 3/8 inch wide.

B. Do not continue horizontal joint reinforcement through control or expansion joints.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. If control joint locations are not indicated on drawings, locate control joints in CMU walls complying with the NCMA TEK note recommendations and at wall height changes; within ten feet of corners; at wall thickness changes; at bond beam breaks; at abutments of columns and walls; at abutment of cold garages to warm basements or walls; at openings in walls such as doors and windows; and at intervals in continuous walls not exceeding 20 feet in length, unless more restrictive spacing is recommended in the NCMA TEK notes.

E. Locate expansion joints in masonry veneers as indicated on drawings and in compliance with the Brick Industry Association Technical Notes.

1. If expansion joints are not indicated on drawings, request Architect clarification.

3.15 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.

1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/8 inch, plus 1/8 inch.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow testing agencies and inspectors access to work areas as needed. Retesting of materials that fail to comply with specified requirements shall be done at Contractor’s expense.

1. See Structural Drawings for additional requirements.

B. Grout: Compressive strength tests per ASTM C1019. Form grout specimens using units used for this project. Do not use cardboard forms unless written approval is obtained based on comparative preconstruction testing performed with units used for this project.

C. Self-Consolidating Grout: Compressive strength tests per ASTM C1019 and slump flow and visual stability index (VSI) per ASTM C1611.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, Annex 4.

3.19 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean masonry using materials approved in Masonry Cleaning Plan. Use cleaning procedures so as not to damage masonry surfaces and consistent with the quality standards established in an approved mock-up or on an inconspicuous area of new masonry as determined by Architect.

D. Use non-metallic tools in cleaning operations.

3.20 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

B. Protect sills, ledges, and projections from mortar droppings. Protect base of wall from mortar and mud splashes.

C. Replace damaged and defective work at no cost to Owner.

END OF SECTION

SECTION 050513.1 – SHOP APPLIED COATINGS FOR METAL (SITE/CIVIL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Factory-applied powder prime-coat and powder-coated finish for the following fabrications including, but not limited to:

1. Steel bollards.

1.3 REFERENCE STANDARDS

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements

of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 29 CFR 1926, SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION.

A. American Architectural Manufactures Association

1. AAMA 2605 – High Performance Exterior

B. American Welding Society

1. D1.1/D1.1M:2006, Structural Welding Code - Steel

C. ASTM International (ASTM).

1. ASTM A385 - Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
2. ASTM A780 - Practice for Repair of Damaged Hot-Dip Galvanized Coatings.
3. ASTM B117 - Practice for Operating Salt Spray Apparatus.
4. ASTM D523 - Standard Test Method for Specular Gloss
5. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
6. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
7. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
8. ASTM D2967 - Standard Test Method for Corner Coverage of Powder Coatings.
9. ASTM D3363 - Test Method for Film Hardness by Pencil Test.
10. ASTM D4585 - Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
11. ASTM D5861 - Standard Guide for Significance of Particle Size Measurements of Coating Powders.

D. National Association of Architectural Metal Manufacturers (NAAMM).

1. “Pipe Railing Manual, Including Round Tube"

E. Master Painters Institute (MPI)

1.01 SUBMITTALS

F. Shop Drawings

1. Submit shop drawings of metal components to be finished, showing sizes, details of fabrication and construction, bends and radii, handrail brackets, locations of hardware, anchors, and accessories, and installation details. Shop Drawings shall be submitted to Engineer for approval prior to ordering materials.
2. Submit manufacturers' product data of coating system and powder coating product.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section.

1.7 WARRANTY

A. Coating Warranty: Coating Applicator's warranty in which Applicator agrees to repair finish or replace coated items that demonstrate deterioration of shop-applied finishes within warranty period indicated.

1. Exposed Coating: Deterioration includes but is not limited to:

a. Color fading per ASTM D2244.
b. Peeling, cracking, or cracking of coating adhesion to metal.

B. Warranty Period: 10 Years from date of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Supply: Component materials must be supplied in consistent quality in appearance and physical properties.

B. Materials shall be wrapped or otherwise packaged for shipment and storage as appropriate.

C. Store materials to avoid damage from moisture, abrasion, and other construction activities.

PART 2 - PRODUCTS

2.1 STEEL BOLLARDS AND RAILINGS

A. Bollards and railings shall receive a duplex coating of powder primer and powder coat finish.

B. Galvanizing

1. Hot dip galvanized, ASTM F 1083. Type "A" internal and external surfaces, ASTM F1043.
2. Safeguarding against steel embrittlement: conform with applicable requirements of ASTM A143.
3. Safeguarding against warpage and distortion of steel members: conform with applicable requirements of ASTM A384.
4. Shop galvanized metalwork necessitating field welding which in any manner removes original galvanizing shall be restored by galvanizing repair in accordance with ASTM A780.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review product manufacturer's special instructions for surface preparation, application, temperature, re-coat times, and product limitations.

B. Do not begin finishing until substrates have been properly prepared.

C. Ensure that surfaces to receive paint are dry immediately prior to application.

D. Examine surfaces to receive coatings for surface imperfections and contaminants that could impair performance or appearance of coatings, including but not limited to, loose primer, rust, scale, oil, grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions.

E. Correct conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

F. If substrate preparation is the responsibility of another installer, notify Landscape Architect of unsatisfactory preparation before proceeding. Commencement of work constitutes acceptance of conditions.

3.2 SURFACE PREPARATION

A. Steel: Should be cleaned by the surface preparations described below.

1. Near White Metal Blast Cleaning, SSPC-SP10 or NACE 2: Remove all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale, and small specks of previous coating. Random staining shall be limited to no more than 5% of each area of surface (a unit of area is defined as 9 square inches).

B. Following White-Metal Blast Cleaning, pretreat surfaces to receive coatings using applicator’s proprietary wash coat process including chemical conversion and five stage wash.

3.3 APPLICATION

A. Apply coatings in accordance with manufacturer’s instructions to uniform surface free from blemishes.

B. Electrostatically apply powder coating to 2 to 4 mil thickness.

C. After application polymerize coatings at 400 degrees F for 20 minutes.

3.4 POLYESTER POWDER COATING

A. Polyester Powder Primer: Electrostatically applied zinc-rich primer powder coating, heat cured to chemically bond primer to metal substrate.

B. Polyester Powder Coating: Electrostatically applied colored polyester powder coating heat cured to chemically bond finish to primer substrate.

1. Minimum hardness measured in accordance with ASTM D3363: 2H.
2. Direct impact resistance tested in accordance with ASTM D2794: Withstand 160 inch-pounds.
3. Salt spray resistance tested in accordance with ASTM B117: No undercutting, rusting, or blistering after 500 hours in 5 percent salt spray at 95 degrees F and 95 percent relative humidity and after 1000 hours less than [3/16 inch] [5 mm] undercutting.
4. Weatherability tested in accordance with ASTM D822: No film failure and 88 percent gloss retention after 1 year exposure in South Florida with test panels tilted at 45 degrees.

C. Color: Black (Federal Standard 27038) ASTM D 7803, 2 mil minimum finish coat thickness.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

END OF SECTION 050513.1

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members, suspension cables, sag rods, and struts.

C. Base plates, shear stud connectors and expansion joint plates.

D. Grouting under base plates.

1.2 DESCRIPTION OF WORK

A. This contract includes all labor, materials, equipment and appliances necessary to complete all structural steel as indicated or scheduled on the drawings or hereafter specified.

B. See drawings and schedules for type, location, quantity and details of structural steel required to complete work. Anchor bolts and other incidental items of structural steel to be built into concrete or masonry shall be furnished to respective trades at the proper time and shall include details for their installation.

1.3 RELATED REQUIREMENTS

A. Division 03 - Concrete

B. Section 051213 - Architecturally-Exposed Structural Steel Framing: Additional requirements for structural steel members designated as architecturally-exposed structural steel (AESS).

C. Section 053100 - Steel Decking: Support framing for small openings in deck.

D. Section 055000 - Metal Fabrications: Steel fabrications affecting structural steel work. For steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other steel items not defined as structural steel.

1.4 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual.

B. AISC 207 - Standard for Certification Programs.

C. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.

D. AISC 360 - Specification for Structural Steel Buildings.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

H. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

I. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.

J. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).

K. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

L. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

M. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.

N. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film.

O. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments.

P. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry.

Q. ASTM E709 - Standard Guide for Magnetic Particle Testing.

R. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

S. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series.

T. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

U. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

V. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

W. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

X. AWS D1.1/D1.1M - Structural Welding Code - Steel.

Y. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

Z. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections.

AA. SSPC-SP 2 - Hand Tool Cleaning.

BB. SSPC-SP 3 - Power Tool Cleaning.

CC. SSPC-SP 6 - Commercial Blast Cleaning.

1.5 DEFINITIONS

A. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturer's written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Contractor shall submit for approval copies of all erection drawings.

a. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

b. Indicate welded connections with AWS A2.4 welding symbols, distinguishing between shop and field welds. Indicate size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

c. Indicated type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

d. Indicate locations and dimensions of protected zones.

2. Approval will be for sizes, and locations of principal members only.

3. Connections, as well as any errors in dimensions shown on shop drawings, shall be the responsibility of the contractor. After approval, additional copies shall be furnished for distribution and use in the field.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, include the following:

1. Power source (constant current or constant voltage).

2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats..

F. Materials Test Reports: Submit independent test results or engineered performance analysis of structural thermal-break pad performance in bearing or slip-critical connections where shear and moment loads are applied.

G. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

H. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.8 QUALITY ASSURANCE

A. Design, fabricate, and erect structural steel members in accordance with AISC (MAN) "Steel Construction Manual" and the latest edition of AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings."

B. Maintain one copy of each document on site.

C. Fabricator: Company specializing in performing the work of this section with minimum _____ years of documented experience.

D. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.

E. Fabricator Qualifications:

1. Fabricator is a member of American Institute of Steel Construction, Inc. (AISC). Is certified in the AISC Quality Certification Program and is designated as an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

a. Fabricator shall be registered with and approved by authorities having jurisdiction.

2. Experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance.

3. Sufficient production capacity to fabricate structural steel without delaying the work.

F. Installer Qualifications:

1. A qualified installer who participates in the AISC Quality Certification Program and is designated as an AISC-Certified Erector, Category ACSE.

2. Should be a company specializing in performing the work of this section with minimum _____ years of documented experience.

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

H. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

B. Store fasteners in a protected place in sealed container with manufacturer's labels intact.

1. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

B. Moment Connections: Type PR, partially restrained.

C. Construction: Combined system of moment frame and shear walls.

2.2 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M, ASTM A572/A572M Grade 50 (345), ASTM A529/A529M Grade 50 (345), or ASTM A913/A913M Grade 50 (345).

1. All structural wide flange steel shall be new and domestic.

C. Channels, Angles, M-Shapes: ASTM A36/A36M, ASTM A572/A572M Grade 50 (345), ASTM A529/A529M Grade 50 (345), or ASTM A913/A913M Grade 50 (345).

D. Plate and Bar: ASTM A36/A36M, ASTM A572/A572M Grade 50 (345), ASTM A529/A529M Grade 50 (345).

E. Rolled Steel Structural Shapes: ASTM A992/A992M.

F. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.

G. Pipe: ASTM A53/A53M, Grade B, Type S.

H. Suspension Cable: _____ wire rope.

I. Sag Rods: ASTM A36/A36M.

J. High-Strength Structural Bolts, Nuts, and Washers:

1. ASTM F3125/F3125M, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade C, (ASTM A563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

a. Direct-Tension Indicators: ASTM F959/F959M, Type 325/Type 8.8, compressible-washer type with plain finish.

K. Tension Control, High-Strength Bolt-Nut-Washer Assemblies:

1. ASTM F3125/F3125M, twist-off type, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon-steel washers.

a. Finish: Plain.

L. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.

2. Plate Washers: ASTM A36/A36M carbon steel.

3. Finish: Plain

M. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.

2. Washers: ASTM F436 (ASTM F436M), Type 1, hardened carbon steel.

3. Finish: Plain.

N. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

1. Welding electrodes shall conform to the latest edition of the American Welding Society "Specifications for Iron and Steel Arc-Welding Electrodes."

O. Grout: ASTM C1107/C1107M; Non-shrink, factory-packaged, metallic aggregate, mixed with water to consistency suitable for application and a 30-minute working time. Premixed compound consisting of aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.

2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

P. Primer:

1. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2. Types:

a. SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.

b. SSPC-Paint 25 BCS, Type I, zinc oxide, alkyd, linseed oil primer.

c. SSPC-Paint 23, latex primer.

d. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

3. Galvanizing Repair Paint: MPI #18, MPI #19, or SSPC-Paint 20.

4. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

5. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.3 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

D. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

1. Camber structural-steel members where indicated.

E. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

F. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

G. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

H. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

I. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP3, "Power Tool Cleaning."

J. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.4 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.5 FINISH

A. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare structural component surfaces in accordance with SSPC-SP 2.

B. Shop Priming:

1. Shop prime structural steel surfaces except the following:

a. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).

b. Surfaces to be field welded.

c. Surfaces of high-strength bolted, slip-critical connections.

d. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).

e. Galvanized surfaces.

f. Surfaces enclosed in interior construction.

2.6 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least ____ percent of bolts at each connection.

C. Welded Connections: Visually inspect all shop-welded connections according to AWS D1.1/D1.1M and test at least ____ percent of welds using one of the following:

1. Radiographic testing performed in accordance with ASTM E94/E94M.

2. Ultrasonic testing performed in accordance with ASTM E164.

3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.

4. Magnetic particle inspection performed in accordance with ASTM E709.

D. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated, and in compliance with AISC 303 and AISC 360.

B. All connections shall be AISC standard framing connections, which will fully develop strength of beams. All connections shall be of sufficient strength to carry the reactions in accordance with AISC specifications. Connections shall not be for less 10 kips for welded and bolted connections.

C. Baseplates (Bearing Plates and Leveling Plates): Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of baseplate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide 1/4" steel leveling plates under all steel column bearings.

E. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

F. Splice members only where indicated.

G. All reaction points shall be properly fastened by anchors, anchor bolts, or other approved devices.

H. Field weld components indicated on shop drawings.

1. All welding, both shop and field, shall be performed only by qualified welders. Qualifications shall be on the basis of test as set up by the American Welding Society.

2. The shop and field welds shall be subject to approval by the Engineer and Owner's testing agency.

I. Do not field cut or alter structural members without approval of Engineer.

J. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

K. All punching and drilling of the steel required for the attachment of other materials shall be done under this contract.

L. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

M. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

N. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

O. All columns welded to steel base or cap plates shall be milled or give full bearing over cross section.

P. Provide angle framing to support deck at all openings.

Q. This contractor is responsible for the correct fittings, schedules, and design of efficient details. They shall notify the Contractor of any information or templates required for coordination of the work of other trades with the structural steel. Coordination of the work of all other trades with the structural steel is the Contractor's sole responsibility.

R. Fabrication of any material or the performing of any work prior to the approval of shop drawings will be entirely at the risk of this contractor.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 PAINTING

A. All structural steel shall receive one shop coat of paint as specified, and applied according to the manufacturer's specifications.

B. Prior to painting, all steel shall be thoroughly cleaned of all loose rust, scale, oil, soil, dust or other foreign matter in accordance with steel structures painting council surface preparation specifications No. 3, "Power Tool Cleaning."

C. Do not shop paint areas adjacent to field welds for a distance of 2" on either side of such welds. Such areas shall be field painted as soon as possible.

D. All field welds, bolts, and abrasions to the shop coat on all structural steel shall be touched up with the same paint used for the shop coat.

E. For finish coat on exposed surfaces, refer to other sections of the Specification.

3.6 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.7 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.

2. Verify weld materials and inspect welds.

3. Verify connection materials and inspect high-strength bolted connections.

B. Welded Connections: Visually inspect all field-welded connections according to AWS D1.1/D1.1M and test at least ____ percent of welds using one of the following:

1. Radiographic testing performed in accordance with ASTM E94/E94M.

2. Ultrasonic testing performed in accordance with ASTM E164.

3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.

4. Magnetic particle inspection performed in accordance with ASTM E709. Performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

3.8 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

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SECTION 053100 - STEEL DECKING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the contract, including General and Supplementary General conditions and Division 1, General Requirements apply to the work specified in this section. Note also all Addenda.

1.2 DESCRIPTION OF WORK

A. This contract includes all labor, materials, equipment, and appliances to complete all steel floor form as indicated or scheduled on the drawings or hereafter specified.

1.3 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete topping over metal deck.

B. Section 042000 - Unit Masonry: Placement of anchors for bearing plates embedded in unit masonry assemblies.

C. Section 051200 - Structural Steel Framing: Placement of embedded steel anchors for bearing plates in cast-in-place concrete.

D. Section 055000 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.4 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

G. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

I. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel.

J. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems.

K. ICC-ES AC70 - Acceptance Criteria for Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements.

L. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks.

M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

N. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic").

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes for each type of deck, accessory, and product indicated.

C. Shop Drawings: Indicate deck plan, types of deck panels, support locations, projections, openings, reinforcement, anchorage details, pans, special jointing, accessories, and pertinent details.

D. Certificates: Certify that products furnished meet or exceed specified requirements. Product certificate required for each type of steel deck.

E. Submit manufacturer's installation instructions.

F. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.6 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Cut plastic wrap to encourage ventilation.

C. Separate sheets and store deck on dry wood sleepers; slope for positive drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2 STEEL DECK

A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.

1. Calculate to structural working stress design and structural properties specified.

2. Maximum Vertical Deflection of Floor Deck: 1/360 of span.

3. Maximum Vertical Deflection of Roof Deck: 1/240 of span.

4. Maximum Vertical Deflection of Form Deck: 1/360 of span.

B. Roof Deck: Non-composite type, fluted steel sheet. Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A1008/A1008M, Structural Steel (SS), Grade 33 (230) minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

a. Color: Manufacturer's standard.

2. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating; cleaned, pretreated, and primed with manufacturer's standard, baked-on, rust-inhibitive primer.

a. Color: Manufacturer's standard.

3. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.

4. Minimum Base Metal Thickness: 20 gauge, 0.0359 inch.

5. Nominal Height: 1-1/2 inch.

6. Profile: Fluted; SDI WR.

a. Deck Profile: Type WR, wide rib.

7. Side Joints: Interlocking seam.

8. End Joints: Overlapped, welded.

9. Minimum Yield Strength: 33 KSI.

C. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete. Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
3. Span Design: Simple.
4. Minimum Base Metal Thickness: 18 gauge, 0.0474 inch.
5. Nominal Height: 1-1/2 inches.
6. Profile: Fluted; SDI NR.
7. Formed Sheet Width: 36 inch.
8. Side Joints: Interlocking seam.
9. End Joints: Overlapped, welded.
10. Minimum Yield Strength: 33 KSI.

D. Metal Form Deck: Corrugated sheet steel, with provision for ventilation of concrete:

1. Minimum Base Metal Thickness: 20 gauge, ___ inch.
2. Nominal Height: 1 1/2 inch.
3. Formed Sheet Width: 24 inch.
4. Side Joints: Overlapped, welded.
5. End Joints: Overlapped, welded.
6. Minimum Yield Strength: 33 KSI.

2.3 ACCESSORY MATERIALS

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.

C. Stud Shear Connectors: Made from ASTM A108 Grade 1015 bars.

D. Welding Materials: AWS D1.1/D1.1M.

E. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.

1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

F. Mechanical Fasteners: Steel; Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI (DM) design method for roof deck and floor deck applications and ICC-ES AC43.

a. No. 10 minimum diameter.

2. Fasteners for Steel Roof Decks Protected with Waterproofing Membrane: ASTM B633, SC1, Type III zinc electroplate.

3. Fasteners for Exposed Steel Roof Deck Application: Manufacturer's standard stainless steel with bonded neoprene washer.

G. Side-Lap Fasteners: corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No.10 (4.8-mm) minimum diameter.

H. Weld Washers: Mild steel, uncoated, shaped to fit deck rib, 3/4 inch outside diameter, 0.0598 inch (1.52 mm) thick, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

K. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.4 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, girder fillers, and cover plates, 20 gauge, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck,

1. Minimum yield strength of 33,000 PSI.

B. Roof Sump Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

C. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

D. Floor Drain Pans: Formed sheet steel, 14 gauge, 0.0747 inch minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

E. Galvanized Repair Paint: ASTM A780/A780M.

F. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

G. All steel deck and accessories shall be thoroughly cleaned of all grease, oil, and dirt after fabrication.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 INSTALLATION

A. Erect metal deck panels and accessories in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. Locate deck bundles to prevent overloading of supporting members.

C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

G. On concrete and masonry surfaces provide minimum 4 inch bearing.

H. On steel supports provide minimum 1-1/2 inch bearing.

I. Steel form shall extend over 3 or more spans, unless shown otherwise on the drawings.

J. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.

1. Welding: Use fusion welds through weld washers.

2. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

K. Clinch lock seam side laps.

L. At mechanically fastened male/female side laps fasten at 24 inches on center maximum.

M. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

N. At welded male/female side laps weld at 18 inches on center maximum.

O. Weld deck in accordance with AWS D1.3/D1.3M.

P. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

Q. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

R. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

S. Place metal cant strips in position and fusion weld.

T. Roof-Deck Installation:

1. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:

    a. Weld Diameter: 5/8 inch (16 mm), nominal.

    b. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds As indicated.

    c. Weld Washers: Install weld washers at each weld location.

2. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (457 mm), as as follows:

    a. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.

    b. Mechanically clinch or button punch.

    c. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

3. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

    a. End Joints: Lapped 2 inches (51 mm) minimum or butted at Contractor's option.

4. Roof Sump Pans and Sump Plates: Position roof drain pans with flange bearing on top surface of deck. Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches (305 mm) apart with at least one weld at each corner.

a. Install reinforcing channels or zees in ribs to span between supports and weld.

5. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

   a. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

6. Flexible Closure Strips: Install flexible closures strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

U. Floor-Deck Installation:

1. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

   a. Weld Diameter: 5/8 inch (16 mm), nominal.

   b. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches (305 mm) apart, but not more than 18 inches (457 mm) apart

   c. Weld Washers: Install weld washers at each weld location.

2. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:

   a. Mechanically fasten with self-drilling, No.10 (4.8-mm-) diameter or larger, carbon-steel screws.

   b. Mechanically clinch or button punch.

   c. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

3. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

   a. End Joints: Lapped or butted at Contractor's option.

4. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

5. Floor Drain Pans: Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

6. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

V. Weld stud shear connectors through steel deck to structural members below.

W. After welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

3.4 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099123 "Interior Painting."

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

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SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Formed steel joist and purlin framing and bridging.

1.2 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing.

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

F. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

G. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

H. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

I. ICC (IBC) - International Building Code.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.

C. Product Data: Provide manufacturer's data on factory-made connectors and mechanical fasteners, showing compliance with requirements.

D. Product Data: For lateral-force resisting systems, provide product data sheets on hold-down, showing compliance with requirements.

E. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.

1. Indicate stud and ceiling joist layout.

2. Describe method for securing studs to tracks and for bolted framing connections.

F. Design Data:

1. Shop drawings signed and sealed by a professional structural engineer.

2. Design calculations sufficient to demonstrate compliance with design criteria; signed and sealed by a professional structural engineer.

3. Details and calculations for factory-made connectors, signed and sealed by a professional structural engineer.

G. Inspection Reports: Provide material verification Inspection Reports in accordance with requirements of AISI S240.

1.4 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Design Requirements: Design cold-formed framing systems, components and connectors to withstand specified design loads in compliance with ICC (IBC), ASCE 7, AISI S100, and AISI S240.

B. Design Criteria: As follows:

1. Roof Live Loads:

a. Minimum Uniformly Distributed: 20 psf.

b. Minimum Concentrated: _____ psf.

c. Snow Load: 30 psf.

2. Wind Loads: 29.0 psf positive and -38.0 psf negative. (Walls Zone 5)

[29.0] psf positive and [-31.6] psf negative. (Walls Zone 4)

3. Live load deflection meeting the following, unless otherwise indicated:

a. Roofs: Maximum vertical deflection under live load of 1/240 of span.

b. Exterior Walls: Maximum horizontal deflection under wind load of 1/360 of span. Areas providing back up to brick veneer are required to mee 1/600 of span deflection limit.

4. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

5. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.2 MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.

2.3 STRUCTURAL FRAMING COMPONENTS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

1. Structural Grade: As required to meet design criteria.

B. Jamb Studs: AISI S240; manufactured, engineered, c-shaped with wide flanges, designed to replace conventional double-stud framing at openings.

1. Structural Grade: As required to meet design criteria.

C. Headers: AISI S240; manufactured, engineered one-member or two-member assemblies, with wide flanges, designed to replace conventional box or nested header framing at openings.

1. Structural Grade: As required to meet design criteria.

2. Jamb Mounting Clips: Manufacturer's standard.

2.4 LATERAL FORCE-RESISTING SYSTEMS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.

1. Structural Grade: As required to meet design criteria.

B. Curtain Wall Studs and Girts:

1. Thickness and Depth: Depth as indicated on the drawings; thickness and structural grade as required to meet design criteria.

2.5 CONNECTIONS

A. Performance Requirements: Provide connections in compliance with requirements of AISI S240.

B. Structural Performance: Maintain load and movement capacity required by applicable building code and specified design criteria.

C. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.

1. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.

D. Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connectors where indicated on the drawings.

2.6 MISCELLANEOUS CONNECTIONS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

C. Welding: Comply with AWS D1.1/D1.1M.

2.7 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.

B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.2 INSTALLATION - GENERAL

A. Install structural members and connections in compliance with ASTM C1007.

3.3 INSTALLATION OF STUDS

A. Install wall studs plumb and level.

B. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.

C. Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.

D. Install intermediate studs above and below openings to align with wall stud spacing.

E. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.

F. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

3.4 INSTALLATION OF JOISTS AND PURLINS

3.5 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

3.6 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide material verification inspections in accordance with requirements of AISI S240.

C. Provide inspections for welding, mechanical fastening, and cold-formed steel light-frame construction in accordance with requirements of AISI S240.

3.7 TOLERANCES

A. Studs - Vertical Alignment (Plumbness): 1/960 of span or 1/8 inch in 10 ft, in accordance with ASTM C1007.

B. Studs - Maximum Variation from True Position: 1/8 inch in accordance with ASTM C1007.

C. Stud Spacing: 1/8 inch from the designated spacing, provided that the cumulative error does not exceed the requirements of the finishing materials in accordance with ASTM C1007.

END OF SECTION 054000

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SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Shop fabricated steel items, including:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Access ladders.
4. Bollards.
5. Loose steel lintels.
6. Slotted channel framing (Unistrut).
7. Embed plates.

1.3 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.

B. Section 055100 - Metal Stairs.

C. Section 055213 - Pipe and Tube Railings.

D. Section 077200 - Roof Accessories: Roof hatches requiring ladder access.

E. Section 099113 - Exterior Painting: Paint finish.

F. Section 099123 - Interior Painting: Paint finish.

G. Section 099600 - High-Performance Coatings: Exposed exterior steel surfaces identified to receive high performance coatings.

1.4 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.

L. AWS D1.1/D1.1M - Structural Welding Code - Steel.

M. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

N. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

O. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.

P. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

Q. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

2. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.

a. Include the following, as applicable:

1) Design criteria.

2) Engineering analysis depicting stresses and deflections.

3) Member sizes and gauges.

4) Details of connections.

5) Support reactions.

6) Bracing requirements.

3. Provide shop drawings for the following:

a. Steel framing and supports.

b. Ladders.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

F. Designer's Qualification Statement.

G. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.7 QUALITY ASSURANCE

A. Designer Qualifications: Design indicated fabrication items under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer registered in the project State to design metal fabrications complying with performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MATERIALS - STEEL

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:

1. W-Shapes: 60 percent.
2. Channels, Angles: 60 percent.
3. Plate and Bar: 25 percent.
4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25 percent.

B. Steel Channel, Angle, and Plate Sections: ASTM A36/A36M.

C. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

D. Plates: ASTM A283/A283M.

E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

F. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

G. Slotted Channel Fittings: ASTM A1011/A1011M.

H. Fasteners: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening stainless steel.
2. Dissimilar Metals: Type 304 stainless-steel fasteners.
3. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.

I. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

J. Bolts and Nuts (Weathering Conditions): Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

K. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

L. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

M. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

N. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized.

O. Post-Installed Anchors: Torque-controlled expansion anchors.

1. Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

P. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

Q. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

1. Basis of Design Product: Subject to the requirements provide Sherwin-Williams Alkyd Universal Metal Primer, Kem Kromik B-50 Series or a comparable approved product of one of the following:

a. AkzoNobel; International Paints/Devoe Coatings.

b. Benjamin Moore & Co.

c. PPG Architectural Finishes, Inc.

R. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II - Organic, complying with VOC limitations of authorities having jurisdiction.

1. Minimum Zinc Content: 95 percent.
2. Basis of Design:

a. ZRC Galvilite Galvanizing Repair Compound cold galvanizing compound.

S. Epoxy Zinc-Rich Primer: Compatible with topcoat.

1. Basis of Design: Provide Sherwin-Williams Zinc Clad IV or a comparable approved product of one of the following:

a. AkzoNobel; International Paints/Devoe Coatings.

b. Benjamin Moore & Co.

c. PPG Architectural Finishes, Inc.

T. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

U. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.3 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Form exposed work with accurate angles and surfaces and straight edges.

D. Continuously seal joined members by continuous welds.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

1. Comply with NOMMA voluntary guidelines for joint finishes; Finish #2 - completely sanded joint, some undercutting and pinholes acceptable.

F. Provide for thermal expansion/contraction of exterior metal railings and similar linear fabrications exceeding 30 feet in running length; and not closer than 24 inches from corners and intersections.

G. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

H. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

I. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.4 FABRICATED ITEMS

A. Provide and install items shown on Drawings with anchorage and attachments necessary for installation. The following is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

B. Ladders: Steel ladders, other than elevator pit ladders; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.

1. Rungs: One inch diameter solid round bar spaced 12 inches on center; corrugated, dimpled, kerfed, or coated for slip-resistance.
2. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
3. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
4. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.

C. Bollards: Size as indicated in drawings, standard steel pipe, minimum wall thickness 0.280 inches; concrete filled, crowned cap, as detailed; finish as specified.

1. Bollards in Slab on Grade: Penetration depth below top of slab to equal detailed height; core hole in slab on grade 3 inches larger than bollard diameter, and fill joint at slab with a non-shrink grout; prime paint finish.
2. Color: Paint Safety Yellow or as specified by Owner requirements.

D. Lintels: As detailed; galvanized finish.

1. Paint finish as specified in Section 099113 - Exterior Painting for exterior steel.

E. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; hot-dipped galvanized per ASTM A653, Grade G90 finish.

F. Embed Plates: Fabricate embed plates for casting into concrete, and masonry construction as detailed on Drawings. Weld anchors to plates to provide full transfer of design loads and stresses. Test embed plate assemblies prior to installation under provisions of Section 051200 - Structural Steel Framing and Structural Drawings.

2.5 FINISHES - STEEL

A. Unless otherwise recommended by finish coating manufacturer, prepare surfaces to be shop primed in accordance with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" for exterior items and items indicated to receive zinc-rich primer. For other items, prepare to SSPC-SP 3, "Power Tool Cleaning."

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Prime paint all steel items, unless otherwise specified.

1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and miscellaneous framing and supports on exterior of building.

2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

D. Prime Painting: One coat.

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

2. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

2.6 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on Drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

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SECTION 055100 - METAL STAIRS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Stairs with grating treads.

B. Structural steel stair framing and supports.

C. Design engineering for stair assemblies, and anchorage to supporting structure.

1.3 RELATED REQUIREMENTS

A. Section 055213 - Pipe and Tube Railings: Railings for the stairs specified in this section.

B. Section 099123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. AISC 207 - Standard for Certification Programs.

B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

I. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel.

L. NAAMM AMP 510 - Metal Stairs Manual.

M. NAAMM MBG 531 - Metal Bar Grating Manual.

N. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Design Data: As required by authorities having jurisdiction.

1. Design Calculations: Submit design calculations sealed by a registered Professional Engineer licensed in the State in which the Project is located.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 207.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.7 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications:

1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.

2. A company specializing in manufacturing products specified in this Section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.1 METAL STAIRS - GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.

2. Handrails: Comply with applicable accessibility requirements of ADA Standards.

3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.

a. Stair Capacity: Uniform live load of 100 lb/sq ft and a concentrated load of 300 lb.

b. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.

4. Dimensions: As indicated on drawings.

5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.

6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

7. Separate dissimilar metals using paint or permanent tape.

C. Metal Jointing and Finish Quality Levels:

1. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.

a. Welded Joints: Welded on back side wherever possible.

b. Welds Exposed to View: Ground smooth; not required to be flush.

c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.

d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.

D. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

E. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.2 METAL STAIRS WITH GRATING TREADS

A. Jointing and Finish Quality Level: Service, as defined above.

B. Risers: Open.

C. Treads: Steel bar grating.

1. Grating Type: Welded.
2. Bearing Bar Depth: 3/4 inch, minimum.
3. Top Surface: Standard.
4. Nosing: Checkered plate.
5. Nosing Width: 1-1/4 inch, minimum.
6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels.

1. Stringer Depth: 12 inches, minimum.
2. End Closure: Sheet steel, 14 gauge, 0.075 inch minimum; welded across ends.

E. Landings: Same construction as treads, supported and reinforced as required to achieve design load capacity.

F. Finish: Galvanized after fabrication.

2.3 HANDRAILS AND GUARDS

A. Railings and Guards: See Section 055213 - Pipe and Tube Railings.

2.4 MATERIALS

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.

C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.

D. Gratings: Bar gratings that comply with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.

2.5 ACCESSORIES

A. Factory Fabricated Stair Nosing:

1. Materials: Extruded aluminum, alloy type 6063-T5, mill finish.

a. Tread Abrasive Filler: Virgin grain aluminum oxide epoxy-bonded to tread base.

b. Tread Type: Full abrasive.

c. Width: 3 inches.

d. Nosing Types: Long nose for steel pan stairs.

e. Color: As selected by Architect from Manufacturer's standard options.

2. Acceptable Manufacturers:

a. Nystrom.

b. Balco.

c. Wooster Products, Inc..

d. Substitutions: See Section 016000 - Product Requirements.

B. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1.

C. Steel Bolts, Nuts, and Washers: Galvanized to ASTM A153/A153M where connecting galvanized components.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

2.6 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.

1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates and angles required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Provide welded field joints where specifically indicated on Drawings. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

F. Obtain approval prior to site cutting or creating adjustments not scheduled.

G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Wall mounted handrails.

B. Guardrails.

C. Structural design of railing systems.

1.3 RELATED REQUIREMENTS

A. Section 055100 - Metal Stairs: Attachment plates for handrails specified in this section.

B. Section 061000 - Rough Carpentry: Placement of backing plates in stud wall construction.

C. Section 099123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. AISC 207 - Standard for Certification Programs.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

F. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

I. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.

J. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Include the design engineer's seal and signature on each sheet of shop drawings.

C. Samples: Submit two, 12 inch long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications:

1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 207.

2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces from damage.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

C. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935.

E. Guardrail Infill Loads: Concentrated load of 50 pounds per linear foot applied horizontally on an area of 1 sq. ft.

F. Allow for expansion and contraction of members and building movement without damage to connections or members.

G. Dimensions: See Drawings for configurations and heights.

1. Grip Rails: 1-1/2 inches nominal diameter, round, unless otherwise indicated in Drawings.

H. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
3. For anchorage to stud walls, provide backing plates, for bolting anchors.

I. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

J. Interconnect members by butt-welding, with coped joints and flush radiused bends, wall returns at ends of wall mounted rails, and closed ends.

1. Provide expansion joints at maximum 75 feet on center, or as recommended by fabricator for indicated conditions.

2.2 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Straight Splice Connectors: Steel concealed spigots.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.

F. Touch-Up Primer for Galvanized Surfaces: Manufacturer's recommended primer, complying with VOC limitations specified in Section 016116.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction and compatible with paints specified to be used over it.

2.3 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for interior and exterior applications.

2.4 FASTENERS

A. General: Provide the following:

1. Steel Railings (uncoated): Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.

2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Welded Joints:

1. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2. Interior Components: Continuously seal joined pieces by continuous welds.

3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

   a. Comply with NOMMA voluntary guidelines for joint finishes; Finish #2 - completely sanded joint, some undercutting and pinholes acceptable.

E. Changes in Direction: Form by bending or by inserting prefabricated elbow fittings.

1. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

F. Close exposed ends of railing members with prefabricated end fittings.

2.6 STEEL AND IRON FINISHES

A. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

B. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated interior railings with primer compatible with paint systems specified in Section 099123 - Interior Painting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

E. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.

F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 ANCHORING POSTS

A. Anchor posts to steel by welding to steel supporting members, unless otherwise indicated.

B. Use stainless steel sleeves preset and anchored into concrete for installing posts. Provide sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

1. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

C. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

3.5 ATTACHING RAILINGS

A. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

B. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.6 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.7 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

3.9 SCHEDULE

A. Interior Railings: Shop primed and field painted per Section 099123 - Interior Painting.

END OF SECTION

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SECTION 061000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Nonstructural dimension lumber framing.

B. Roofing nailers.

C. Preservative treated wood materials.

D. Fire retardant treated wood materials.

E. Communications and electrical room mounting boards.

F. Concealed wood blocking, nailers, and supports.

G. Miscellaneous wood nailers, furring, and grounds.

1.3 RELATED REQUIREMENTS

A. Section 061600 - {\t\#1000342}Exterior wall sheathing.

1.4 REFERENCE STANDARDS

A. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

B. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. AWPA U1 - Use Category System: User Specification for Treated Wood.

F. PS 1 - Structural Plywood.

G. PS 20 - American Softwood Lumber Standard.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate installation of rough carpentry members specified in other Sections.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and construction panels.

C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.

2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Grade Stamps: Provide each piece of lumber and each panel product stamped showing grade and trademark of grading agency under which it is produced.

1. Additional Stamps: Stamped showing specified requirements for fire-retardant and preservative treatments as specified.

2.2 DIMENSION LUMBER

A. Wood Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.3 CONSTRUCTION PANELS

A. Exterior Sheathing Board: Specified in Section 061600 - Sheathing.

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

C. Blocking Applications:

1. Backing Plate: Proprietary fire-retardant treated wood blocking:

a. ClarkDietrich; Danback Fire-Retardant Treated Wood Backing Plate.

2. Plywood Blocking/Nailers - Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.

3. Plywood Blocking/Nailers - Other Locations: PS 1, C-D Plugged or better.

2.4 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

2.5 FACTORY WOOD TREATMENT - GENERAL

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements, and also stamped "Kiln Dried After Treatment" ("KDAT").

2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards, and also stamped "Kiln Dried After Treatment" ("KDAT").

2.6 FIRE RETARDANT TREATMENT (FRT)

A. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.

1. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
2. Applications:
    a. Treat all exterior rough carpentry items.
    b. Do not use treated wood in direct contact with the ground.

B. Interior Type: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
1. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
2. Applications:
    a. Treat all interior rough carpentry items.
    b. Do not use treated wood in applications exposed to weather or where the wood may become wet.

2.7 PRESERVATIVE TREATMENT (PT)

A. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
2. Applications:
    a. Treat lumber exposed to weather.
    b. Treat lumber in contact with flashing or waterproofing.
    c. Treat lumber in contact with masonry or concrete.
    d. Treat lumber less than 18 inches above grade.
    e. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.2 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. Other locations as detailed on Drawings.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Install adjacent boards without gaps.
3. Size and Location: As indicated on Drawings or as required for equipment mounting.

3.4 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.5 CLEANING

A. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061600 - SHEATHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Exterior wall sheathing.

B. Sheathing joint and penetration treatment.

1.3 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood panels for miscellaneous blocking and mounting boards.

B. Section 092900 - Gypsum Board: Interior gypsum panels.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each type of process and factory-fabricated product.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WALL SHEATHING

A. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.

1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
2. Fungal Resistance: No fungal growth when tested in accordance with ASTM G21.

3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Core Type: Type X, as indicated.
5. Thickness: 5/8 inch.
6. Edges: Square.
7. Products:
    a. USG Corporation; Securock Regular and Firecode X Sheathing.
    b. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing.
    c. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing.
    d. National Gypsum Company; Gold Bond eXP Sheathing.
    e. Substitutions: See Section 016000 - Product Requirements.

2.2 PARAPET WALL SHEATHING (BACK SIDE)

A. Same as cover board listed in Division 07 roofing section.

2.3 ROOF COVER BOARD

A. See Division 07 roofing section.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
    1. Provide non-corrosive fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
    1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
    2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. As recommended by air barrier manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. ICC-ES evaluation report for fastener.

D. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using screws.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with ASTM C1280, GA-253, and with manufacturer's written instructions.

1. Fasten gypsum sheathing to framing with screws with edges butted tight unless otherwise indicated.

2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.

3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Coordinate finishing requirements with Air Barriers specified in Division 07.

2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION

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SECTION 062200 - FLEXIBLE WOOD TAMBOUR PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2

1.3 SECTION INCLUDES

A. Flexible wood tambour panels of the following types:

1. Solid wood tambours for transparent finish.

1.4 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Field finishing.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide data for each type of product.

C. Shop Drawings: Indicate layout of pattern and configuration, including details of perimeter conditions and mounting.

D. Samples: Two samples, in manufacturer's standard size, illustrating tambour profile and specified finish.

E. Manufacturer's Instructions: Provide manufacturer's installation instructions.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

C. Basis of Design: Specifications are based on products by specified basis of design manufacturer. Products manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, performance, composition, color, and profile are minor, and do not detract substantially from the indicated design intent.

1.8 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Construct mock-up of tambour panels, full size, illustrating wood grain and specified finish.

1. Locate where directed.
2. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install panels until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Manufacturers and products as scheduled on drawings.

B. Other Acceptable Manufacturers:

1. Moulding, Corbels & More : www.mouldings.com.
2. Surfacing Solution: www.surfacingsolution.com.
3. Substitutions: See Section 016000 - Product Requirements.

2.2 SOLID WOOD TAMBOUR PANELS

A. Tambour Panels: Solid wood tambours on flexible backing.

1. Wood Species: Maple.

a. For Transparent Finish: As scheduled.

2. Profile: Fluted.
3. Slat Width: 1.25 inches.
4. Mounting Method: Direct applied with adhesive.
5. Finish: Factory-primed for field finish.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific panel and substrate application indicated and as recommended in writing by panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dirt and bond breaking substances prior to beginning installation.

B. Acclimatize panels at the installation site for a minimum of 48 hours prior to installation.

3.3 INSTALLATION

A. Install products in strict accordance with manufacturer’s instructions, approved submittals and in proper relationship to adjacent construction.

1. Roll tambour panels in accordance with manufacturer’s instructions to properly space slats.
2. Follow manufacturer’s recommendations for adhesives and mounting devices.
3. Replace damaged or defaced products prior to Substantial Completion.

3.4 FINISHING

A. See Section 099123 - Interior Painting for field-finishing of wood tambours.

3.5 CLEANING

A. Clean surfaces to remove soiling, stains, dust, and dirt using materials acceptable to manufacturer.

B. Leave installation area clean and free of residue and debris resulting from work of this Section.

END OF SECTION

SECTION 064000 - ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Wood casework with laminate cladding.

B. Cabinet and drawer hardware.

1.3 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry.

B. Section 090000 - Finish Schedule.

C. Section 123600 - Countertops.

1.4 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications.

C. ANSI/AWI 0400 - Factory Finishing.

D. ANSI/AWI 0620 - Finish Carpentry/Installation.

E. ANSI/AWI 0641 - Architectural Wood Casework.

F. AWI 200 - Care and Storage.

G. AWI 300 - Materials.

H. BHMA A156.9 - Cabinet Hardware.

I. BHMA A156.18 - Materials and Finishes.

J. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

K. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

L. PS 1 - Structural Plywood.

M. PS 20 - American Softwood Lumber Standard.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate schedule of climate-controlled rooms with schedule of storage of wood and wood-based materials requiring climate-controlled environments.
2. Coordinate work of this section with installation of wood blocking, wood backing, metal strapping, and other anchorage that provides casework backing and structural support.
3. Coordinate work of this section with rough-in plumbing and rough-in electrical integrally-related with casework.
4. Field verify critical dimensions and clearances prior to fabrication of woodwork items; assure that field conditions are as required to comply with indicated design requirements.
    a. Where field measurements cannot be made without delaying work, establish required dimensions and maintain those dimensions for fabrication of woodwork.
5. Coordinate cabinet spacing and clearances to ensure that doors and drawers do not conflict with each other.
6. Coordinate cabinet opening and spacing requirements with approved appliances and plumbing fixtures.

B. Preinstallation Meeting: Convene preinstallation meeting not less than one week prior to completion of framing behind casework; require attendance of contractor, framing contractor, and casework installer.

1. Review locations of casework backing and structural support.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's published, product descriptive data for each panel material, finish, and hardware.

C. Shop Drawings:

1. General: Provide each sheet sequentially numbered and dated.
    a. Shop drawings are required to be generated as separate digital drawings specific to this Project, not utilizing Architect's digital drawing files in any manner.
    b. Show all adjacent construction including abutting walls, columns and similar elements affecting woodwork installation.
2. AWI QCP Program Requirements:
    a. Aesthetic Grade: Identify specified grade and indicate compliance.
    b. Performance Duty Level: Identify specified duty level and indicate compliance.
    c. Identification of Materials: Include material lists or schedules.

d. Reference Plans: Casework locations in relative context of building floor plans.

e. Plans and Elevations: Plan and elevation views of each assembly type.

f. Detailed Sections: Dimensioned section views of each casework configuration.

1) Include appropriate locations for casework wall anchorage.

2) Drawing Scale: 1-1/2 inch = 1 foot, minimum.

g. Details: Dimensioned casework assembly details with material thicknesses.

D. Samples:

1. Woodwork: Submit actual samples of architectural woodwork construction, minimum 12 inches square, illustrating each proposed cabinet and woodwork substrate and finish.

2. Hardware: For each hinge, pull, and cabinet lock type, submit one sample, full-size, indicating specified finish.

E. Fabricator's qualification statement.

F. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1.7 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this section with minimum five years of documented experience; with qualifications indicating ability to comply with requirements of this section.

1. Woodworking company with at least one project in past five years with value of casework within 20 percent of casework cost for this project.

2. Single Source Responsibility: Provide fabrication and installation from single woodworking company.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original packaging materials bearing product identification. Deliver woodwork items to installation areas only after clean, well ventilated, and temperature-controlled installation areas are available. Do not deliver woodwork items to installation areas until painting and similar operations are complete in those areas.

B. Store products prior to installation on flat, level, clean surfaces; elevate products above floors and protect from sunlight.

C. Store products in interior rooms with completed wet work and overhead work.

D. Relative Humidity Conditions for Storing Wood and Wood-Based Products:

1. Maintain relative humidity between 25 and 45 percent.

E. For products other than wood and wood-based products, store and handle in accordance with manufacturer's documented instructions.

F. Handle materials and products to prevent damage to edges, ends, or surfaces.

1.9 FIELD CONDITIONS

A. Ambient Conditions for Acclimation, Installation, and Post-Installation of Wood-Based Products:

1. Acclimation Period Prior to Installation: 72 hours minimum, inside installation environment.
2. Temperature Conditions During Acclimation, Installation, and Post-Installation: Maintain temperature between 60 degrees F and 90 degrees F.
3. Relative Humidity Conditions During Acclimation, Installation, and Post-Installation: Maintain relative humidity between 25 and 45 percent.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Single Source Responsibility: Provide and install this work from single fabricator.

2.2 ARCHITECTURAL WOODWORK

A. Provide architectural woodwork components in sizes and profiles as indicated on drawings.

B. Scribed Fillers:

1. Finish and Materials: Same materials and finish as exposed surfaces.

2.3 PERFORMANCE REQUIREMENTS

A. Architectural Woodwork Institute (AWI) Performance Requirements:

1. Comply with AWI 300, ANSI/AWI 0641, ANSI/AWI 0400, and ANSI/AWI 0620 as applicable for specified casework finish, aesthetic grade, and performance duty level.
    a. Aesthetic Grade: Premium.
    b. Product Performance Duty Level: Duty Level 2.
2. Panel and Material Thicknesses: Provide panels and materials as required to meet specified performance duty level, subject to minimum thickness requirements of AWI 300 and ANSI/AWI 0641 and flatness requirements indicated below.
3. Panel Flatness: Provide panels with maximum variation from flat in 12 inches as measured diagonally across panel.
    a. Premium Grade: Plus or minus 0.063 inch maximum.

4. Cabinet Door Flatness:

    a. Comply with specified performance requirements.

2.4 OTHER ARCHITECTURAL WOODWORK ITEMS

A. Wardrobe and Mail-Sorter:

1. Aesthetic Grade: Premium Grade.
2. Performance Grade: Duty Level 2 - Commercial.
3. Exposed Surfaces: HPDL finish, color as scheduled .

B. Bench Seating:

1. Aesthetic Grade: Premium Grade.
2. Performance Grade: Duty Level 2 - Commercial.
3. Exposed Surfaces: HPVA HP-1 Grade A, Maple, plain sliced, book-matched.
4. Cushions:

    a. Foam Padding: Commercial quality, fire-retardant, high-resiliency polyurethane foam; 1.8 to 2.1 pcf density; 28 to 32 percent indentation force deflection; thickness and configurations as indicated on Drawings.

    b. Fabric: Treated for stain and soil resistance, flame retardant treated complying with NFPA 701.

    c. Tailoring: Straight stitch seams, straight and neatly tailored.

    d. Fabric Colors and Patterns: As scheduled.

    e. Inspection: Allow for inspection by Architect during manufacturing process and after final assembly.

2.5 WOOD VENEER PANELS

A. Description: Panels consisting of wood face veneers applied to cores; panel layup with face ply, back ply, and core of either single layer or odd number of inner plies, to produce balanced construction panel; comply with HPVA HP-1.

1. Panels subject to size limitations, minimum thickness requirements, and fabrication tolerances of specified aesthetic grade and performance duty level in accordance with AWI 300 and ANSI/AWI 0641.

B. Hardwood Face Veneers Intended to Receive Transparent Finish:

1. Species and Cut: As specified in this section with wood casework for transparent finish.
2. Face Veneer Grade: As specified in this section with wood casework intended for transparent finish; associated with applicable surface exposures and specified performance requirements.
3. Face Veneer Special Characteristics: In accordance with specified aesthetic grade.

C. Softwood Face Veneers Intended to Receive Transparent Finish:

1. Species and Cut: As specified in this section with wood casework for transparent finish.
2. Face Veneer Grade: As specified in this section with wood casework intended for transparent finish; associated with applicable surface exposures and specified performance requirements.
3. Face Veneer Special Characteristics: In accordance with specified aesthetic grade.

D. Back: Comply with backer requirements of AWI 300.

E. Panel Cores for Ben:

1. Veneer Core; for Bench Seating.
   a. Plies: 7-ply.
   b. Thickness: 3/4 inch.
2. Particleboard (PTB); for Wardrobe and Mail-Sorter.

2.6 PANEL CORES

A. Particleboard (PTB):

1. Description: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
2. Grade and Thickness: As required to meet performance requirements.

B. Medium Density Fiberboard (MDF):

1. Description: Composite panel composed of cellulosic fibers, additives, and bonding system cured under heat and pressure; comply with ANSI A208.2.
2. Grade and Thickness: As required to meet performance requirements.

2.7 CONCEALED CABINET BASE COMPONENTS

A. Cabinet Base Toe-Kick Subfronts:

1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

B. Cabinet Base Blocking and Stretchers:

1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

C. Cabinet Base Sleepers:

1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

2.8 WOOD AND WOOD-BASED MATERIALS

A. AWI 200 Wood Moisture Content Requirements:

1. Climate Zone 2: Between 6 and 10 percent.

B. AWI 300 General Requirements for Wood.

1. Provide wood that is sound, free of decay, shake, pith, wane, and warp.
2. Provide wood in accordance with AWI 300.

C. Plywood: Comply with PS 1.

D. Wood Boards: Comply with PS 20.

E. Wood Anchoring Strips:

1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.

2.9 CABINET AND DRAWER HARDWARE

A. Hinges, Number of Hinges for Each Cabinet Door:

1. Door Heights Under 48 inches: Not less than two hinges per door.
2. Door Heights Between 48 inches and 84 inches: Not less than three hinges per door.
3. Door Heights Greater than 84 inches: Not less than four hinges per door.

B. Hinges, Self-Closing, Integrated Damper Hinges:

1. Description: Self-closing hinges with integrated damper mechanisms.
2. Comply with BHMA A156.9, B01712.
3. Features: Provide soft-closing integrated damper hinges.
4. Opening Range: Between 115 to 150 to degrees.
    a. At 90 degree inside corner conditions, provide restriction clips to limit the opening of cabinet doors to no more than 86 degrees to prevent damage to adjacent surfaces.
5. Manufacturers:
    a. Blum, Inc: www.blum.com/#sle.
    b. Grass America Inc: www.grassusa.com/#sle.
    c. Hettich America, LP; Sensys: www.hettich.com/#sle.
    d. Sugatsune America, Inc: www.sugatsune.com/#sle.
    e. Titus Cabinet Hardware: www.titusplus.com/us/en/#sle.
    f. Substitutions: See Section 016000 - Product Requirements.

C. Cabinet Door and Drawer Pulls: Provide one at each door and drawer.

1. Description: Back-mounted pulls.
2. Comply with specified performance requirements.
3. Design: As indicated on drawings.
4. Basis of Design: As indicated in Section 090000 - Finish Schedule.

D. Shelf Rests:
   1. Description: Metal shelf rests for installation into prepared holes in substrate.
   2. Comply with specified performance requirements.
   3. Material and Finish: Steel with nickel-plated finish.
   4. Products:
      a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
      b. Sugatsune America, Inc: www.sugatsune.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

E. Drawer Slides:
   1. Description: Hardware units that suspend drawers and provide controlled drawer sliding.
   2. Comply with BHMA A156.9, Heavy Duty Grade 1HD-100.
   3. Features: Self-closing and soft-closing.
   4. Mounting: Side-mounted.
   5. Travel: Full extension.
   6. Acceptab:
      a. Accuride International, Inc: www.accuride.com/#sle.
      b. Blum, Inc: www.blum.com/#sle.
      c. Grass America Inc: www.grassusa.com/#sle.
      d. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
      e. Sugatsune America, Inc: www.sugatsune.com/#sle.
      f. Titus Cabinet Hardware: www.titusplus.com/us/en/#sle.
      g. Substitutions: See Section 016000 - Product Requirements.

F. Cabinet Door and Drawer Silencers:
   1. Description: Self-adhesive rubber silencers.
   2. Doors, Quantity: One silencer at top and bottom of closing edge of each door.
   3. Drawers, Quantity: One silencer at back side of each drawer front cover.

G. Cabinet Door Keyed Locks with Dead Bolts:
   1. Description: Keyed cylinder locks for securing cabinet doors.
   2. Keying Action: Key projects and retracts dead bolts.
   3. Mounting: Half-mortised into back of door.
   4. Interchangeable Cores: Provide interchangeable cores.
   5. Keying: Coordinate with Owner's standard keying system.

6. Material and Finish: Match finish of pulls.

H. Garment Hooks; Mounted in W

1. Description: Devices with one or more arms projecting from attachment bases; for hanging garments.
2. Mounting: Surface mounted.
3. Material and Finish: BHMA A156.18, 627 or 628 satin aluminum.

2.10 CASEWORK ACCESSORY COMPONENTS

A. Grommets: Plastic, with matching slotted caps; round.

1. Shape: Round.
2. Inside Diameter: 1-1/2 inches.
3. Color: As selected by Architect.

2.11 FABRICATION

A. Shop-fabricate casework to dimensions, profiles, and details indicated on drawings.

B. Fabricate to maximum extents plausible, including doors, drawers, and hardware; fabricate units in sizes transportable through building openings.

C. When necessary to cut and fit on site, provide materials with sufficient allowance for cutting.

D. Matching Wood Grain: Comply with requirements of quality standard for specified Grade

E. Provide cutouts for plumbing fixtures; verify locations of cutouts from on-site dimensions. Sand and seal cut edges.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify casework and materials required for installation have been delivered, handled and stored as specified.

B. Verify wood blocking and backing that provides casework structural support is installed as indicated on drawings.

C. Verify location and sizes of rough-in plumbing and rough-in electrical associated with work of this section.

D. Verify location and sizes of cutouts for appliances and special equipment to be mounted in or adjacent to casework.

E. Verify critical clearances and dimensions prior to installation of woodwork items.

3.2 PREPARATION

A. Acclimate casework to environments indicated for installation.

3.3 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Install work of this section rigid, plumb, and level and in accordance with fabricator's documented instructions.

1. Align and secure adjoining cabinet units with fasteners in concealed locations.

C. Install cabinet hardware in accordance with hardware manufacturer's documented instructions using hardware manufacturer's furnished fasteners.

D. Install scribe fillers to close gaps between casework and adjacent walls.

E. Secure full height cabinets, shelving units, and similar casework items exceeding 60 inches in height to floor using appropriate angles and anchorages.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/8 inch in 96 inches.

B. Maximum Variation From Level: 1/8 inch in 96 inches.

3.5 ADJUSTING

A. Adjust hardware for smooth operation in accordance with hardware manufacturer's documented instructions.

3.6 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean woodwork, casework, counters, shelves, hardware, fittings, and fixtures.

3.7 PROTECTION

A. Protect installed woodwork from subsequent construction operations.

END OF SECTION

SECTION 066420 - DECORATIVE ARCHITECTURAL PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fabricated architectural panels.

B. Mounting and suspension system.

C. Hardware and attachment accessories.

1.3 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with installation of associated and adjacent components.

B. Sequencing: Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide data on panel specified panel products.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot.

D. Samples: Submit two samples of each specified panel product, 6 x 6 inch in size illustrating panel features and colors.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this Section with minimum five years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture and mechanical damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer:

1. 3-Form: www.3-form.com.

B. Other Acceptable Manufacturers:

1. Heartland Collection; CIELO System with matching aluminum trim extrusions: https://www.heartlandcollection.us/.
2. Substitutions: See Section 016000 - Product Requirements.

2.2 DECORATIVE ARCHITECTURAL PANELS

A. Panels:

1. Thickness: 1/2 inch.
2. Sizes and Configurations: As indicated on Drawings.
3. Fire Resistance: ASTM E84; flame spread 35 maximum, smoke development index 15 maximum.
4. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.
5. Color and Pattern: As indicated on Drawings.

2.3 FASTENINGS

A. Stand-Off Hardware: Satin stainless steel, multi-purpose mounting hardware system; MPB-Series manufacturted by Doug Mockett & Company, Inc.; www.mockett.com.

1. Caps and Stand-Off Barrels: 1/2 inch diameter.
2. Screw Connectors: Sized to suit indicated applications; supplied by hardware manufacturer.

B. Concealed Joint Fasteners: Threaded steel.

2.4 ACCESSORIES

A. Adhesive: Type recommended by panel manufacturer.

B. Aluminum Edge Trim: Extruded shapes; smooth surface finish; for inside corners, outside corners, panel joints, and panel edges. Finish and color to match wall panels.

2.5 FABRICATION

A. Shop fabricate panels for delivery to site to the greatest extent possible.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and substrate.

B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this work.

3.2 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.3 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

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SECTION 068316 - FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Accessories and trim.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

1.4 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ISO 846 - Plastics - Evaluation of the Action of Microorganisms.

F. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 4 by 4 inch in size illustrating material and surface design of panels.

1.6 QUALITY ASSURANCE

A. Basis of Design: Specifications are based on panel types by specified basis of design manufacturer and product(s). Panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, and profile are minor, and do not detract substantially from the indicated design intent.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PANEL SYSTEMS

A. Wall Panels:

1. Panel Size: As indicated on Drawings.
2. Panel Thickness: 0.09 inch.
3. Surface Texture: As scheduled.
4. Color: As scheduled.
5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.3 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.

1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

3. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
4. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
5. Biological Resistance: Rating of 0, when tested in accordance with ISO 846.

B. Trim: Vinyl; color coordinating with panel.

C. Adhesive: Type recommended by panel manufacturer.

D. Sealant: Silicone; color matching panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.2 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Place trim on panel before fastening edges, as required.

G. Fill channels in trim with sealant before attaching to panel.

H. Install trim with adhesive and screws or nails, as required.

I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

J. Remove excess sealant after paneling is installed and prior to curing.

3.3 CLEANING

A. Remove excess sealant materials from finish surfaces and clean as recommended by panel manufacturer.

3.4 PROTECTION

A. Protect installed materials from damage due to subsequent construction operations.

END OF SECTION

SECTION 070553 - FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.3 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Paint finish.

1.4 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years of documented experience.

1.7 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Fire Wall Signs, Inc.: www.firewallsigns.com.
2. Safety Supply Warehouse, Inc.: www.safetysupplywarehouse.com.
3. SmartSign: www.smartsign.com.
4. Substitutions: See Section 016000 - Product Requirements.

2.2 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Either adhered or applied (painted) identification signage may be used at Contractor's option.

B. Regulatory Requirements: Where there is an accessible concealed floor, floor-ceiling or attic space, fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations, comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC), and, minimally the following:

1. Within accessible concealed spaces, locate identification signage within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
2. Include lettering not less than 3 inches in height with a minimum 3/8-inch stroke in a contrasting color incorporating the suggested wording, “FIRE AND/OR SMOKE BARRIER—PROTECT ALL OPENINGS,” or other similar wording.

C. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl sign with factory applied adhesive backing.

D. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 099123 for products.

E. Languages: Provide all markings in English.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 PREPARATION

A. See Section 099123 for substrate preparation for painted markings.

3.3 INSTALLATION

A. Locate markings as required by the adopted building code and authorities having jurisdiction.

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 099123.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

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SECTION 072100 - THERMAL INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Board insulation{CH#304679} at {CH#304680}.

B. Batt insulation in exterior framed wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Continuous rigid insulation.

1.3 RELATED REQUIREMENTS

A. Section 072726 - Fluid-Applied Air Barriers: Separate air barrier materials.

B. Section 072119 - Foamed-In-Place Insulation Insulation specified as part of the total building thermal envelope.

C. Section 075323 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM): Insulation specified as part of roofing system.

D. Section 092900 - Gypsum Board: Acoustic insulation for interior stud cavities.

1.4 DEFINITIONS

A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.

1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.5 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

E. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C.

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.7 QUALITY ASSURANCE

A. Thicknesses specified are for the thermal conductivity (k-value at 75 degrees F) specified for each material. Provide adjusted thicknesses for approved use of substituted materials with different thermal conductivity ratings. Where insulation is specified to have a specific "R" value, furnish manufacturer's standard thickness required to equal or exceed the specified value.

1.8 MOCK-UP

A. Comply with general mock-up requirements specified in Section 014000.

B. Integrated Exterior Mock-up: Provide a mock-up for evaluation of workmanship, including insulation products, insulation fasteners and attachments, and board joint treatments.

1. Coordinate with mock-up requirements specified in other sections.
2. Locate where directed.
3. Mock-up may remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

B. Protect plastic insulation from exposure to direct sunlight.

C. Do not deliver plastic insulation materials to the project site ahead of time of installation. Protect at all times against ignition. Complete the installation and concealment of plastic materials as soon as possible in each area of work.

1.10 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Continuous Wall Insulation: Extruded polystyrene (XPS) board.

B. Insulation in Framed Construction: Batt insulation with no vapor retarder.

2.2 INSULATION MATERIALS

A. Where units are included in fire rated wall, ceiling, or floor construction, provide insulation units which have been tested and rated as required for the indicated assembly.

2.3 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.

1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
4. Complies with fire resistance requirements specified as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
5. Board Thickness: As indicated on Drawings.
6. Board Edges: Square.
7. Water Absorption for Insulation Materials in Ground Contact: Type IV, 0.3 percent by volume, maximum, by total immersion, when tested in accordance with ASTM C272.
8. Acceptable Manufacturers:

a. Dow Chemical Company; STYROFOAM Extruded Polystyrene Insulation (XPS): www.dow.com/#sle.

b. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.

c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2.4 BATT INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit for filling miscellaneous voids to maintain thermal control layer continuity.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
4. Thermal Resistance: As indicated in Drawings.
5. Facing: Provide the following types:

a. Facing: Unfaced.

6. Acceptable Manufacturers:

a. CertainTeed Corporation: www.certainteed.com/#sle.

b. Johns Manville: www.jm.com/#sle.

c. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

2.5 ACCESSORIES

A. Insulation Fasteners: Appropriate for purpose intendedand approved by insulation manufacturer.

1. Length as required for thickness of insulation material and penetration of structural backing or framing as indicated, with metal or plastic washers.
2. Acceptable Manufacturers:

a. Hilti: www.hilti.com.

b. Trufast: www.trufast.com.

c. McMaster-Carr: www.mcmaster.com.

B. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

C. Adhesive: Type recommended by insulation manufacturer for indicated applications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, or irregularities.

3.2 INSTALLATION, GENERAL

A. Install insulation to maintain continuity of thermal protection to building elements and spaces.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install corrosion resistant impaling pins or other mechanical insulation retention devices, minimum 6 per board or as otherwise recommended by insulation manufacturer, in accordance with insulation manufacturer's written recommendations.

B. Exterior Walls Behind Veneers and Claddings: Install boards tight to substrate without gaps between boards on walls.

1. Install in running bond pattern.
2. Butt edges and ends tightly to adjacent boards and protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. Insulation Behind Masonry Veneer: See Section 042000 - Unit Masonry for veneer anchors.

3.4 BATT INSULATION INSTALLATION

A. Installation - General:

1. Install insulation at locations indicated and in accordance with manufacturer's instructions.
2. Install in exterior micellaneous wall and ceiling cavity spaces without gaps or voids. Do not compress insulation.
3. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
4. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
5. Keep insulation minimum 3 inches from heat emitting devices such as recessed light fixtures, and minimum 2 inches from sidewalls of chimneys and vents.

3.5 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Foamed-in-place insulation.

1.3 REFERENCE STANDARDS

A. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

F. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials.

G. NFPA 275 - Standard Method of Fire Tests for the Evaluation of Thermal Barriers.

H. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

I. UL 1040 - Standard for Safety Fire Test of Insulated Wall Construction.

J. UL 1715 - Standard for Safety Fire Test of Interior Finish Material.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.

1. Agenda:

a. Materials approved for use and their compatibility.

b. Coordination with substrate preparation.

c. Coordination with installation of adjacent and covering materials.

d. Sequence of construction.

e. Field testing.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, insulation properties, and preparation requirements.

C. Certificates: Certify that products of this Section meet or exceed specified requirements.

D. Manufacturer's Installation Instructions: Indicate special procedures,substrate preparation requirements, and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified, and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Closed Cell Foam:

1. Carlisle Spray Foam Insulation; SealTite Pro Closed Cell: www.carlislesfi.com/#sle.
2. Henry Company; Permax 2.0: www.henry.com/#sle.
3. Huntsman Building Solutions; HeatLok HFO: www.huntsmanbuildingsolutions.com/#sle.
4. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Provide continuity of thermal barrier and air barrier seal at building enclosure elements in conjunction with air seal materials; see Division 07 section for Air Barriers and Insulated Metal Panels.

2.3 MATERIALS

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Applications: As indicated on drawings.
2. Thickness: As indicated on drawings.
3. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and fire protection requirements.

a. Thermal Barrier: Provide 15-minute thermal barrier of 1/2 inch gypsum board or equivalent material complying with NFPA 275 test method, or foamed-in-place insulation that complies with FM 4880, NFPA 286, UL 1040, or UL 1715.

4. Density In Place: Minimum 2.0 lb/cu ft.; ASTM D1622/D1622M.
5. Thermal Resistance: R-value of 6.4, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
6. Water Vapor Permeance: 1.1 perms, nominal, per 1 inch thickness, when tested at intended thickness in accordance with ASTM E96/E96M.
7. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
8. Air Permeance: 0.004 cfm per square foot, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf.
9. Closed Cell Content: At least 90 percent.
10. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.4 ACCESSORIES

A. Primer: As required by insulation manufacturer.

B. Transition Membrane: Self-adhering type, with 2 mil thick type 304 stainless steel sheet with 8 mil butyl adhesive and a removable release liner

1. Application: Where indicated on drawings or where otherwise required as a transition membrane between spray foam and adjacent air-sealing materials or systems.
2. Products:

a. Momentive Performance Materials, Inc/GE Construction Sealants; GE Elemax SS Flashing: www.siliconeforbuilding.com.

b. VaproShield; Vapro-SS Flashing: www.vaproshield.com.

c. York Manufacturing, Inc.; York 304 SA: www.yorkmfg.com.

d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify work within construction spaces or crevices is complete before insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit adhesion.

3.2 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.3 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids and shadowing. Screed away excess foam to produce smooth and uniformly textured exposed surfaces.

C. Apply to a uniform minimum thickness.

D. Comply with manufacturer's written requirements for recommended thickness of each pass and cooling between passes.

E. Apply protective coating monolithically, without voids to fully cover foam insulation.

F. Patch damaged areas.

G. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts or void applicable warranties of opening components.

H. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Field inspections and tests will be performed by an independent testing agency.

C. Inspection will include verification of insulation thickness and density.

3.5 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

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SECTION 072726 - FLUID-APPLIED AIR BARRIERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fluid-applied air barriers.

1.3 RELATED REQUIREMENTS

A. Section 061600 - Sheathing: Substrates requiring prep for air barrier installation.

B. Section 072119 - Foamed-In-Place Insulation.

C. Section 074213.19 - Insulated Metal Wall Panels.

1.4 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable with water vapor permeance as specified, having sealed seams and sealed joints to adjacent surfaces.

1.5 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.

B. ASTM D751 - Standard Test Methods for Coated Fabrics.

C. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

G. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation with adjacent flashings and weather barriers for compatibility and continuity of those systems.
2. Coordinate installation of flashings at openings with Sections that specify window, door, and other opening installations.
3. Do not install air barrier material before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.

B. Preinstallation Meeting: Conduct a preinstallation meeting at least two weeks prior to the start of the work of this Section.

1. Agenda shall include quality standards set by approved mock-up, sequence of construction, coordination with substrate preparation, air barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction.
2. Attendance is required by Contractor, Architect, Installer, and representatives of related trades including covering materials, substrate materials and adjacent materials.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, limitations, and manufacturer's standard flashing and termination details.

C. Shop Drawings of Mock-Up: Provide drawings of proposed mock-up showing plans, elevations, large scale details, and air barrier transitions and terminations.

D. Shop Drawings: Provide drawings of project-specific flashing, termination, and special joint conditions based on manufacturer's standard details; minimum scale 1-1/2 inch equals 1 foot.

1. Show extent of air barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the materials are secured with air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.

E. Compatibility: Submit letter from primary material manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use.

F. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

G. Field Test Results: Submit test results for tests described in the Field Quality Control article, including retesting if intitial results are not satisfactory.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

J. Testing agency qualification statement.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

B. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. System Compatibility: Confirm that selected weather barrier system components are compatible with each other as as system and are also compatible with substrate surfaces, opening materials, other adjacent flashings and weather barrier materials, and joint sealants.

E. Basis of Design: Specifications are based on primary systems by specified basis of design manufacturer. Primary systems manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in design, weight, and performance are minor, and do not detract substantially from the indicated design intent.

1.9 MOCK-UPS

A. Integrated Exterior Mock-up: Construct mock-up representative of primary air barrier assemblies, including backup wall and typical openings, flashings, and penetrations. Use materials and accessories proposed for use in the exterior wall assembly.

1. Mock-ups shall be suitable for field quality control testing.
2. Locate where directed.
3. Mock-up may remain as part of work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Handle materials in accordance with material manufacturer’s recommendations.

1.11 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

B. Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.12 WARRANTY

A. Material Warranty: Provide material manufacturer's standard product warranty, for a minimum five years from date of Substantial Completion.

B. Installation Warranty: Provide a two (2) year installation warranty from date of Substantial Completion, including all accessories and materials of the air barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of attachment, loss of adhesion and failure to cure properly.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR IMPERMEABLE)

A. Fluid Applied Air and Vapor Barrier:

1. Dry Film Thickness (DFT): As recommended by manufacturer for each substrate surface profile type.

   a. Smooth Surfaces: 36 mils.

   b. Rough Surfaces: 54 mils.

2. Air Permeance: 0.0013 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.

3. Water Vapor Permeance: 0.03 perm, maximum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.

4. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M.

5. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.

6. Elongation: 250 percent, minimum, when tested in accordance with ASTM D412.

7. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.

8. Complies with NFPA 285 requirements for wall assembly.

9. Seam and Perimeter Tape: As recommended by sheet manufacturer.

10. Acceptable Products:

    a. Basis of Design: Henry Company; Air-Bloc 16MR: www.henry.com.

11. Acceptable Manufacturers:

    a. Carlisle Coatings and Waterproofing, Inc: www.carlisleccw.com/#sle.

    b. GCP Applied Technologies: www.gcpat.com/#sle.

c. Polyglass: www.polyglass.com.

d. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

e. W.R. Meadows, Inc.: www.wrmeadows.com.

f. Substitutions: See Section 016000 - Product Requirements.

2.2 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions, and as required for a complete and air-tight installation.

1. All accessory materials shall have air and water vapor permeance performance matching that of the primary air barrier system.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.

1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
2. Elongation: 400 percent, minimum, measured in accordance with ASTM D412.
3. Peel Adhesion: 28 lb/inch, minimum, when tested in accordance with ASTM D903.
4. Hydrostatic Head Pressure: Resists head pressure of 57 feet, maximum, when tested in accordance with ASTM D751.
5. Comply with NFPA 285 requirements for wall assembly.

C. Primer: As recommended by primary air barrier membrane manufacturer.

D. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.

1. Thickness: 40 mil, 0.040 inch, nominal; exception from ASTM D1970/D1970M.
2. Width: 4 inches, minimum.
3. Water Vapor Permeance: Matching that of primary air barrier, when tested in accordance with ASTM E96/E96M Procedure A (Desiccant Method) at 73.4 degrees F.

E. Preformed Transition Membrane: Semirigid silicone or polyester composition, tapered edges, ribbed back, tear resistant.

1. Products:

a. Dow; DOWSIL Silicone Transition Strip and System: www.dow.com/#sle.

b. Henry Company; Moistop Corner Shield: www.henry.com/#sle.

c. Momentive Performance Materials, Inc/GE Silicones; RF100 Reinforcing Fabric: www.siliconeforbuilding.com/#sle.

d. Tremco Commercial Sealants & Waterproofing; ProGlaze ETA System 1: www.tremcosealants.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

F. Stainless Steel Flashing: Flexible flashing with 2 mil, 0.002 inch thick Type 304 stainless steel sheet, 8 mil, 0.008 inch of butyl adhesive and siliconized release liner.

1. Width: 6 inches wide, minimum.
2. Overlap joints at least 2 inches.
3. Products:

a. Hohmann & Barnard, Inc.; Mighty-Flash SA Stainless Flashing: www.h-b.com.

b. Momentive Performance Materials, Inc/GE Silicones; GE Elemax SS Flashing: www.siliconeforbuilding.com/#sle.

c. STS Coatings, Inc; Wall Guardian Self Adhering Stainless Steel Flashing: www.stscoatings.com/#sle.

d. VaproShield, LLC; VAPRO-SS FLASHING: www.vaproshield.com/#sle.

e. York Manufacturing, Inc; York 304 SA: www.yorkmfg.com/#sle.

f. Substitutions: See Section 016000 - Product Requirements.

G. Liquid Flashing: One part, fast curing, nonsag, elastomeric, gun grade, trowelable.

H. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Ensure that the following conditions are met:

1. Surfaces are sound, dry, even, and free of excess mortar or other contaminants.
2. Inspect substrates to be smooth without large voids or sharp protrusions.

C. Verify substrate is visibly dry and free of moisture.

D. Verify sealants are compatible with membrane proposed for use.

E. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

F. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives, sealants, and air barrier materials in accordance with manufacturer's installation instructions.

C. Protection from spray-applied materials:

1. Mask and cover adjacent areas to protect from over-spray.

2. Ensure any required foam stop or back up materials are in place to prevent over-spray and achieve complete seal.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Refer to air barrier manufacturer's detail drawings for installation procedures including:

1. Changes in substrate.

2. Control joints.

3. Crack treatments.

4. Inside and outside corners.

5. Penetrations.

6. Rough openings.

7. Sheathing joints.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Do not cover installed air barriers until required inspections have been completed.

C. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

D. Take digital photographs of each portion of installation prior to covering up air barriers.

E. Provide field testing of installed air barrier system by independent laboratory during the construction process. Perform the following:

1. Air and Water Infiltration - Test Chamber: Test in accordance with requirements specified in glazing system sections for air and water leakage. Deficiencies include air leakage beyond values specified, uncontrolled water leakage, unsatisfactory workmanship.

a. Coordinate with Section 084413 for installation of glazing system as part of tested assembly.

b. Mock-up Testing: Perform test of mock-up prior to installation of insulation, cladding and trim but after installation of all fasteners, brackets, supports for cladding and trim, and other penetrating elements.

c. Building Testing: Perform tests on building prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements. Perform testing at 10%, 50%, and 70% completion of air barrier installation.

2. Membrane Adhesion: Test in accordance with ABAA T0002-2019 using a type II pull tester except that the membrane shall be cut through to separate the material attached to the disc from the surrounding material. Perform test after curing period recommended by the material manufacturer. Record mode of failure and area where the material failed. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the material manufacturer has not declared a minimum adhesion value for their product/substrate combination, the value shall simply be recorded.

a. Mock-up Testing: Perform test of mock-up at three locations.

b. Building Testing: Perform tests on building at three locations. Perform testing at 10%, 50%, and 70% completion of air barrier installation.

3. Air Barrier Assembly Testing - Bubble Gun: Test in accordance with ASTM E1186.

a. Mock-up Testing: Perform three tests on sheathing seams and at each type of bracket, clip, and masonry tie.

b. Building Testing: Perform three tests on sheathing seams and at each type of bracket, clip, and masonry tie. Perform testing at 10%, 50%, and 70% completion of air barrier installation.

F. If the testing and/or inspections reveal any defects or deficiencies, promptly remove and replace defective work, and retest until satisfactory results are obtained at no additional cost to the Owner.

G. Repair air barrier and other materials damaged from field testing.

3.5 PROTECTION

A. Protect air barrier materials from damage during installation and the remainder of the construction period, according to material manufacturer's written instructions.

B. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 074213.19 - INSULATED METAL WALL PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Factory-assembled metal panel system for walls, with trim, related flashings and accessory components.

1.3 RELATED REQUIREMENTS

A. Section 072100 - Thermal Insulation.

B. Section 072119 - Foamed-In-Place Insulation.

C. Section 072726 - Fluid-Applied Air Barriers: Air barrier materials.

1.4 REFERENCE STANDARDS

A. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

D. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with placement of anchors.
2. Coordinate installation of air barrier seals to adjacent system.

B. Preinstallation Meeting: Convene one week before starting work of this Section.

1. Require attendance by the installer and relevant sub-contractors.
2. Review scheduling of wall system manufacturer's representative site inspection visits.

3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.

4. Review procedures for protection of work and other construction.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer documentation on tested structural, thermal, and fire resistance capabilities of assembled panel.

C. Shop Drawings: Indicate dimensions, panel profile and layout, spans, joints, construction details, methods of anchorage, and method and sequence of installation.

D. Samples: Submit two samples of panel, 12 by 12 inch in size illustrating finish color, sheen, and texture.

E. Design and Performance Data: Indicate panel profile and dimensions.

F. Manufacturer's qualification statement.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of this Section with minimum five years experience.

C. Basis of Design: Specifications are based on wall panel types by specified basis of design manufacturer. Wall panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, composition, and profile are minor, and do not detract substantially from the indicated design intent.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.9 FIELD CONDITIONS

A. Do not install panels when air temperature or relative humidity are outside manufacturer's limits.

1.10 WARRANTY

A. Correct defective materials within a twenty year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

B. Correct defective work within a two year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for insulated metal wall panels.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer:

1. Kingspan; QuadCore Optimo: www.kingspan.com/us/en/.

B. Other Acceptable Manufacturers:

1. Centria: www.centria.com.
2. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE / DESIGN CRITERIA

A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.

1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
2. Accommodate tolerances of building structural framing.
3. Provide continuity of thermal barrier and air barrier seal at building enclosure elements in conjunction with air seal materials; see Division 07 section for Air Barriers and Foamed-in-Place Insulation.

B. Performance Requirements:

1. Thermal Performance: Provide thermal resistance through entire system; R-value as indicated on drawings.
2. Structural Performance: Design and size to withstand all dead loads and wind loads caused by positive and negative wind pressure acting normal to plane of panel.

a. Verify structural performance in accordance with ASTM E330/E330M, using test pressure 1.5 times design wind pressure, with 10 seconds duration of maximum load.

b. Design Wind Loads: Calculated in accordance with applicable code and as required by ASCE 7 and Structural Drawings.

c. Maximum Allowable Deflection of Panel: 1/180 of span.

3. Fire Resistance: Class 1 fire rated, without height limitation, when tested in accordance with FM 4880.

4. Water Penetration, Static Pressure: No uncontrolled water penetration when tested in accordance with ASTM E331 at minimum 15 psf pressure differential for a two (2) hour duration.
5. Water Penetration, Dynamic Pressure: No uncontrolled water penetration when tested in accordance with AAMA 501.1 at a minimum static differential pressure of 12 lb. /sq. ft.
6. Movement: Accommodate the movement caused by the following without damage to system, components, or deterioration of seals:
    a. Normal movement between system components.
    b. Seasonal temperature cycling.
    c. Deflection of structural support framing,

2.3 COMPONENTS

A. Panels: Exterior and interior metal sheet skin, factory-assembled, with foamed in place insulation; exterior and interior sheet interlocking at edges, utilizing no glues or adhesives, with factory sealed tongue-and-groove and pressure-equalized rainscreen-designed joinery, attached to supports using concealed fasteners. Laminated panels are unacceptable.
    1. Panel Width: 30 inch.
    2. Profile: As indicated; horizontal panels.
    3. Panel Thickness: As indicated on drawings.
    4. Exterior Sheet: Pre-finished galvanized steel, 24 gage, 0.0276 inch minimum base metal thickness.
        a. Texture: Non-embossed, smooth.
    5. Interior Sheet: Galvanized steel, pre-finished, 26 gage, 0.0217 inch minimum base metal thickness.
        a. Texture: Non-embossed.
    6. Panel Edge Profile: Tongue and groove, for flush seam.
    7. Panel Joint Reveal: 1/8 inch.
    8. Panel Lengths: As detailed.
    9. Exterior Finish: Polyvinylidene fluoride (PVDF) coating; two-coat 1.0 mil,
        a. Color: As selected by Architect from manufacturer's full range.
    10. Interior Finish: Silicone polyester coating; manufacturer's standard color.

B. Trim, Closure Pieces, Flashings, and Infills: Same material, thickness and finish as exterior sheets; factory-fabricated to required profiles; fabricated in longest practicable lengths.

2.4 MATERIALS

A. Precoated Galvanized Steel Sheet: ASTM A653/A653M, Commercial Steel (CS) or Forming Steel (FS), with G90/Z275 coating; continuous-coil-coated with epoxy, acrylic, or polyurethane primer coat, polyvinyl fluoride (PVF) top coat, and polyester washcoat for panel back.

B. Foamed-in-Place Insulation: Polyisocyanurate type.

1. Density: 2.2 lb/cu ft, minimum, when tested in accordance with ASTM D1622/D1622M.

2.5 SECONDARY METAL FRAMING

A. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM C 645, Grade 50, with ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating.

B. Sill Channels: 16 gauge minimum.

C. Hat Channels: 16 gauge minimum, 7/8 inch or as otherwise shown in Drawings.

2.6 ACCESSORIES

A. General: Provide complete assembly incorporating panels, trim, sills, inside and outside corners, closures, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, tapes, closure strips, and caps for a complete installation. Fabricate accessories in accordance with SMACNA Manual.

B. Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.

C. Extrusion Trim: Provide manufacturer-provided extruded trim for the following locations and as indicated on Drawings:

1. Base trim.
2. Coping.
3. Panel installation perimeter.
4. Opening perimeters.

D. Concealed Sealants: Non-curing butyl sealant or tape sealant.

E. Exposed Sealants: Type recommended by metal wall panel system manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."

F. Flashing Tape: 4-inch wide self-adhering butyl flashing tape.

G. Panel Attachment Clips: Concealed G-90 galvanized steel clip configured to prevent overdriving of fastener and crushing of foam core, with panel fasteners engaging both face and liner elements and mechanically attaching to panel supports. Clip configured also to be utilized without removing significant portions of the foam at each clip location.

H. Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal wall panels by means factory-applied coating.

I. Field Touch-up Paint: As recommended by panel manufacturer.

J. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that structural framing is ready to receive panel system.

B. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

C. Openings: Verify that windows, doors, louvers and other penetrations match layout on shop drawings.

D. Correct out of tolerance work and other deficient conditions prior to proceeding with panel installation.

3.2 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

B. Secondary Metal Framing: Install secondary metal framing components as indicated. Install secondary metal framing and other metal panel supports per ASTM C 754 and metal wall panel manufacturer's recommendations.

3.3 INSTALLATION

A. Install panel system on walls in accordance with manufacturer's instructions and approved shop drawings.

B. Protect panel surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

D. Locate panel joints over supports.

E. Provide for thermal and structural movement.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Attach panels to metal framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.

1. Fasteners for Steel Wall Panels: Stainless-steel for exterior locations and locations exposed to moisture; carbon steel for interior use only.
2. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as approved by manufacturer.
3. Fasten metal wall panels to supports with concealed clips at each joint at location, spacing, and with fasteners recommended by manufacturer. Install clips to supports with self-tapping fasteners.
4. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

H. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.

3.4 ACCESSORY INSTALLATION

A. General: Install metal wall panel accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install related flashings and sheet metal trim per requirements of Division 07 Section "Sheet Metal Flashing and Trim."
2. Install components required for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Comply with performance requirements and manufacturer's written installation instructions.
4. Provide concealed fasteners except where noted on approved shop drawings.
5. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.5 FIELD QUALITY CONTROL

A. The panel installer shall water test panel areas for each crew at least once during installation schedule and once at the conclusion of the installation.

B. Progress or check tests can be performed by the installer following test procedures noted in AAMA 501.2. No independent test agency need to be employed in this test phase. Results of this test phase is to be recorded and reported to the panel manufacturer.

3.6 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.7 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove site cuttings from finish surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

D. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

3.8 PROTECTION

A. Replace damaged panels and accessories that cannot be repaired by finish touch-up or minor repair.

B. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 074293 - METAL SOFFIT PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Manufactured metal panels with related flashings and accessory components.

B. Subgirt framing assembly.

1.3 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 079200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.4 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of wall panel system anchorsand back-up support framing.

B. Preinstallation Meeting: Convene one week before starting work of this Section.

1. Require attendance by the installer and relevant sub-contractors.
2. Review storage and handling procedures.
3. Review procedures for protection of work and other construction.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data - Soffit System: Manufacturer's data sheets on each product to be used, including:

1. Physical characteristics of components shown on shop drawings.
2. Storage and handling requirements and recommendations.
3. Installation instructions and recommendations.

C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.

1. Differentiate between shop and field fabrication.
2. Indicate substrates and adjacent work with which the wall system must be coordinated.
3. Include large-scale details of anchorages and connecting elements.
4. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
5. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

D. Selection Samples: For each color specified, submit at least 5 color chips representing Architect's designated color range.

E. Verification Samples: Submit two samples of wall panel, 12 inch x 12 inch in size illustrating finish color, sheen, and texture.

F. Source Quality Control Submittals.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

1.7 QUALITY ASSURANCE

A. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in installing the products specified in this Section with minimum three years of documented experience.

D. Basis of Design: Specifications are based on metal panel types by specified basis of design manufacturer. Wall panel types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, composition, and profile are minor, and do not detract substantially from the indicated design intent.

1.8 MOCK-UPS

1.9 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.

D. Prevent contact with materials that may cause discoloration or staining of products.

1.10 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.11 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Special Manufacturer’s Warranty: On manufacturer’s standard form, in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials and workmanship within two years from date of Substantial Completion.

C. Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Morin Corporation: www.morincorp.com.

a. Formed Metal Soffit Panel System: Primo Soffit PS-12-2.

b. Flat Seam Concealed Fastener Metal Wall Panel System: Morin Concealed Fastener.

B. Acceptable Manufacturers:

1. ATAS International, Inc.: www.atas.com/#sle.
2. Berridge Manufacturing Company: www.berridge.com/#sle.
3. Englert, Inc: www.englertinc.com/#sle.

4. McElroy Metal: www.mcelroymetal.com/#sle.
5. Petersen Aluminum Corporation: www.pac-clad.com/#sle.
6. Centria: www.centria.com.
7. Substitutions: See Section 016000 - Product Requirements.

2.2 METAL SOFFIT PANEL SYSTEM

A. Soffit Panel System: Factory fabricated prefinished metal panel system, site assembled.

1. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
2. Design Pressure: In accordance with ASCE 7 and loads indicated on Structural Drawings.
3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch returns.

B. Soffit Panels:

1. Profile: Style as indicated.
2. Material: Precoated steel sheet, 24 gauge minimum thickness.
3. Color: As selected by Architect from manufacturer's premium wood-look line.

C. Subgirt Framing Assembly: Profiles and configuration as required by system manufacturer to attach panel system to building.

1. 16 gauge, 0.0598 inch thick formed non-precoated steel sheet.

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles. Mitered internal corners to be back braced with precoated sheet stock to maintain continuity of profile.

E. Expansion Joints: Same material, thickness and finish as exterior sheets; ___ gauge, ___ inch thick; manufacturer's standard brake formed type, of profile to suit system.

F. Trim, Closure Pieces, and Flashings: Same material and finish as exterior sheets; brake formed to required profiles.

1. See Section 076200.

2.3 MATERIALS

A. Select materials with surface flatness, smoothness, and lack of surface blemishes where exposed to view in finished system.

2.4 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch.

1. Panel Backside Finish: Where exposed to weathering (screenwall application), finish panel backside to match exposed surface finish.

2. Products:

a. Arkema, Inc; Kynar 500: www.arkema.com/#sle.

b. PPG; Duranar: www.ppgmetalcoatings.com/#sle.

c. Sherwin-Williams Company; Fluropon: www.coil.sherwin.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2.5 ACCESSORIES

A. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 079200

B. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

C. Fasteners: Manufacturer's standard type to suit application; stainless steel.

1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

D. Field Touch-up Paint: As recommended by panel manufacturer.

E. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that air barrier has been installed over substrate completely and correctly.

C. Examine rough-in for components and systems penetrating wall panels to coordinate actual penetration locations relative to wall panel joint locations prior to installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install subgirts perpendicular to panel length and in a direction to promote drainage, securely fastened to substrates and shimmed and leveled to uniform plane. Space at 24 inches on center, maximum.

B. Remove protective strippable film prior to installation of panels.

C. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.3 INSTALLATION

A. Install panels in accordance with manufacturer's instructions.

B. Fasten panels to structural supports; aligned, level, and plumb.

C. Locate joints over supports.

D. Provide expansion joints where indicated.

E. Use concealed fasteners unless otherwise indicated by Architect.

F. Comply with standards set forth in the Architectural Sheet Metal Manual published by SMACNA.

G. Install panels in such a manner that horizontal lines are true and level and vertical lines are plumb.

H. Install starter and edge trim before installing wall panels.

I. Attach panels using manufacturer’s standard clips and fasteners, spaced in accordance with approved shop drawings.

J. Install accessories with positive anchorage to building, weather tight mounting, provisions for thermal expansion, and coordinate installation with flashings and other components.

1. Install components required for a complete wall panel assembly including trim, flashings and other accessory items.

3.4 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch, maximum.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/8 inch.

3.5 CLEANING

A. Remove site cuttings from finish surfaces.

B. Remove protective material from wall panel surfaces.

C. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

3.6 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION

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SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (EPDM)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. EPDM membrane roofing system and accessories.

B. Cover board.

C. Insulation.

D. Vapor retarder.

E. Deck sheathing.

1.3 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 072726 - Fluid-Applied Air Barriers: Continuity of air barrier at roof and wall transitions.

1.4 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in section.

1.5 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

C. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing.

D. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

F. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.

G. ASTM D4811/D4811M - Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing.

H. ASTM D5147/D5147M - Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

J. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.

K. FM 4470 - Examination Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction.

L. NRCA (RM) - The NRCA Roofing Manual.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with installation of associated counter flashings and roof drainage components installed under other sections.
2. Coordinate installation with adjacent flashings and air barrier systems for compatibility and continuity.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1. Agenda:

a. Sequence of construction.

b. Coordination with substrate preparation.

c. Roofing materials approved for use.

d. Compatibility of materials.

e. Coordination with installation of adjacent and covering materials.

f. Construction details.

2. Require attendance of parties directly influencing roofing work quality or affected by roofing work performance.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide membrane manufacturer's printed data showing roofing system components comply with specified requirements and with membrane manufacturer's requirements and recommendations for system type specified; include data for each product used in conjunction with roofing membrane, including insulation and fasteners.
2. Provide documentation showing roofing system is UL classified or FM approved where UL or FM requirements are specified; include data itemizing classified or approved system components.

C. Shop Drawings: Indicate membrane manufacturer's standard details drawn to scale and customized for project for relevant conditions.

1. Include flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
2. For tapered insulation, indicate project-specific layout, slopes, thicknesses, and dimensions.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate installation of components; where instructions allow installation options, clearly indicate which option to use.

F. Preinstallation Notice: Provide copy of manufacturer's approved preinstallation notice.

G. Installer's qualification statement.

H. Executed warranty.

I. Specimen Warranty: Submit before starting work.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum twenty (20) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this section with minimum five years of documented experience installing specified system and having the following:

1. Trained and approved by manufacturer.
2. Capability to provide payment and performance bond to Owner.

C. Documents at Project Site: Maintain at project site one copy of manufacturer's installation instructions.

1.9 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

C. Store materials clear of ground and moisture with weather-protective covering.

D. Keep combustible materials away from ignition sources.

E. Ensure storage and staging of materials does not exceed static and dynamic loadbearing capacities of roof decking.

F. Protect foam insulation from direct exposure to sunlight.

1.10 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather or when ambient conditions conflict with manufacturer's installation instructions.

B. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

C. Schedule applications so no partially completed sections of roof are left exposed at end of workday.

1.11 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Comply with warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

C. Manufacturer Warranty: Full system warranty; 20-year limited warranty covering membrane, roof insulation, and membrane accessories.

1. Liability Limit: No dollar limitation.
2. Scope of Coverage: Repair leaks in roofing system caused by:

a. Ordinary wear and tear of elements.

b. Manufacturing defects in materials.

c. Defective workmanship used to install materials.

d. Damage due to winds up to 72 mph.

e. Hail up to 2 inches in diameter.

D. Metal Roof Edging System Warranty: Include edge metals in membrane manufacturer's full system warranty.

E. Metal Roof Edging System Finish Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturers:
   1. Elevate: www.holcimelevate.com.
   2. Carlisle SynTec: www.carlisle-syntec.com.
   3. Johns Manville: www.jm.com.
   4. GAF: www.gaf.com.
   5. Versico: www.versico.com.

B. Insulation: Same manufacturer as roof membrane.

C. Substitutions: See Section 016000 - Product Requirements.

D. Source Limitations: Furnish products produced by single manufacturer.

2.2 EPDM MEMBRANE ROOFING SYSTEM

A. Description: EPDM single-ply membrane.
   1. Membrane Attachment: Fully adhered.
   2. Deck Slope: Flat; provide slope of 1/4 inch per foot by means of tapered insulation.
   3. Provide roofing system to withstand wind uplift forces calculated with ASCE 7 and as indicated in Drawings.
   4. Provide assembly having Underwriters Laboratories, Inc. (UL) Class B fire hazard classification.

B. Components, from Top of Roof Down:
   1. Membrane: Thickness as specified below.
   2. Cover Board: Cement Roof Board, 1/2 inch thick; mechanically fastened.
   3. Insulation:
      a. Maximum Board Thickness: 3 inches; use as many layers as necessary; stagger joints in adjacent layers.
      b. Tapered: Minimum slope as indicated on drawings; provide minimum R-value at thinnest point; place tapered layer on top or on bottom.
      c. Total System R-value: Minimum value as indicated in drawings.
      d. Top Layer: Polyisocyanurate foam board, noncomposite; cold adhesive attached.
      e. Bottom Layer: Polyisocyanurate foam board, noncomposite; cold adhesive attached.
      f. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated on drawings.

4. Vapor Retarder: Self-adhering membrane.
5. Deck Sheathing: Cement Roof Board , 1/2 inch thick; mechanically fastened.

2.3 MEMBRANE MATERIALS

A. Roofing and Flashing Membrane: Cured synthetic single-ply membrane composed of EPDM with the following properties:
   1. Reinforcement: None; membrane complying with ASTM D4637/D4637M, Type I.
   2. Membrane and Flashing Color: White.
   3. Thickness: 90 mils, 0.09 inch
   4. Nominal Thickness Tolerance: Plus/minus 10 percent.
   5. Sheet Width: Provide widest available sheets to minimize field seaming.

B. Flashing Membrane: Self-curing, nonreinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D4811/D4811M, Type II, with the following properties:
   1. Thickness: 55 mils, 0.055 inch.

C. Self-Adhesive Flashing Membrane: Semi-cured 45-mil, 0.045-inch EPDM membrane laminated to 35-mil, 0.035-inch EPDM tape adhesive.

D. Premolded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes.

E. Self-Adhesive Lap Splice Tape: 35 mil EPDM based, formulated for compatibility with EPDM membrane and high-solids primer.

F. Splice Adhesive: Manufacturer's recommended synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces.

G. Bonding Adhesive: Manufacturer's recommended bonding adhesive, formulated for compatibility with EPDM membrane and other substrate materials, including masonry, wood, and insulation facings.

H. Adhesive Primer: Manufacturer's recommended primer formulated for compatibility with EPDM membrane and tape adhesive.

I. Low-Rise Foam Adhesive: Manufacturer's recommended two-component, low-rise polyurethane adhesive designed to attach fleece-backed roofing membranes to variety of acceptable substrates.

J. Lap Sealant: Manufacturer's recommended lap sealant formulated for compatibility with primers and flashings.

K. AP Sealant: Manufacturer's recommended single-component, polyurethane, nonsag, moisture-curing sealant.

L. Seam Edge Treatment: Manufacturer's recommended EPDM rubber-based sealant, formulated for sealing exposed membrane edges at seams.

M. Pourable Sealer: Manufacturer's recommended two-part polyurethane, two-color for reliable mixing.

N. Water Block Seal: Manufacturer's recommended butyl rubber sealant for use between two surfaces, not exposed.

O. Metal Plates and Strips Used for Fastening Membrane and Insulation: Steel with galvalume coating; comply with FM 4470 criteria for corrosion resistance.

P. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.1 inch thick.

Q. Roof Walkway Pads: EPDM, 0.3 inch thick and 30 by 30 inches with EPDM tape adhesive strips laminated to bottom.

2.4 COVER BOARDS

A. Cement Roof Cover Board: Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units, UL type designation “DCB”, complying with ASTM C1325.

1. Mold Resistance: Score of 10, tested in accordance with ASTM D3273.
2. Water Vapor Permeance: 5.84 perm, maximum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method.
3. Surface-Burning Characteristics: Flame spread index of 0 and smoke developed index of 0, tested in accordance with ASTM C518.
4. Flute Span-ability: 12 inches, tested in accordance with ASTM E661.
5. Thermal Value: R-0.39, tested in accordance with ASTM C518.
6. Compressive Strength: 1800 psi.
7. Thickness: 1/2 inch.
8. Weight: 2.4 psf.
9. Long Edges: Square.
10. Product:

    a. Basis of Design: USG; Securock Cement Board: www.usg.com/.

2.5 INSULATION

A. Polyisocyanurate Board Insulation: Closed-cell polyisocyanurate foam laminated to facers, complying with ASTM C1289, Type II, Class 1, with the following additional characteristics:

1. Compressive Strength: 20 psi when tested in accordance with ASTM D1621.
2. Ozone Depletion Potential: Zero; made without CFC- or HCFC-blowing agents.

B. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty; use only adhesives furnished by roof membrane manufacturer.

2.6 VAPOR RETARDER MATERIALS

A. Self-Adhering Membrane Vapor Retarder: SBS-modified bitumen adhesive, factory-laminated to tri-laminate woven, high-density polyethylene top surface with release liner.

1. Thickness: 30 mils, 0.03 inch, minimum.

2. Low-Temperature Flexibility: 0.0325 inch at minus 30 degrees F when tested in accordance with ASTM D5147/D5147M.
3. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
4. Water Vapor Permeance: 0.04 perm, maximum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method.
5. Water Penetration Resistance around Nails: Pass, when tested in accordance with ASTM D1970/D1970M.

2.7 DECK SHEATHING

A. Cement Roof Deck Sheathing: Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units, UL type designation “DCB”, complying with ASTM C1325.
1. Mold Resistance: Score of 10, tested in accordance with ASTM D3273.
2. Water Vapor Permeance: 5.84 perm, maximum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method.
3. Surface-Burning Characteristics: Flame spread index of 0 and smoke developed index of 0, tested in accordance with ASTM C518.
4. Flute Span-ability: 12 inches, tested in accordance with ASTM E661.
5. Thermal Value: R-0.39, tested in accordance with ASTM C518.
6. Compressive Strength: 1800 psi.
7. Thickness: 1/2 inch.
8. Weight: 2.4 psf.
9. Long Edges: Square.
10. Product:
    a. Basis of Design: USG; Securock Cement Board: www.usg.com/.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine roof deck to determine deck is sufficiently rigid to support installers and mechanical equipment so deflection will not strain or rupture roof components or deform deck.

B. Verify surfaces and site conditions are ready to receive work. Correct defects in substrate before commencing with roofing work.

C. Examine roof substrate to verify adequate slope to drains.

D. Verify specifications and drawing details are workable and not in conflict with roofing manufacturer's recommendations and instructions; start of work constitutes acceptable project conditions and requirements.

E. Verify wood nailers are installed according to manufacturer's instructions.

3.2 PREPARATION - GENERAL

A. Take appropriate measures to ensure fumes from adhesive solvents are not drawn into building through air intakes.

B. Do not start work until preinstallation notice has been submitted to manufacturer.

C. Before proceeding, ensure roof surface is clean, dry, and smooth and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease, and other materials that may damage membrane.

D. Fill surface voids in immediate substrate greater than 1/4-inch wide with fill material insulation approved by insulation and membrane manufacturers.

E. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.

1. Protect from spills and overspray from bitumen, adhesives, sealants, and coatings.
2. Protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within range of windborne overspray.
3. Protect finished areas of roofing system from roofing-related work traffic and traffic by other trades.

3.3 INSTALLATION - GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for specified roofing system. Where manufacturer provides no instructions or recommendations, follow NRCA (RM) written requirements and industry standards. Comply with federal, state, and local regulations.

B. Obtain relevant instructions and maintain copies at project site for duration of installation period.

C. Provide temporary closures to ensure moisture does not damage completed roofing. Use flashings, terminations, and temporary closures to provide watertight installation.

3.4 INSTALLATION - VAPOR RETARDER

A. Before installing insulation, install vapor retarder directly over deck.

B. Install vapor retarder in accordance with manufacturer's written instructions.

C. Ensure penetrations and edge conditions are sealed to prevent moisture and air drive into roofing system.

3.5 INSTALLATION - INSULATION

A. Install insulation in accordance with manufacturer's written instructions.

B. Install only as much insulation as can be covered with completed roofing system before end of day's work or before onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave roofing membrane unsupported over space greater than 1/4 inch.

E. Cold Adhesive Attachment, All Layers: Apply in accordance with membrane manufacturer's instructions and recommendations; apply pressure to individual roof insulation boards to obtain maximum adhesive contact.

3.6 INSTALLATION - COVER BOARD

A. Install in accordance with membrane manufacturer's instructions and recommendations.

B. Cold Adhesive Attachment: Apply pressure to individual boards to obtain maximum adhesive contact.

3.7 INSTALLATION - SINGLE-PLY MEMBRANE

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax before attachment or splicing. Refer to membrane manufacturer's guidelines for minimum relaxation time.

B. Lay out membrane pieces so field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

E. Edge Securement: Secure membrane at locations where membrane terminates or goes through angle change greater than 2 in 12 inches using mechanically-fastened reinforced perimeter fastening strips, plates, or metal edging as indicated in drawings, or as recommended by roofing manufacturer.

1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches wide.

3.8 INSTALLATION - FLASHING AND ACCESSORIES

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Install weathertight flashing at walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces.

1. Extend flashing minimum 8 inches above membrane surface unless otherwise noted on drawings.

2. Use longest practical flashing pieces.

3. Evaluate substrate and overlay; adjust installation procedure in accordance with membrane manufacturer's recommendations.

4. Complete splices between flashing and main roof sheet with specified splice adhesive before adhering flashing to vertical surfaces.
5. Provide termination directly to vertical substrates with termination bars and as shown on roof drawings.

C. Roof Drains:

1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified premanufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
2. Position membrane, then cut hole for roof drain to allow 1/2 to 3/4 inch of membrane to extend inside clamping ring past drain bolts.
3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
4. Apply sealant on top of drain bowl where clamping ring seats below membrane.
5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

D. Flash penetrations passing through membrane; make flashing seals directly to penetration.

1. Pipes, Round Supports, and Similar Items: Flash with specified premolded pipe flashings wherever practical; otherwise, use specified self-curing elastomeric flashing.
2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1-inch clearance from penetration; fill with manufacturer's pourable sealer and slope to shed water.
3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide standard curb with flashing.
4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
5. High-Temperature Surfaces: Protect elastomeric components from direct contact with hot surfaces using intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer when in-service temperature is or can be over 180 degrees F,

3.9 INSTALLATION - FINISHING AND WALKWAYS

A. Install walkways at access points to roof, around rooftop equipment requiring maintenance, and where indicated on drawings.

1. Do not install walkway pads within 10 feet of roof edge or perimeter.

B. Walkway Pads: Adhere to roofing membrane, spacing each pad at minimum of 1 inch and maximum of 3 inches from each other to allow for drainage.

1. If installation of walkway pads over field-fabricated splices or within 6 inches of splice edge cannot be avoided, adhere another layer of flashing over splice and extending beyond walkway pad minimum of 6 inches on either side.
2. Prime membrane, remove release paper on pad, press in place, and walk on pad to ensure adhesion.

3.10 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspection by Manufacturer: Provide final inspection of roofing system by technical representative employed by roofing system manufacturer to inspect installation for warranty purposes, not a sales person.

C. Perform corrections necessary for issuance of warranty.

D. Repair or replace building components and finished surfaces damaged or defaced due to work of this section; comply with recommendations of manufacturers of components and surfaces.

3.11 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

C. Remove leftover materials, trash, debris, and equipment from project site and surrounding areas.

3.12 PROTECTION

A. Where construction traffic continues over finished roof panels, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

1.3 RELATED REQUIREMENTS

A. Section 075323 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM): Warranty requirements for sheet metal copings and edge metals.

1.4 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with roofing work for scheduling installation of counterflashing, rain drainage and similar items related to roofing.
2. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
3. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.
4. Coordinate with the work of Section 079200 for installation of related sealants.

B. Preinstallation Meeting: Convene one week before starting work of this Section.

1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion.

2. Review preparation and installation procedures and coordinating and scheduling required with related work.

C. Sequencing: Do not proceed with installation of flashing and sheet metal work until substrate construction, cants, blocking, reglets, and other construction are ready to receive the work of this Section.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1. Include identification of material, thickness, weight, and finish for each item and location in Project.

2. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.

3. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.

4. Include details of connections to adjoining work.

5. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.8 MOCK-UP

A. Comply with general mock-up requirements specified in Section 014000.

B. Integrated Exterior Mock-up: Build mock-up representative of sheet metal assemblies, including underlayments and accessories, for evaluation of aesthetics and workmanship. Mock-up shall be as detailed in Drawings.

1. Locate where directed.

2. Mock-up may remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

C. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.

B. Provide 20 year manufacturer warranty for prefinished sheet metal materials. Warranty shall include degradation of metal finish.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet Metal Assemblies:

1. Capable of withstanding structural movement and exposure to wind and weather without failure or permanent deformation.

a. Design Pressure: Conforming with ASCE 7 or as indicated on structural drawings, whichever is most restrictive.

2. Physically protect building elements and systems from damage that would permit water leakage into building enclosure assemblies under all weather conditions.

B. Sheet Metal Standards: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum gage as scheduled, shop pre-coated with PVDF coating.

1. Exposed Coating: PVDF (Polyvinylidene Fluoride) Superior Performance Organic Finish, AAMA 621; multiple coat, thermally cured fluoropolymer finish system.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

B. Anodized Aluminum: ASTM B209 (ASTM B209M); minimum gage as scheduled; anodized finish of color as selected.

1. Clear Anodized Finish: AAMA 611, AA-M12C22A41, Class I, clear anodic coating not less than 0.7 mil, 0.0007 inch thick.

2. Color Anodized Finish: AAMA 611, AA-M12C22A42/44, Class I, integrally or electrolytically colored anodic coating not less than 0.7 mil, 0.0007 inch thick.

a. Color: As selected by Architect from manufacturer's standard colors.

C. Pre-Finished Aluminum: ASTM B209 (ASTM B209M), minimum gage as scheduled; shop pre-coated with with PVDF coating.

1. Exposed Coating: PVDF (Polyvinylidene Fluoride) Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.

2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

D. Stainless Steel: ASTM A240, Type 304 alloy, soft temper, fully annealed, minimum gage and finish as scheduled.

1. Finish: 2D (dull, cold rolled).

2.3 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats and starter strips of same material as sheet, minimum 12 inches wide, one gage thickness heavier than exposed sheet, and interlocking with exposed sheet.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

E. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.4 SEAMS AND JOINTS

A. Sealant Joints: Where movable, expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

B. Non-Moving Seams:

1. For metal greater than 0.040 inch thick, fabricate with butt seams with backup plates, fastened one side (SMACNA Figure 3-3, Type 19); seal with butyl sealant concealed within joint.

2. For metals 0.040 inch thick or less, fabricate with flat-lock seams (SMACNA Figure 3-2, Type 2); treat as follows:

a. Prepainted Steel and Aluminum: Form seams and seal with elastomeric sealant. Rivet joints where necessary for strength.

b. Unpainted Aluminum (includes mill finish and anodized: Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

c. Other Metals: Tin edges to be seamed, form seams, and solder.

C. Moving Seams:

1. For metal greater than 0.040 inch thick: Form expansion joints of butt seams with backup plates fastened to substrate (SMACNA Figure 3-3, Type 18) with no fasteners exposed through covers. Seal seams with butyl sealant concealed within joints.

2. For metal 0.040 inch thick or less: Form expansion joints of intermeshing hooked flanges (SMACNA Figure 3-2, Type 1), not less than 1 inch deep, filled with butyl sealant concealed within joint.

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

1. Do not solder prepainted metal sheet.

2.5 ROOF SHEET METAL FABRICATIONS

A. Counterflashings: Factory fabricated and finished sheet metal that overlaps top edges of base flashing by at least 4 inches, and designed to snap into thru-wall flashing or reglets with lapped joints. Provide spring action pressure at bottom edge against base flashings.

1. Type and Finish: See Sheet Metal Schedule.

B. Flashings for Metal Roofs: Fabricate miscellaneous metal flashings according to the following SMACNA (ASMM) details or as recommended by roofing manufacturer:

1. Roof Panel Penetrations with Crickets: Figure 8-3 (pipes and vents).

2. Curb Flashings: Figure 8-3.

3. Ridge Caps: Figure 6-17.

4. Ridge, Rake, and Valley Flashings: Figure 6-7.

5. Eave, Hip, and Cap Flashings: Figure 6-6.

C. Roof Equipment Support Flashing: Cover raised bases and equipment supports. Fabricate with seamed and soldered joints and corners. Extend flashings over roof base flashings 4 inches minimum, and fold back bottom edge 1/2 inch. Where metal is penetrated for bolt or other fastener connections, use 4 lb sheet lead washers 2 inches larger than fastener hole.

1. Comply with SMACNA (ASMM) Figure 8-11B.

2. Type and Finish: See Sheet Metal Schedule.

2.6 WALL SHEET METAL FABRICATIONS

A. Openings Flashing: Fabricate head, sill, jamb and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams.

1. Type and Finish: See Sheet Metal Schedule.

2.7 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. General: Form roof drainage sheet metal fabrications to profiles and sizes indicated and as required to properly collect and remove water. Fabricate complete with required connection pieces, expansion joints and strap anchors to maintain watertight joints.

B. Hanging Gutters: SMACNA (ASMM) Rectangular profile.

1. Comply with SMACNA (ASMM) Figure 1-12.

C. Downspouts: Rectangular profile.

1. Downspouts: Comply with SMACNA (ASMM) Figures 1-32.

D. Gutters and Downspouts: Size indicated on drawings.

E. Overflow Scuppers: Fabricate to SMACNA (ASMM) and as detailed on Drawings. Fabricate in two sections, with roof side flanges secured first, then outside flanges attached after insertion through wall opening. Form edges of outside flange with snap-lock flange to engage scupper receiver and to create spring action against the outer wall surface.

1. Collector / Conductor Heads: None.
2. Scuppers: Comply with SMACNA (ASMM) Figure 1-26.
3. Flood test scuppers prior to installation to verify suppers are leak-tight.

F. Accessories: Profiled to suit application.

1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
2. Gutter Supports: Brackets.
3. Downspout Supports: Brackets.

G. Downspout Boots: Cast iron.

1. Acceptable Manufacturers:

a. EJ Group: www.ejco.com/.

b. J.R. Hoe: www.jrhoe.com/.

c. Mifab: www.mifab.com/.

d. Substitutions: See Section 01 6000 - Product Requirements.

2.8 FLASHING

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.9 ACCESSORIES

A. Fasteners: Non-corrosive type.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Zinc-Coated (Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I, No. 15.

C. Synthetic Underlayment: Polyethylene or polypropylene sheet.

D. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip- resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Thermal Stability: Stable after testing at 220 deg F; ASTM D 1970.

2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.

3. Acceptable Products:

a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.

b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.

c. Henry Company; Blueskin PE200 HT.

d. Metal-Fab Manufacturing, LLC; MetShield.

e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

f. Polyguard Products, Inc.; Deck Guard HT.

g. Substitutions: See Section 016000 - Product Requirements.

E. Slip Sheet: Rosin sized building paper, 3 lb/100 sq. ft.minimum.

F. Primer Type: Zinc chromate.

G. Protective Backing Paint: Zinc molybdate alkyd.

H. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.

I. Concealed Sealants: Non-curing butyl sealant.

J. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

K. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

L. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

M. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

N. Solder: ASTM B32; Provide type as described:

1. For Stainless Steel: Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: Maximum lead content of 0.2 percent.

2.10 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior performance organic finish with minimum 70 percent PVDF fluoropolymer resin by weight, multiple coat, thermally cured finish system.

1. Acceptable Products:

a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.

b. Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.

c. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.

d. Arkema; Kynar 500: www.americas.kynar.com.

e. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

C. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.

3.3 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

1. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

1. Do not use plastic underlayment where metals will be site soldered or where plastic sheet will be in direct contact with metal sheets exposed to solar daytime heating.

C. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.4 INSTALLATION - GENERAL

A. Comply with SMACNA Architectural Sheet Metal Manual.

B. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
4. Torch cutting of sheet metal flashing and trim is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where concealed flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Coat concealed surfaces of aluminum downspout that come into contact with dissimilar metals with two coats of clear lacquer.
3. Underlayment: Where installing metal directly on cementitious or wood substrates, install underlayment.

D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

E. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance, but in no case less than 1-1/4 inches for nails and 3/4 inch for wood screws in wood blocking or sheathing.

F. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

G. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

I. Rivets: Rivet joints where necessary for strength.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Recessed Reglet Flashings and Counterflashings: Insert flashings full depth into recessed reglet. Anchor by mechanical means, including driven wedges of lead or other compatible metal spaced at 12 inches on center. Seal joint with elastomeric sealant specified in Section 079200.

C. Surface Mounted Reglet Flashings and Counterflashings: Place surface mounted reglet not less than 9 inches above top of cant strip. Place sealant in preformed groove on back of reglet and on lap before installation. Secure reglet to wall with power driven pins through neoprene washers spaced not less than 16 inches on center. Fill top groove with elastomeric sealant specified in Section 079200. After roofing is installed, install snap-lock counterflashing.

1. Lap counterflashing end joints minimum 3 inches. Do not solder joints. Provide continuous counterflashings at angles and corners, and lap over roof base flashings minimum 4 inches, unless detailed otherwise.

D. Apply plastic cement compound between metal flashings and felt flashings.

E. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

F. Seal metal joints watertight.

G. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 INSTALLATION - WALL FLASHINGS

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.7 INSTALLATION - ROOF DRAINAGE FABRICATIONS

A. Install as recommended by SMACNA (ASMM). Join lengths with formed seams sealed watertight.

B. Slope gutters minimum 1/8 inch per foot.

C. Secure downspouts to wall with steel straps or concealed clamp supports, spaced not more than 8 feet oc. Fasten straps or clamps to building with non-corrosive expansion screws.

D. Set splash pad under each downspout, unless otherwise indicated to connect to underground drainage system.

3.8 INSTALLATION - PRE-FINISHED SHEET METAL

A. Take special care in the handling and installation to avoid damage to finish.

B. Remove protective film from each unit after installation, but not before adjacent construction is complete.

C. Touch up minor damage or defects to match factory finish. Replace units which are excessively damaged as determined by Architect.

3.9 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.10 SCHEDULE

A. General:

1. Where more than one metal material is scheduled, provide sheet metal as indicated on Drawings or, if not indicated, to match metal material of adjacent wall or roof material.
2. Unless otherwise indicated in drawings, where flashings are adjacent to metal wall and roof panel systems or aluminum glazing system frames, match adjacent metal finish and color.
3. Counterflashing and flashing receivers used in conjunction with premanufactured roof edge flashings shall be premanufactured by manufacturer of roof edge flashings. Other counterflashing and flashing receivers may be either premanufactured or shop fabricated.
4. Thicknesses shown are minimums. Increase thicknesses as required to comply with SPRI testing requirements and SMACNA recommendations and to meet performance requirements.
5. Visible is defined as "able to be seen from normal public areas." Provide factory finished materials in visible locations unless otherwise indicated.

B. Counterflashings, Visible:
   1. Aluminum: 0.025 inch.
   2. Prefinished Galvanized Steel: 0.0217 inch.
   3. Finish: PVDF

C. Counterflashings, Concealed:
   1. Stainless Steel: 0.0187 inch.
   2. Finish: 2D dull annealed.

D. Flashing Receivers, Visible:
   1. Prefinished Galvanized Steel: 0.0217 inch.
   2. Finish: PVDF

E. Flashing Receivers, Concealed:
   1. Stainless Steel: 0.0187 inch.
   2. Finish: 2D dull annealed.

F. Hanging Gutters with Girth up to 15 inches:
   1. Aluminum: 0.040 inch.
   2. Prefinished Galvanized Steel: 0.0217 inch.
   3. Finish: PVDF

G. Downspouts:
   1. Aluminum: 0.025 inch.
   2. Aluminum: 0.040 inch.
   3. Prefinished Galvanized Steel: 0.0276 inch.
   4. Finish: PVDF

H. Concealed Scuppers:
   1. Stainless Steel: 0.0187 inch.
   2. Finish: 2D dull annealed.

I. Visible Scuppers:
   1. Aluminum: 0.032 inch.
   2. Finish: PVDF

J. Miscellaneous Sheet Metal Fabrications, Trims, Flashings, and Top of Wall Closures, Visible:
   1. Aluminum: 0.040 inch thick.
   2. Prefinished Galvanized Sheet Steel: 0.0276 inch.
   3. Finish: PVDF

K. Openings Flashing in Frame Construction, Visible:
   1. Aluminum: 0.025 inch thick.

2. Prefinished Galvanized Sheet Steel: 0.0217 inch.
3. Finish: PVDF

L. Openings Flashing in Frame Construction, Concealed:
1. Stainless Steel: 0.0156 inch.
2. Finish: 2D dull annealed.

M. Aluminum Glazing Frame Flashing, Concealed:
1. Stainless Steel: 0.0187 inch.
2. Finish: 2D dull annealed.

N. Aluminum Glazing Frame Flashing, Visible:
1. Aluminum: 0.032 inch.
2. Finish: PVDF

O. Aluminum Glazing Frame Sill Extensions, Visible:
1. Aluminum: 0.040 inch.
2. Finish: PVDF

P. Equipment Support Cap Flashing, Roof Penetration Flashing, and Umbrella Flashing:
1. Stainless Steel: 0.0187 inch.
2. Finish: 2D dull annealed.

Q. Masonry Drip Edges:
1. As specified in Section 04 20 00 - Unit Masonry.
2. Stainless Steel: 0.0156 inch
3. Finish: 2D dull annealed.

END OF SECTION

SECTION 077100 - ROOF SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Roof edge flashings and copings.

1.3 RELATED REQUIREMENTS

A. Section 075323 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM): Warranty requirements for sheet metal copings and edge metals.

B. Section 076200 - Sheet Metal Flashing and Trim: Custom and site-fabricated sheet metal fabrications.

C. Section 077200 - Roof Accessories: Manufactured curbs and roof hatches.

D. Section 079513 - Expansion Joint Cover Assemblies: Manufactured roof expansion joints.

1.4 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free.

F. NRCA (RM) - The NRCA Roofing Manual.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate installation of components of this Section with installation of roofing system.

2. Coordinate installation of sealants and roofing cement with work of this Section to ensure water tightness.

B. Preinstallation Meeting: Convene one week before starting work of this Section.

1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion. Include the manufacturer's technical representative.

2. Review preparation and installation procedures and coordinating and scheduling required with related work.

C. Sequencing: Do not proceed with installation of flashing and sheet metal work until substrate construction, cants, blocking, reglets, and other construction are ready to receive the work of this Section.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

1. Include identification of material, thickness, weight, and finish for each item and location in Project.

2. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.

3. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.

4. Include details of connections to adjoining work.

5. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

D. Selection Samples: Submit at least 5 color chips in architect's designated range for selection of metal finish and color.

E. Verification Samples: Submit two finish samples, 6 x 6 inch, illustrating finish and color.

F. Product Test Reports: For copings and edge metals, for tests performed by a qualified testing agency.

G. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

C. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes failure of watertightness or seals.

B. Roofing-System Warranty: Coordinate requirements with roofing system Section.

C. Provide 20 year manufacturer warranty for prefinished sheet metal materials. Warranty shall include degradation of metal finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Roof Edge Flashings and Copings:

1. Architectural Products Co: www.archprod.com/#sle.
2. ATAS International, Inc: www.atas.com/#sle.
3. Drexel Metals Inc: www.drexmet.com/#sle.
4. Hickman Edge Systems: www.hickmanedgesystems.com/#sle.
5. Metal-Era Inc: www.metalera.com/#sle.
6. Metal Roofing Systems, Inc: www.metalroofingsystems.biz/#sle.
7. Pac-Clad Petersen, a Carlisle Company: www.pac-clad.com.
8. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. Capable of withstanding structural movement and exposure to wind and weather without failure or permanent deformation.

    a. Design Pressure: Conforming with ASCE 7 or as indicated on structural drawings, whichever is most restrictive.

2. Physically protect building elements and systems from damage that would permit water leakage into building enclosure assemblies under all weather conditions.

B. FM Approvals Listing: Manufacture and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, matching Class specified for roofing. Identify materials with name of fabricator and design approved by FM Approvals.

C. Edge Metal Assemblies:

1. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1, RE-1, RE-2, and RE-3 as applicable to positive and negative design wind pressure as defined by SPRI ES-1.
2. Capable of withstanding structural movement, thermally induced movement, and exposure to wind and weather without failure or permanent deformation.
3. Physically protect roofing systems, roof accessories, and other building elements and systems from damage that would permit water leakage to building interior under all weather conditions.
4. Comply with roofing manufacturer's requirements for full system warranty.

D. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 ROOFING COMPONENTS

A. Where more than one material is scheduled, provide sheet metal as indicated on Drawings or, if not indicated, to match adjacent wall or roof material, unless otherwise indicated.

B. Unless otherwise indicated in drawings, where copings and flashings are adjacent to metal panel systems, match adjacent panel finish and color.

C. Roof Edge Flashings: Factory fabricated to sizes required; mitered corners; concealed fasteners.

1. Configuration: Fascia, and edge securement for roof membrane.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.
3. Exposed Face Height: As indicated on drawings.
4. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
5. Finish: 70 percent polyvinylidene fluoride (PVDF).
6. Color: To be selected by Architect from manufacturer's custom range.

D. Copings: Factory fabricated to sizes required; mitered corners; concealed fasteners.

1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness, and finish as cap; concealed stainless steel fasteners.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
3. Wall Width: As indicated on drawings.
4. Outside Face Height: As indicated on drawings.

5. Inside Face Height: As indicated on drawings.
6. Material: Formed aluminum sheet, 0.040 inch thick, minimum.
7. Finish: 70 percent polyvinylidene fluoride.
8. Color: To be selected by Architect from manufacturer's custom range.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Superior Performance Coil Coating for Aluminum Sheets: PVDF (Polyvinylidene Fluoride) Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

C. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.5 ACCESSORIES

A. Fasteners: Non-corrosive type.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

B. Sealant for Joints in Linear Components: As recommended by component manufacturer.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

F. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

G. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

H. Underlayment: ASTM D226/D226M, organic roofing felt, Type II (No. 30).

I. Self-Adhering, High-Temperature Sheet Underlayment: Minimum 30 mils thick, consisting of a slip- resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Thermal Stability: Stable after testing at 220 deg F; ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
3. Products:
    a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
    c. Henry Company; Blueskin PE200 HT.
    d. Metal-Fab Manufacturing, LLC; MetShield.
    e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
    f. Polyguard Products, Inc.; Deck Guard HT.

J. Slip Sheet: Rosin sized building paper, 3 lb/100 sq. ft.minimum.

K. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

1. Apply continuously under copings and roof edge specialties.
2. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.

B. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.4 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Anchor components securely.

1. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

2. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

C. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

D. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

E. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat back side of uncoated aluminum and stainless-steel roofing specialties with bituminous coating where concealed flashing and trim will contact wood, ferrous metal, or cementitious construction.

F. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections.

G. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 077200 - ROOF ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Roof curbs.

B. Equipment rails.

C. Roof penetrations mounting curbs.

D. Rooftop mounted guardrails.

E. Roof hatches.

F. Ladder safety equipment.

G. Non-penetrating pedestals.

1.3 RELATED REQUIREMENTS

A. Section 077100 - Roof Specialties: Other manufactured roof specialty items.

1.4 REFERENCE STANDARDS

A. 29 CFR 1910.23 - Ladders.

B. 29 CFR 1910.29 - Fall Protection Systems and Falling Object Protection - Criteria and Practices.

C. 29 CFR 1926.502 - Fall protection systems criteria and practices.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate with installation of roofing system and related flashings for weather tight installation.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this Project. Show dimensioned location and number for each type of roof accessory.

1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.
2. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

D. Warranty Documentation:

1. Submit manufacturer warranty.
2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 ROOF CURBS

A. Acceptable Manufacturers:

1. Active Ventilation Products, Inc: www.roofvents.com/#sle.
2. AES Industries Inc.: www.aescurb.com.
3. The Pate Company: www.patecurbs.com.
4. LMCurbs: www.lmcurbs.com/#sle.
5. MKT Metal Manufacturing: www.mktduct.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.

1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings, HVAC units, exhaust fans, and duct openings.
2. Sheet Metal Material:

   a. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33; G60 coating designation; 18 gauge, 0.048 inch thick.

3. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to meet wind uplift requirements.
4. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
5. Metal Counterflashing: See Section 076200.
6. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches.

C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.

1. Provide preservative treated wood nailers along top of curb.
2. Insulate inside curbs with 3 inch thick fiberglass insulation.
3. Height Above Finished Roof Surface: 12 inches, minimum.

D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.

1. Provide preservative treated wood nailers along top of rails.
2. Height Above Finished Roof Surface: 12 inches, minimum.

E. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.

1. Provide preservative treated wood nailers over entire top surface, for supports that are provided by others.

2.2 ROOFTOP MOUNTED GUARDRAILS

A. Acceptable Manufacturers:

1. Babcock-Davis: www.babcockdavis.com/#sle.
2. Diversified Fall Protection: www.fallprotect.com.
3. EDGE Fall Protection: www.edgefallprotection.com/#sle.
4. Kattsafe: www.kattsafe.com.
5. Kee Safety: www.keesafety.com.
6. SafePro Safety Products: www.safeprosafety.com.
7. Safety Rail Company: www.safetyrailcompany.com/#sle.
8. Substitutions: See Section 016000 - Product Requirements.

B. Non-Penetrating Rooftop Mounted Guardrails:

1. Provide top and mid railings that comply with 29 CFR 1910.29.
2. Structural Load: 200 lb, minimum, in any direction with components in compliance with 29 CFR 1926.502.
3. Height: 42 inches, minimum.
4. Railings: 1-5/8 inches minimum outside diameter, hot-rolled, welded tubing, free of sharp edges and snag points.
5. Mounting Bases: 104 lb, Class 30, gray iron material cast to hold four receiver posts, with rubber pads on underside.
6. Receiver Posts: Provide with positive locking system for placement in receiver holes of mounting bases that allow rails to be mounted in any direction; provide drain holes in receiver posts.
7. Steel Surface Finish: Hot-dip zinc galvanized, with color of safety yellow.

2.3 ROOF HATCHES

A. Acceptable Manufacturers - Roof Access Hatches:

1. Acudor Products Inc.: www.acudor.com.
2. Babcock-Davis: www.babcockdavis.com.
3. Bilco Company: www.bilco.com/sle.
4. Dur-Red Products: www.dur-red.com/#sle.
5. Nystrom, Inc: www.nystrom.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Roof Hatches: Factory-assembled aluminum frame and cover, complete with operating and release hardware.

1. Style: Provide flat metal covers unless otherwise indicated.

2. Mounting: Provide frames and curbs suitable for mounting conditions as indicated on drawings.
3. Thermally Broken Hatches: Provide insulation within frame and cover.
4. Size: As indicated on drawings; single-leaf style unless otherwise indicated.
5. For Ladder Access: Single leaf; 36 by 36 inches.

C. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
1. Material: Mill finished aluminum, 11 gauge, 0.0907 inch thick.
2. Insulation: Manufacturer's standard; 3 inch rigid polyisocyanurate, located on inside hollow curb.
3. Curb Height: 12 inches from finished surface of roof, minimum.

D. Metal Covers: Flush, insulated, hollow metal construction.
1. Capable of supporting 40 psf live load.
2. Material: Mill finished aluminum; outer cover 11 gauge, 0.0907 inch thick, liner 0.04 inch thick.
3. Insulation: Manufacturer's standard 3 inch rigid polyisocyanurate.
4. Gasket: Neoprene, continuous around cover perimeter.

E. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
2. Hinges: Heavy duty pintle type.
3. Hold open arm with vinyl-coated handle for manual release.
4. Latch: Upon closing, engage latch automatically and reset manual release.
5. Manual Release: Pull handle on interior.
6. Locking: Padlock hasp on interior.

2.4 LADDER SAFETY EQUIPMENT

A. Manufacturers:
1. Basis of Design: The BILCO Company; Type LU-1 Ladder Safety Post: www.bilco.com/.
2. Substitutions: See Section 016000 - Product Requirements.

B.

C. Ladder Safety Post: High strength steel square tubing system attached to ladder with adjustable mounting brackets; stainless steel spring balancing mechanism for controlled operation when raising and lowering the safety post; pull up loop at the upper end of the post; pre-assembled from the manufacturer.

D. Operation:
1. Tubular post locks automatically when fully extended.

2. Controlled upward and downward movement of post.
3. Release lever to allow the post to be returned to its lowered position.
4. Adjustable mounting brackets sufficient to fit rung spacing up to 14 inch on center and clamp brackets to accommodate ladder rungs up to 1-3/4 inch in diameter.

E. Hardware: Type 316 stainless steel.

F. Finish: Yellow powder coat steel.

2.5 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.
1. Design Loadings and Configurations: As required by applicable codes.
2. Height: Provide minimum clearance of 6 inches under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

B. Safety Railing System: Roof hatch safety rail system mounted directly to curb without penetration of roofing system.
1. Railing Size: As indicated on drawings.
2. Railing: Comply with 29 CFR 1910.23 for ladder safety, with safety factor of two.
3. Self-Closing Gate: Comply with 29 CFR 1910.29 for safe egress and fall protection through hatch opening.
4. Posts and Rails: Galvanized steel tubing.
5. Gate: Same material as railing; automatic closing with latch.
6. Finish: Manufacturer's standard, factory-applied.

C. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
2. See relevant piping system specification Section for additional requirements.

D. Duct Supports: Provide extruded aluminum supports and sized in accordance with diameter of supported ducts, and with base that is non-penetrating of roofing membrane.

E. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
1. Bases: High density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

B. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

3.4 ADJUSTING

A. Adjust hardware for smooth operation.

3.5 CLEANING

A. Clean installed work to like-new condition.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 078400 - FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Firestopping systems, materials, and accessories.

B. Firestopping at electrical junction boxes in fire-rated walls.

C. Firestopping of all membrane penetrations, through penetrations and joint applications within fire rated assemblies, whether indicated on Drawings or not, and other openings indicated.

D. Contractor's responsibility for determining required scope of firestopping system work, and for determining applicable tested/listed systems for the entire project, and for securing jurisdictional authority approval of firestopping systems.

1.3 RELATED REQUIREMENTS

A. Section 070553 - Fire and Smoke Assembly Identification.

1.4 DEFINITIONS

A. Firestopping: A material or combination of materials used to retain the continuity and integrity of fire- and smoke-rated construction by maintaining an effective barrier against the spread of flame, and to impede the passage of smoke, gases, and moisture through penetrations, blank openings, construction joints, and perimeter fire/smoke containment in or adjacent to fire-and smoke-rated wall, floor, ceiling, and other rated construction assemblies.

B. Assembly: Particular arrangement of materials specific to type of construction described or detailed in referenced UL or other approved design.

C. Fire-Resistance-Rated Barriers: Fire-resistance-rated fire walls, fire barriers, fire partitions, smoke barrier walls, rated floor/ceiling assemblies, and structural floors.

D. Through Penetration: Opening or foreign material passing through or into a fire-resistance-rated assembly or structural floor such that full thickness of rated materials is interrupted.

E. Membrane Penetration: An opening made through one side of a fire-resistance-rated assembly without passing completely through the assembly.

F. Fire-Resistant Joint System: Gaps between adjacent sections of fire-resistance-rated walls, exterior walls, top of wall and ceiling, structural floors or roof decks, and adjacent sections of structural floors. Where fire-resistance-rated walls meet non-rated wall or floor conditions, reference "Continuity Joint" conditions.

G. 3rd Party Tested Systems: Specific products and applications, classified and numbered by UL or other 3rd party approved testing agency in accordance with specific barrier base designs and through penetration applications.

H. Sleeve: Metal fabrication or pipe section extending through thickness of barrier used to permanently guard penetration in accordancew with tested systems.

I. VOC: Volatile organic compound(s).

1.5 REFERENCE STANDARDS

A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

D. ASTM E1399 - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

G. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.

H. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus.

I. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

J. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies.

K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

L. ASTM E3038 - Standard Practice for Assessing and Qualifying Candidates as Inspectors of Firestop Systems and Fire-Resistive Joint Systems

M. IFC - International Firestop Council Recommended Guidelines for Evaluating Firestop Systems Engineering Judgements; current edition.

N. ITS (DIR) - Directory of Listed Products.

O. FCIA - Firestop Contractors International Association Manual of Practice; current edition.

P. FM (AG) - FM Approval Guide.

Q. FM 4991 - Approval Standard of Firestop Contractors.

R. SCAQMD 1168 - Adhesive and Sealant Applications.

S. UL (DIR) - Online Certifications Directory.

T. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

U. UL 1479 - Standard for Fire Tests of Penetration Firestops.

V. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

W. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Stage and coordinate installation of firestopping systems with affected trades and adjacent work in accordance with manufacturer's instructions.

B. Preinstallation Meeting: Convene one week before starting work of this Section. Notify Owner, who may request attendance by an independent consultant.

1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion. Include the manufacturer's technical representative.
2. Review installation procedures and coordination required with related work, and conditions which could affect successful performance of the work.

C. Sequencing: Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

1. Do not cover or conceal firestopping installations until Owner's inspection agency and jurisdictional authority have inspected each installation.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

1. Use Firestopping Systems Schedule Form attached to the end of this Section, or other form approved by Architect.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

1.8 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this Section and:

1. Trained by firestop system manufacturer.

2. Meeting any of the three options below:

a. Approved by UL in accordance with "UL Solutions Qualified Firestop Contractor Program."

b. Approved by Factory Mutual Research Corporation under FM 4991

c. Meeting all three of the following criteria:

1) Verification of minimum five years documented experience installing work of this type.

2) Verification of at least five satisfactorily completed projects of comparable size and type.

3) Acceptable to the local authorities having jurisdiction (AHJ).

D. Obtain firestop systems for each type and condition of penetration from a single manufacturer; intermixing of system components for each type and condition of penetration by different manufacturers is not permitted.

E. Listed and tested assemblies and systems must be utilized, if they exist, before alternative systems requiring Engineering Judgement (EJ)/UL Technical Evaluation (UL TE) or Equivalent Fire Resistance Rated Assembly (EFRRA) will be considered. Comply with IFC and FCIA for EJ and EFRRA design and submittal requirements.

1.9 REGULATORY REQUIREMENTS

A. Comply with execution requirements of authority having jurisdiction including, if applicable, the requirement that all firestopping work be performed by a single qualified firm or subcontractor.

1.10 DELIVERY, STORAGE, AND PROTECTION

A. Deliver materials in original unopened containers identified with manufacturer's brand designation and applicable UL label.

B. Do not use damaged or expired materials.

1.11 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions. Maintain uniform temperature of minimum 40 degrees F prior to, during, and after installation of materials

B. Provide ventilation in areas where solvent-cured materials are being installed.

1.12 WARRANTY

A. Include agreement to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, general durability, or apparent deterioration beyond manufacturer's printed limitations for stipulated warranty period from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design - Floor, Wall, and Joint Systems:
   1. Specified Technologies Inc.: www.stifirestop.com/#sle.

B. Other Acceptable Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop.
   2. A/D Fire Protection Systems Inc.: www.adfire.com.
   3. GCP Applied Technologies: www.gcpat.com.
   4. Hilti, Inc: www.us.hilti.com/#sle.
   5. Nelson FireStop Products; _____: www.nelsonfirestop.com/#sle.
   6. RectorSeal, a CSW Industrials Company: www.rectorseal.com/firestop-solutions/#sle.
   7. Pecora Corporation: www.pecora.com.
   8. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   9. USG: www.usg.com.
   10. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS - GENERAL

A. Firestopping Materials: Any materials meeting requirements specified.
   1. Comply with ASTM E814, UL 1479, and UL 2079 as applicable to achieve indicated fire ratings.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

D. Fire Ratings: Refer to Drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. General: Use firestopping systems which are acceptable for those applications for which they are specifically designed. Use of other UL listed systems is Contractor's Option, subject to compliance with specified performance, regulatory, and quality assurance requirements.

1. Where there is no specific tested and classified firestop system for an indicated condition, obtain from the firestopping system manufacturer an Engineering Judgement (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) according to IFC and FCIA.

B. Scope: Install firestopping at all locations requiring protected openings where piping, conduit, cables, sleeves, ductwork and similar items penetrate fire-resistive, fire-rated, and smoke assemblies, including but not limited to:

1. Penetrations through wall, floor, and roof assemblies, including empty openings and openings containing penetrations.
2. Membrane penetrations where items penetrate one side of the barrier assembly.
3. Joints between rated assemblies to allow independent movement.
4. Perimeter barriers between exterior wall assemblies and floor and roof assemblies.
5. Joints, through-penetrations, and membrane penetrations in smoke-rated assemblies.

C. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

1. Movement: Provide systems that have been tested to show movement capability as indicated.
2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

D. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

E. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

F. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.

3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

G. Fire Rated Joint Systems: Integrity and indicated fire-resistance ratings as determined by UL 2079, ASTM E1399, or ASTM E1996 as applicable.

H. Fire Rated Construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

I. Smoke Barrier Construction: Maintain fire-resistance-rated wall and floor barrier and structural floor resistance in conformance with UL 1479 F & L ratings at all penetrations, connections with other surfaces and types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

J. Other General Characteristics:
1. Surface Burning: ASTM E84 and UL 723; flame spread less than 25, smoke developed less than 450.
2. Air Leakage of Perimeter Firestopping Barriers and Penetrations: UL 2079; L-rating less than 2.0 cfm/sf or 5.0 cfm/lf as applicable to the type and location of joint.
3. Durability and Longevity: Permanent.
4. Side Effects During Installation: Non-toxic.
5. Side Effects Under Fire Exposure: Non-toxic.
6. Long Term Side Effects: None.

2.4 MATERIALS

A. Putty Compound: 100 percent solids intumescent or vinyl-type formulation, free of asbestos, silicones, solvents, halogens, PCB's, and inorganic fibers; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84; paintable, not sensitive to freezing after set.

B. Sealant Compound: One-part intumescent, endothermic, ablative, or elastomeric acrylic water-based calking material required by applicable UL Design; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.

C. Spray-Applied Compound: Water-based, flexible coating which drys to form a flexible seal; tested in accordance with ASTM E1399, complying with wind sway and thermal category, 500 cycles at minimum 10 cycles/minute.

D. Foam Compound: Two-part, liquid-silicone elastomer formulated to foam in place when mixed; flame spread/smoke developed rating 0/0 when tested in accordance with ASTM E84.

E. Plastic Pipe Device: Intumescent strip material, factory or site fabricated in flexible metal collar with adjustable, screw-tightened stainless steel clamp; UL classified for use with PVC, CPVC, CCPVC, CCABS, PVDF, PP, PB, PEX, and FRPP plastic pipe.

F. Composite Sheet: Composite, intumescent sheet, designed for firestopping large openings in conjunction with other firestopping components, capable of being cut to size in the field and fabricated to fit required penetration openings.

G. Blanket Material: Refractory ceramic fiber blanket encapsulated with aluminum foil scrim complying with NFPA 96; widths and thicknesses required by applicable UL Design; specifically designed as a flexible, fireproof enclosure for kitchen exhaust ducts and fire-rated air ductwork.

H. Fire-Safing Insulation: ASTM C612, Type I; high-melt mineral fibers and resinous binders formed into blankets, density not less than 4.0 lbs/cu ft, tested for 3-hour fire containment for required depths and dimensions.

I. Firestopping Putty Pads: Non-hardening intumescent, putty pad formed to 7.25 x 7.25 x 3/16 inch or 9 x 9 x 3/16 inch self-adhering pads, 2-hour fire rating listed by UL.

J. EP Powershield Electrical Box Insert Pad: Intumescent, non-curing insert pad for protection of electrical switch and receptacle boxes to reduce horizontal separation to less than 24 inches.

2.5 ACCESSORIES

A. Provide necessary accessory materials specified in UL Design to achieve complete firestop system at each penetration. Include collars, sleeves, attachment devices, intumescent materials, and other items required.

B. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design, and as recommended by firestopping manufacturer for specific substrate surfaces.

C. Dam Material: Mineral fiberboard, mineral fiber matting, sheet metal, alumina silicate fire board, or other permanent material required as part of the firestopping system, or removable if not specifically required as part of the firestopping system.

D. Retainers: Impale type clips to support mineral fiber safing blankets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this Section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing or damming materials required to arrest liquid material leakage.

3.3 INSTALLATION - GENERAL

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by Owner's Independent Testing Agency or in accordance with ASTM E2174 or ASTM E2393 where applicable.

C. Apply firestopping materials in sufficient thicknesses to achieve scheduled fire ratings, to uniform density and texture.

D. Install firestop materials within annular spaces at openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

E. Remove dam material after firestopping material has cured only if dam material is not required as part of the firestopping system; otherwise dam material to remain permanently in place.

F. Do not cover installed firestopping until inspected by authorities having jurisdiction.

G. Install labeling required by code.

3.4 INSTALLATION - FIRE SAFING INSULATION

A. Install safing insulation to completely fill spaces between floor slab edges and spandrel construction as detailed.

B. Install safing insulation to completely fill voids between floor and roof deck flutes and top of wall construction where wall ratings are indicated.

C. Install and support safing insulation permanently in position with gaged metal to comply with tested fire assembly and applicable building code requirements.

3.5 INSTALLATION - FIRESTOPPING PADS

A. Install firestopping putty pads on back side of electrical junction boxes or EP Powershield Electrical Box (Insert Pads) in fire-rated walls where boxes are located in same stud space on opposite sides of same wall, and elsewhere required by jurisdictional authority and local fire department.

3.6 THROUGH-PENETRATION FIRESTOPPING IDENTIFICATION

A. Labeling: Identify firestopping systems with pre-printed metal or plastic labels in accordance with FM 4991. Attach label permanently to surfaces immediately adjacent to and within 6 inches of edge of firestop installation so that label will be visible to anyone seeking to remove penetrating items or firestop system.

1. Metal Labels: Use mechanical fasteners.

2. Plastic Labels: Use self-adhering type with adhesive capable of permanently bonding label to substrate and, in combination with label material, will result in partial destruction of label if removal is attempted.

B. Include following information on each label:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Installing contractor's name, address, and phone number.
3. Firestop system designation, including applicable testing and inspection agency.
4. Date of installation.
5. Firestop system manufacturer's name.
6. Installer's name.

C. Wall and Partition Identification: Refer to Section 070553 - Fire and Smoke Assembly Identification.

3.7 FIELD QUALITY CONTROL

A. Independent Testing and Inspection Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.8 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

https://systems.stifirestop.com/

UL Alphanumeric Schedule

Type of Penetrant Floor Penetration Systems	Concrete Floors - Minimum thickness Less than or equal to 5"						Concrete Floors - Minimum thickness More than 5"						Framed Floors					
	Caulk	Device	F	T	L	W	Caulk	Device	F	T	L	W	Caulk	Device	F	T	L	W
No Penetrating Item	CAJ-0014		3	2			CAJ-0014		3	2								
Blank Opening	CAJ-0126		2	2	X	X	CAJ-0126		2	2	X	X						
		CAJ-0113	4					CAJ-0113	4									
		CAJ-0116	2					CAJ-0116	2									
0000-0999		CAJ-0061	3	2	X			CAJ-0061	3	2	X							
Metallic Pipe, Conduit or	CAJ-1080	CAJ-1353	3		X		CBJ-1058		2		X	X	FC-1010		2	2	X	
Tubing	CAJ-1354		2		X		CBJ-1065		2	2	X	X	FC-1013		1	1	X	
	CAJ-1240		2		X	X	CBJ-1066		2	2	X	X	FC-1014		2	1	X	
		CAJ-1533	2				FB-1014		2		X	X	FC-1053		1	1		
1000-1999		FA-1118	2	2	X	X	FB-1030	*FB-1021*	2		*X*		FC-1074	FC-1075	2	1	X	
Non-Metallic Pipe,	CAJ-2292		2	2			CBJ-2046		2		X		FC-2032		1	1	X	
Conduit or Tubing		CAJ-2104	2		X	X		FB-2014	3	3	X	X	FC-2158		2	2	X	
		CAJ-2297	3	3	X	X		CAJ-2297	3	3	X	X	FC-2014	FC-2322	1	1		
		CAJ-2772	2	2	X	X		CAJ-2772	2	2	X	X	FC-2320		1	1		
		FA-2192	3	3	X	X		FA-2192	3	3	X	X	FC-2321		2	2	X	
2000-2999		FA-2210	2	1	X	X		FA-2210	2	1	X	X		FC-2348	2	1	X	
Electrical Cables	CAJ-3154		4	2			CBJ-3034		4				FC-3010		1	1		
	CAJ-3042		3		X		CAJ-3042		3		X		FC-3057		2			
		FA-3055	3		X	X		FA-3055	3		X	X	FC-3041		2	2	X	
		FA-3015	4		X			FA-3015	4		X		FC-3042		1	1	X	
		FA-3037	3	2	X			FA-3037	3	2	X		FC-3045		2	2	X	
		FA-3054	4		X			FA-3054	4		X			FC-3046	1	1	X	
3000-3999		FA-3064	2	2	X			FA-3064	2	2	X			FC-3103	1			
Cable Trays with		CAJ-4088	2					CAJ-4088	2									
Electrical Cables		CAJ-4089	2		X			CAJ-4089	2		X							
4000-4999																		
Insulated Pipes	CAJ-5087		2	1	X		CAJ-5087		2	1	X		FC-5014		1	1	X	
	CAJ-5437		2	2			**CAJ-5437**		2	2			FC-5029		1	1		
	CAJ-5103		2	2	X	X	CAJ-5103		2	2	X	X	FC-5043		2	1	X	
		FA-5041	3	1	X	X		FA-5041	3	1	X	X						
5000-5999		FA-5045	3		X	X		FA-5045	3		X	X						
Miscellaneous Electrical	CAJ-6008		3		X		CAJ-6008		3		X							
Penetrants - Elec Buss		CAJ-6019	3					CAJ-6019	3									
6000-6999		CAJ-6038	2					CAJ-6038	2									
Miscellaneous Mechanical	CAJ-7023	CAJ-7027	3		X	X	CAJ-7023	CAJ-7027	3		X	X	FC-7002	FC-7034	1			
Penetrants - "Metal Duct	CAJ-7160		2	2			CAJ-7160		2	2			FC-7014		1	1	X	
and Insulated Metal Duct"	CAJ-7143		2		X		CAJ-7143		2		X		FC-7023	FC-7045	1		X	
7000-7999		CAJ-7106	2					CAJ-7106	2				FC-7060		1	1	X	
Groupings of Penetrations	CAJ-8113		2	2			CAJ-8113		2	2			FC-8001		2	2	X	
"Multiple Penetrations"	CAJ-8188		2		X	X	CAJ-8188		2		X	X	FC-8021	FC-8010	1	1		
		CAJ-8081	3		X			CAJ-8081	3		X		FC-8029	FC-8045	1		X	
8000-8999		CAJ-8093	3	2	X			CAJ-8093	3	2	X		FC-8036	FC-8043	1	1		
Fuel Line Protection	**FP3 / FP4**		**2**	**2**			**Gypsum Wall - Electrical Panel Protection**		**WL-7307**						**2**	**2**		

LEGEND

F - Rating
T - Rating
L - Rating
W - Rating

UL System Alignment

Left - Caulk
Right - Device
Middle - Shaft Wall
Bold - Membrane
E-Wrap

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UL Alphanumeric Schedule

Type of Penetrant Wall Penetration Systems	Concrete or Masonry Walls - Minimum Thickness less than or equal to 8"						Concrete or Masonry Walls - Minimum Thickness more than 8"						Gypsum Framed Walls					
	Caulk	Device	F	T	L	W	Caulk	Device	F	T	L	W	Caulk Shaft	Device	F	T	L	W
No Penetrating Item	CAJ-0014		3	2			CAJ-0014		3	2			WL-0016		2	2	X	
Blank Opening	CAJ-0126		2	2	X	X	CAJ-0126		2	2	X	X		WL-0010	4	2	X	
		CAJ-0113	4					CAJ-0113	4					WL-0020	4			
		CAJ-0061	3	2	X			CAJ-0061	3	2	X			WL-0032	2		X	
Metallic Pipe, Conduit or	CAJ-1080		3		X		CBJ-1058		2		X	X	WL-1173	WL-1384	4			
Tubing	CAJ-1353		3		X		CBJ-1065		2	2	X	X	WL-1222	WL-1226	2	1		
	CAJ-1354		2		X		CBJ-1066		2	2	X	X		WL-1251	2			
	CAJ-1240		2		X	X							WL-1049		2		X	
		CAJ-1533	2										**WL-1527**	WL-1463	2	2	X	
Non-Metallic Pipe,	CAJ-2292		2	2			CBJ-2046		2		X		WL-2241	**WL-2635**	2	1	X	
Conduit or Tubing		CAJ-2104	2		X	X		CAJ-2297	3	3	X	X	WL-2631	WL-2243	2	2	X	
		CAJ-2297	3	3	X	X		CAJ-2772	2	2	X	X	WL-2237	WL-2288	2	2		
		CAJ-2772	2	2	X	X								WL-2257	2	2		
	WJ-2289		2	2	X								WL-2674	WL-2493	2	2	X	
		WJ-2216	2	1	X								**WL-2636**	**WL-2637**	2	2	X	
Electrical Cables	CAJ-3154		4	2			CBJ-3034		4				WL-3171	**WL-3172**	2			
	CAJ-3042		3		X		CAJ-3042		3		X		WL-3210	WL-3169	2			
	WJ-3063		2	1			CAJ-3154		4	2			WL-3134	WL-3435	2		X	
	WJ-3158	WJ-3158	2	2	X		WJ-3158	WJ-3158	2	2	X		WL-3306	WL-3356	2	2	X	
		WJ-4097	2		X			WJ-4097	2		X			WL-3271	2			
		WJ-3140	2		X			WJ-3140	2		X			WL-3390	4	2	X	
		WJ-3045	2				WJ-3045	WJ-3068	2				WL-3379	WL-3378	2	2	X	
		WJ-3068	2					WK-3001	4	1				WL-3459	2	1	X	
Electrical Box													CLIV		2	2		
Cable Trays with		CAJ-4088	2					CAJ-4088	2				WL-4008	WL-4029	2			
Electrical Cables		CAJ-4089	2		X			CAJ-4089	2		X		WL-4063	WL-4102	2		X	
		WJ-4097	2		X			WJ-4097	2		X		WL-4078	WL-4043	2	2		
													WL-4077		4			
Insulated Pipes	CAJ-5087		2	1	X		CAJ-5087		2	1	X		WL-5121		2	1		
	CAJ-5437		2	2			**CAJ-5437**		2	2			WL-5014		2	1	X	
	CAJ-5103		2	2	X	X	CAJ-5103		2	2	X	X		WL-5262	2	1		
Miscellaneous Electrical	CAJ-6008		3		X		CAJ-6008		3		X		WL-6001		2		X	
Penetrants - Elec Buss		CAJ-6019	3					CAJ-6019	3					WL-6020	2			
		CAJ-6038	2					CAJ-6038	2					WL-6006	2	2		
Miscellaneous Mechanical	WJ-7089		2				WJ-7089		2				WL-7025	WL-7164	2		X	
Penetrants - "Metal Duct	CAJ-7023	CAJ-7027	3		X	X	CAJ-7023	CAJ-7027	3		X	X	WL-7149	WL-7026	2		X	
and Insulated Metal Duct"	CAJ-7160		2	2			CAJ-7160		2	2			WL-7145		2	2	X	
	CAJ-7143		2		X		CAJ-7143		2		X			WL-7238	2			
		WJ-7092	2		X			WJ-7092	2		X			WL-7066	2			
Groupings of Penetrations	CAJ-8188		2		X	X	CAJ-8188		2		X	X	WL-8003		2		X	
"Multiple Penetrations"		CAJ-8081	3		X			CAJ-8081	3		X		WL-8026		2	2		
		CAJ-8093	3	2	X			CAJ-8093	3	2	X		WL-8073		2			

LEGEND

F - Rating
T - Rating
L - Rating
W - Rating

UL System Alignment

Left - Caulk
Right - Device
Middle - Shaft Wall
Bold - Membrane E-Wrap

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UL Alphanumeric Schedule

Type of joint Fire Rated Joint Systems	Joint Width Less Than or Equal to 2" 0000-0999							Joint Width Greater Than 2", Less Than or Equal to 6" 1000-1999						
	Caulk	Spray	Device	F	T	L	M	Caulk	Spray	F	T	L	M
Continuity Joint	CJD-0001			1			II / III						
	CJD-0002			1			II / III						
	CJD-0003			1	1		II / III						
Concrete Floor-to-Floor		FFD-0028		4	4	X	II		FFD-1007	2	2	X	II
		FFD-0015		4	4	X	II		FFD-1025	3	3	X	II
	FFD-0001			3	3	X	II	FFD-1008		3	3	X	II
	FFD-0016			4	4	X	II	FFD-1001		3	3	3X	II
Edge of Concrete Floor		FWD-0023		4	4	X	II	FWD-1001		3	3	X	II
Slab-to-Wall	FWD-0010			4	4	X	II		FWD-1035	3	3	X	II
			FWS-0019	2	2	X		FWD-1007		3	3	X	II
			FWD-0097	1	1	X	II						
Concrete or Block Wall to	HWD-0156			4	4	X	II	HWD-1006		3	3	X	II
Flat Concrete Slab Floor	HWD-0157			4	4	X	II	HWD-1094		2	2	X	II
(Top of Wall)	HWD-0041			3	3	X	II		HWD-1034	3	3	X	II
		HWD-0885		2	2	X	II		HWD-1089	2	2		II
Concrete or Block Wall to	HWD-0245			2	2	X	II		HWD-1076	2	2	X	II
Concrete Over Fluted Metal	HWD-0039			2	2	X	II		HWD-1089	2	2		II
Deck (Top of Wall)		HWD-0140		2	2	X	II						
		HWD-0086		4	4	X	II						
Gypsum Wall to Flat Concrete	HWD-0034			2	2	X	II		HWD-1075	2	2	X	II
Slab Floor (Top of Wall)		HWD-0044		4	4	X	II						
			HWD00689	2	2	X	II / III						
			HWD-0618	2	2	X	II / III						
			HWD-0846	2	2	X	II / III						
Gypsum Shaft Wall to Flat	**HWD-0485**		**HWD-0548**	2	2	X	II						
Concrete Slab (Top of Wall)			**HWD-0699**	2	2	X	II / III						
Gypsum Wall to Concrete	HWD-0034			2	2	X	II	HWD-1073		2	2	X	II
Over Fluted Metal Deck	HWD-0103			2	2	X	II	HWD-1074		2	2	X	II
(Top of Wall)	HWD-0210			2	2	X	II						
		HWD-0043		4	4	X	II						
		HWD-0099		2	2	X	II						
		HWD-0252		2	2	X	II						
			HWD-0617	2	2	X	II						
			HWD-0749	2	2	X	II						
	HWD-0241			2	2	X	II						
Gypsum Shaft Wall to	**HWD_0644**			2	2	X	II						
Concrete Over Fluted Deck		**HWD-0645**		2	2	X	II						
(Top of Wall)			**HWD-0548**	2	2	X	II						
			HWD-0642	2	2	X	II						
Concrete Wall to Wall	WWD-0018			4	4	X	II	WWD-1002		3	3	X	II
	WWD-0103	WWD-0103		2	2	X	II	WWD-1007		4	4	X	II
			WWS-0063	2	2	X		WWD-1090	WWD-1090	2	2	X	II
								WWD-1091	WWD-1091	2	2	X	II
									WWD-1037	3	3	X	II
Gypsum Wall-to-Concrete Wall	WWS-0052			4	4	X		WWD-1090	WWD-1090	2	2	X	II
			WWS-0063	2	2	X							
			WWS-0064	2	2	X							
Bottom of Wall	BWS-0003			2	2	X							
	BWS-0028			2	2	X							
	BWS-0017			4	4								
	BWS-0020			2	2	x							
			BWS-0029	2	2	x							

LEGEND
F - Rating
L - Rating
M - Movement

UL System Alignment
Left - Caulk
Middle - Spray
Right - Device
Bold - Shaft Wall

Movement:
Class I Thermal
Class II Wind-Sway
Class III Seismic

* Top-of-Wall Joint May Include Spray-On Monokote Fireproofing
** Contact STI For Current UL System or Engineering Judgment
Note: Per UL System, Verify Class II, or Class III Movement Classification

FIRESTOPPING SYSTEMS SCHEDULE

Project: _____ Architect: _____

Number: _____ Date: _____

Contractor: _____ Contract for: _____

Subcontractor: _____ Contract for: _____

The following items require the attention of the Contractor for completion or correction. Submit separate form for each Subcontractor responsible for installing firestopping.
Add additional rows as required. Failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the

Design Number (A)	Mfg's I.D. and Manufacturer (B)	Penetrating Item Description: Material, Size, Insulated, Combustible (C)	Annular Space / Opening (D)	Construction (E)	Fire Resistance Rating (F)	F-rating (G1)	T-rating (G2)	L-rating CFM/SF (G3)	W-rating (G4)
Through Penetrations - Horizontal Assemblies									
Through Penetrations - Wall and Partition Assemblies									
Membrane Penetrations - Wall and Partition Assemblies									

Design Number (A)	Mfg's I.D. and Manufacturer (B)	Joint Width Min. / Max. (D)	Adjacent Construction (both sides of joint) (E)	Fire Resistance Rating (F)	F-rating (G1)	T-rating (G2)	L-rating CFM/SF (G3)	W-rating (G4)
Fire-Resistant Joint Systems								

Firestopping Product Manufacturer(s):	

Provide information for proposed firestopping as follows:

(A) Indicate design number or other system designator assigned by FM (AG), ITS (DIR), UL (DIR), UL (FRD), or other testing laboratory acceptable to authorities having jurisdiction.

(B) Indicate manufacturer's system designator, if any. Include reference numbers and drawing numbers, if any.

(C) Identify the various types of penetrating items (i.e. pipe, vent, conduit, cable tray, etc.) and, for piping, indicate if dry (normally empty) or wet (normally filled) type. Include a material description (i.e. metal, plastic, EMT, etc.) and size (length by width or diameter). State whether the penetrating item is externally insulated or not. State whether the penetrating item is combustible or non-combustible.

(D) Indicate size limitations for annular space and/or opening and width limitations for joints.

(E) Identify the various types of construction being penetrated. Horizontal Assemblies include fire-resistance-rated floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies. Wall and Partition Assemblies include fire walls, fire-barrier walls, shaft enclosure walls, fire partitions, smoke-barrier walls, and smoke partitions.

1. Worded description of construction may be omitted if Architect's wall type designator is used (i.e. Wall 3A instead of metal stud & gypsum board).
2. For joints, indicate the types of construction at each side of joint beginning each joint with the following abbreviations:
   a. FF for Floor to Floor joints
   b. FW for Floor to Wall joints
   c. HW for Head of Wall joints
   d. WW for Wall to Wall joints
   e. CW for the Perimeter Fire Barrier System at the intersection of a fire-resistance-rated floor assembly and an exterior curtain wall assembly

(F) Identify the fire resistance rating of the assembly in minutes if less than one hour or hours if one hour or longer as indicated on the Drawings.

(G) System Ratings: Indicate the F-Rating, T-Rating, L-Rating, and W-Rating when installed and tested in accordance with standards specified.

END OF FORM 07 84 00.13

SECTION 079200 - JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.3 RELATED REQUIREMENTS

A. Section 092900 - Gypsum Board: Sealing acoustical and sound-rated walls and ceilings.

B. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.4 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

C. ASTM C834 - Standard Specification for Latex Sealants.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.

H. ASTM C1311 - Standard Specification for Solvent Release Sealants.

I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

J. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.

K. SCAQMD 1168 - Adhesive and Sealant Applications.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.
6. Substrates for which use of primer is required.
7. Substrates for which laboratory adhesion and/or compatibility testing is required.
8. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
9. Sample product warranty.
10. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

G. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

H. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

I. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

J. Executed warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Stain Testing: In accordance with ASTM C1248; for porous substrates only.
4. Allow sufficient time for testing to avoid delaying the work.
5. Deliver sufficient samples to manufacturer for testing.
6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

E. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.

1. Identification of testing agency.
2. Name(s) of sealant manufacturer's field representatives who will be observing.
3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.

a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.

b. Test date.

c. Location on project.

d. Sealant used.

e. Stated movement capability of sealant.

f. Test method used.

g. Date of installation of field sample to be tested.

h. Date of test.

i. Copy of test method documents.

j. Age of sealant upon date of testing.

k. Test results, modeled after the sample form in the test method document.

l. Indicate use of photographic record of test.

F. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.

1. Record results on Field Quality Control Log.
2. Repair failed portions of joints.

H. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.

1. Sample: At least 18 inches long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.
4. Record results on Field Quality Control Log.
5. Repair failed portions of joints.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints:

a. Seal open joints except open joints indicated on drawings as not to be sealed, including, but not limited to, the following:

1) Wall expansion and control joints.

2) Joints between doors, windows, and other frames or adjacent construction.

3) Joints between different exposed materials.

4) Weather sealing joints identified in manufacturer's standard details.

2. Interior Joints:

a. Do not seal interior joints indicated on drawings as not sealed.

b. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.

c. Seal open joints except open joints indicated on drawings as not to be sealed, including, but not limited to, the following:

1) Joints between plumbing fixtures and adjacent construction.

2) Joints between door frames and window frames and adjacent construction.

3) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.

4) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.

3. Do Not Seal:

a. Intentional weep holes in masonry.

b. Joints indicated to be covered with expansion joint cover assemblies.

c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.

d. Joints where sealant installation is specified in other sections.

e. Joints between suspended ceilings and walls.

B. Type S - Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.

1. Type B - Bedding sealant at thresholds and sills: Butyl rubber.
2. Type Bn - Lap Joints in Sheet Metal Fabrications: Butyl rubber, noncuring.
3. Type Bn - Lap Joints between Manufactured Metal Panels: Butyl rubber, noncuring.
4. Type Psl - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane sealant.

C. Type P - Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

1. Type L - Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
2. Type Sm - Joints between plumbing fixtures and adjoining walls, floors, and counters: Mildew-resistant silicone sealant.
3. Type Sm - Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant.
4. Type Esr - Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
5. Type Psl - Other Floor Joints: Self-leveling polyurethane traffic-grade sealant.

D. Definitions:

1. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
2. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

E. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.2 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors for Concealed Locations: Manufacturer's standard.

C. Colors for Locations Exposed to View: As selected by Architect from Manufacturer's Full Range, except as noted otherwsise.

D. Colors for Locations Adjacent to Brick Masonry: Custom color matched to brick and reviewed by Architect.

2.3 NONSAG JOINT SEALANTS

A. Type S - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Materials: Non-staining to light-colored natural stone, masonry, and marble when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Color: To be selected by Architect from manufacturer's full range.
5. Products:

a. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.

b. Momentive Performance Materials, Inc/GE Silicones; SCS9000 SilPruf NB - Non-Staining Silicone Weatherproofing Sealant: www.siliconeforbuilding.com/#sle.

c. Pecora Corporation; Pecora 864 NST (Non-Staining Technology): www.pecora.com/#sle.

d. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.

e. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.

f. Substitutions: See Section 016000 - Product Requirements.

B. Type Sm - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Products:

a. Momentive Performance Materials, Inc/GE Silicones; SCS1700 Sanitary Sealant: www.siliconeforbuilding.com.

b. Pecora Corporation; 860: www.pecora.com.

c. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.

d. Dow Corning Corporation; 786-M.

e. Tremco Incorporated; Tremsil 200.

C. Type P - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range, except where noted otherwise in general sealant requirements listed in this section.
4. Service Temperature Range: Minus 40 to 180 degrees F.

5. Products:

   a. Pecora Corporation; Dynatrol I-XL: www.pecora.com.

   b. Sika Corporation; Sikaflex-1a: www.usa.sika.com/#sle.

   c. Tremco Incorporated; Dymonic FC.

D. Type L - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Products:

   a. Momentive Performance Materials, Inc/GE
   Silicones; RCS20 Acoustical Latex Sealant: www.siliconeforbuilding.com.

   b. Pecora Corporation; AC-20+: www.pecora.com.

   c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.

   d. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.

   e. BASF Building Systems; Sonolac.

E. Type B - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.

1. Service Temperature Range: Minus 13 to 180 degrees F.
2. Products:

   a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.

   b. Pecora Corporation; BC-158.

   c. Tremco Incorporated; Tremco Butyl Sealant

F. Type Bn - Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications.

1. Products:

   a. Pecora Corporation; Pecora BA-98 Non-Skinning Butyl Sealant: www.pecora.com/#sle.

   b. Tremco Commercial Sealants & Waterproofing; Acoustical/Curtainwall Sealant: www.tremcosealants.com/#sle.

   c. Substitutions: See Section 016000 - Product Requirements.

2.4 SELF-LEVELING JOINT SEALANTS

A. Type Psl - Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.

1. Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Service Temperature Range: Minus 40 to 180 degrees F.
4. Products:

a. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.

b. W. R. Meadows, Inc; POURTHANE SL: www.wrmeadows.com/#sle.

c. Tremco Incorporated; Vulkem 45SSL.

d. Pecora Corporation; NR-201.

e. Substitutions: See Section 016000 - Product Requirements.

B. Type Esr - Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1. Composition: Multicomponent, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Joint Width, Minimum: 1/8 inch.
5. Joint Width, Maximum: 1/4 inch.
6. Products:

a. Adhesives Technology Corporation; CRACKBOND JF-90 HD: www.atcepoxy.com/#sle.

b. Euclid Chemical Company; EUCO 700: www.euclidchemical.com/#sle.

c. Mapei; Mapeiflex Joint Sealant EP 90/50: www.mapei.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2.5 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.

1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
3. Arrange for sealant manufacturer's technical representative to be present during tests.
4. Record each test on Preinstallation Adhesion Test Log as indicated.
5. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
6. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.

D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet, notify Architect immediately.

E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

F. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

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SECTION 079513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, and ceiling surfaces.

1.3 RELATED REQUIREMENTS

A. Section 077100 - Roof Specialties: Roof expansion and control joint covers.

1.4 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

D. ITS (DIR) - Directory of Listed Products.

E. UL (DIR) - Online Certifications Directory.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. MM Systems Corp.: www.mmsystemscorp.com.
2. Substitutions: See Section 016000 - Product Requirements.

B. Acceptable Manufacturers:

1. BASF Watson Bowman Acme Corporation: www.wbacorp.com/#sle.
2. Construction Specialties, Inc.: www.c-sgroup.com/#sle.
3. EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
4. Inpro: www.inprocorp.com/#sle.
5. Balco: www.balcousa.com.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Non-Fire-Rated Floor Joints Subject to Thermal Movement:

1. Basis of Design Product: X-U-2.

B. Interior Non-Fire-Rated Wall-to-Wall Inside Corner Joints Subject to Thermal Movement:

1. Basis of Design Product: FSWL-150.

C. Interior Non-Fire-Rated Wall-to-Wall Coplanar and Ceiling-to-Ceiling Coplanar Joints Subject to Thermal Movement:

1. Basis of Design Product: VSW-200.

D. Interior Non-Fire-Rated Wall-to-Ceiling Joints Subject to Thermal Movement:

1. Basis of Design Product: VSW-L-200.

E. Interior Non-Fire-Rated Suspended Acoustic Panel Ceiling-to-Ceiling Joints Subject to Thermal Movement:

1. Basis of Design Product: VSG-200.

F. Interior Non-Fire-Rated Suspended Acoustic Panel Ceiling-to-Wall Joints Subject to Thermal Movement:

1. Basis of Design Product: VSGL-200.

G. Exterior Wall Joints Subject to Thermal Movement:

1. Basis of Design Product: SCE.

a. Color: Custom to match adjacent brick masonry.

2.3 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.

1. Joint Dimensions and Configurations: As indicated on Drawings.
2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.

1. If floor covering is not indicated, obtain instructions from Architect before proceeding.

C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.

D. Sliding Cover Plate Type Covers: Provide plate with beveled edges and neat fit that does not collect dirt.

E. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

F. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.

1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

2.4 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.

1. Exposed Finish at Floors: Mill finish or natural anodized.
2. Exposed Finish at Walls and Ceilings: As selected by Architect from manufacturer's standard range of options, unless indicated otherwise.

B. Resilient Seals:

1. For Interior Walls and Ceilings: Pre-fabricated elastomeric material.
2. For Exterior Walls: Silicone.
3. Color: As selected by Architect from manufacturer's standard range, unless indicated otherwise.

C. Anchors and Fasteners: As recommended by cover manufacturer.

D. Ferrous Metal Anchors: Galvanized where embedded in concrete or in contact with cementitious materials.

E. Threaded Fasteners: Stainless steel.

F. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.2 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.3 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Hollow metal borrowed lites glazing frames.

1.3 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing.

C. Section 090000 - Finish Schedule.

D. Section 099123 - Interior Painting: Field painting.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

I. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities.

K. ITS (DIR) - Directory of Listed Products.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.

N. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames.

O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.

S. UL (DIR) - Online Certifications Directory.

T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with wall construction for anchor placement.
2. Coordinate installation of hardware.
3. Coordinate installation of glazing.
4. Coordinate installation of electrical connections to electrical hardware items.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Door Schedule: Provide schedule coordinated with numbering on drawings and hardware schedule. Indicate door types and openings receiving electrified hardware.

D. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8 - SDI-100, and as supplemented in this Section.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

C. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: https://steeldoor.org/sdi-certified/#sle.

D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

E. Maintain at project site copies of reference standards relating to installation of products specified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

C. Inspect hollow metal products upon delivery for damage. Minor damage may be repaired provided refinishing is equal in all respects to new work and is acceptable to Architect; otherwise replace damaged items with new products as specified.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com.
3. Deansteel Manufacturing Company, Inc: www.deansteel.com/#sle.
4. Mesker, dormakaba Group: www.meskeropeningsgroup.com/#sle.
5. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
6. Steelcraft, an Allegion brand: www.allegion.com/#sle.

7. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Door Edge Profile: Manufacturers standard for application indicated.
4. Typical Door Face Sheets: Flush, unless otherwise indicated on Drawings.
5. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
    a. Prepare doors and frames for hardware in accordance with templates provided under Section 087100 - Door Hardware.
6. Zinc Coating for Typical Interior: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: A40/ZF120 (galvannealed) for exterior doors. Coating not required for typical interior door applications. Provide at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. Interior Doors, Non-Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 2 - Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches, nominal.
4. Door Finish: Factory primed and field finished.

B. Interior Doors, Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 2 - Heavy-duty.

b. Physical Performance Level B 500 000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.

d. Door Face Metal Thickness: 18 gauge, 0.042 inch, minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.

b. Provide units listed and labeled by UL (DIR) or ITS (DIR).

c. Attach fire rating label to each fire rated unit.

3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.

4. Door Thickness: 1-3/4 inches, nominal.

5. Door Finish: Factory primed and field finished.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.

1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum, for doors up to 42 inches wide.

2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum, for doors greater than 42 inches wide.

3. Frame Metal Thickness: 14 gage, 0.067 inch, minimum, for doors with continuous hinges, regardless of width.

4. Frame Finish: Factory primed and field finished.

C. Door Frames, Fire-Rated: Full profile/continuously welded type.

1. Fire Rating: Same as door, labeled.

2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

3. Frame Finish: Factory primed and field finished.

D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.

E. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.

F. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

H. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ACCESSORIES

A. Glazing: As specified in Section 088000 and 088813.

B. Glazing Stops at Lites: Formed sheet steel, mitered or butted corners on secure side with non-removable stops on non-secure side.

1. Style: Flush.

C. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

D. Silencers: Resilient rubber or vinyl, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. For frame installation, use concealed anchors where possible. Where exposed frame anchors are required, countersink fasteners, fill, and sand smooth.

D. Install door hardware as specified in Section 087100.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Comply with glazing installation requirements of Section 088000.

F. Touch up damaged factory finishes.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Flush wood doors.

1.3 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

D. Section 088813 - Fire-Rated Glazing.

E. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

1.4 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

B. ASTM E413 - Classification for Rating Sound Insulation.

C. AWI (QCP) - Quality Certification Program.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

E. ITS (DIR) - Directory of Listed Products.

F. NEMA LD 3 - High-Pressure Decorative Laminates.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives.

H. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives.

I. UL (DIR) - Online Certifications Directory.

J. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

K. WDMA I.S. 1A - Interior Architectural Wood Flush Doors.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with door opening construction, door frame and door hardware installation.
2. Coordinate installation of glazing.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Door Schedule: Provide schedule coordinated with numbering on drawings and hardware schedule. Indicate door types and openings receiving electrified hardware.

D. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1. Provide information as required by AWI/AWMAC/WI (AWS).
2. Include certification program label.

E. Verification Samples: Submit two samples of door veneer, 6 by 6 inch in size illustrating each finish and sheen.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Test Reports: Show compliance with specified requirements for the following:

1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

H. Specimen warranty.

I. Warranty, executed in Owner's name.

1.7 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

D. Woodwork Quality Assurance Program:

1. Comply with AWI (QCP) woodwork association quality assurance service/program in accordance with requirements for work specified in this section; www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by quality assurance program.
4. Provide designated labels on installed products as required by quality assurance program.
5. Submit documentation upon completion of installation that verifies this work is in compliance with specified requirements.

E. Obtain all doors of each type specified from a single manufacturer to assure uniformity of appearance and construction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.

1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers - High Pressure Decorative Laminate Faced Doors:

1. Basis of Design: VT Industries, Inc.; Heritage Collection: www.vtindustries.com.
2. Other Acceptable Manufacturers:

a. Eliason Corporation, a Division of Senneca Holdings: www.eliasoncorp.com/#sle.

b. Forte Opening Solutions: www.forteopenings.com/#sle.

c. Oregon Door: www.oregondoor.com/#sle.

d. Poncraft Door Co.: www.poncraft.com.

3. Substitutions: See Section 016000 - Product Requirements.

2.2 DOORS

A. Doors:

1. Quality Standard: Custom Grade, Extra Heavy Duty performance, in accordance with WDMA I.S. 1A.

2. High Pressure Decorative Laminate (HPDL) Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location, unless otherwise noted.

2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.

3. Smoke and Draft Control Doors: In addition to required fire rating, provide flush wood door assemblies in compliance with WDMA I.S. 1A requirements for "S" label; no additional gasketing or edge sealing allowed.

4. Sound-Rated Doors: Minimum STC as indicated on drawings, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.

5. High pressure decorative laminate (HPDL) finish as scheduled..

2.3 DOOR AND PANEL CORES

A. General Requirement: Provide door cores fully bonded to stiles and rails.

B. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), structural composite lumber stiles and rails; plies and faces as indicated.

C. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

D. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.4 DOOR FACINGS

A. High Pressure Decorative Laminate (HPDL) Facing for Fire Doors: NEMA LD 3, HGF; color as scheduled in Section 090000 - Finish Schedule ; textured, low gloss finish.

B. High Pressure Decorative Laminate (HPDL) Facing for Non-Fire-Rated Doors: NEMA LD 3, HGS; _____; textured, low gloss finish.

C. Facing Adhesive: Type I - waterproof.

2.5 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.

a. Provide solid blocking for other throughbolted hardware.

2. Provide minimum 6 inch high solid wood top rail and minimum 16 inch high solid wood bottom rail, all doors; fire-resistant treated at fire-rated doors.

C. Stile Edges: PVC, full width of door sufficient to cover exposed edges of HPDL facing.

1. Thickness: 3 millimeter, minimum.

2. Color: Wood grain, as selected by Architect from manufacturer's full range.

D. Top and Bottom Rails: Factor sealed.

E. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

F. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

H. Provide edge clearances in accordance with the quality standard specified.

2.6 ACCESSORIES

A. Hollow Metal Door Frames: See Section 081113.

B. Glazing: See Section 088000.

C. Glazing Stops - Doors Up to and Including 20-minute Ratings: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.

1. Profile: Flush bead.

2. At doors with 20-minute fire protection ratings, provide wood beads and metal glazing clips approved for such use.

D. Glazing Stops - Doors with Ratings Exceeding 20-minutes: Wood veneer laminated to manufacturer's fire-rated glazing frame to maintain tested assembly rating.

1. Veneer Type and Finish: Match door veneer.

2. Fire Rating: As scheduled for applicable door assembly.

E. Fire Rated Glazing: See Section 088813.

F. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

1. Install fire-rated doors in accordance with NFPA 80, ITS (DIR), and UL (DIR) requirements.

2. Install smoke and draft control doors in accordance with NFPA 105 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Adjust width of non-rated doors by cutting equally on both jamb edges.

1. Trim maximum of 3/4 inch off bottom edges.

2. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.3 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

C. Maximum Undercut at Fire-Rated Doors: 3/4 inch clearance to non-combustible finish floor surface.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Restore finish on all edges of shop finished doors before installation, if fitting or machining is required on site.

3.5 SCHEDULE

A. Refer to Door and Frame Schedule on the Drawings.

END OF SECTION

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SECTION 081613 - FIBERGLASS DOORS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fiberglass doors.

B. Fiberglass door frames.

1.3 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing.

1.4 REFERENCE STANDARDS

A. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with door opening construction, door frame and door hardware installation.
2. Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Shop Drawings: Indicate layout and profiles; include assembly methods.

1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.

2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.

D. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer; include detailed terms of warranty.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

B. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.

1. Store at temperature and humidity conditions recommended by manufacturer.

2. Do not use non-vented plastic or canvas shelters.

3. Immediately remove wet wrappers.

C. Store in position recommended by manufacturer, elevated minimum 4 inches above grade, with minimum 1/4 inch space between doors.

1.9 FIELD CONDITIONS

A. Do not install doors until structure is enclosed.

B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty covering materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Laminated Fiberglass Doors:

1. Corrim Company: www.corrim.com/#sle.
2. Fib-R-Dor - Chase Doors, a Senneca Co.: www.fibrdor.com.
3. Special-Lite, Inc: www.special-lite.com/.
4. Substitutions: See Section 016000 - Product Requirements.

2.2 DOOR AND FRAME ASSEMBLIES

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.

1. Operation: Manual.
2. Screw-Holding Capacity: Tested to 890 pounds, minimum.
3. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
4. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
5. Chemical Resistance: Resist degradation due to exposure to tap water and distilled water.

    a. Chlorine-treated moisture in air.
6. Sizes: As indicated on Drawings.
7. Clearance Between Door and Frame: 1/8 inch, maximum.
8. Clearance Between Bottom of Door and Finished Floor: 3/4 inch, maximum; not less than 1/4 inch clearance to threshold.

2.3 COMPONENTS

A. Doors: Fiberglass construction with reinforced core.

1. Type: As indicated on drawings, including swinging doors.
2. Thickness: 1-3/4 inch, nominal.
3. Core Material: Manufacturer's standard core material for application indicated.

4. Construction:

   a. Molded fiberglass shells with color gel coating, bonded into seamless unit; manufacturer's standard subframe and hardware reinforcements.

      1) Fill door panel with foam insulation.

5. Face Sheet Texture: Smooth.

6. Door Panel Configuration: Flush door.

7. Subframe and Reinforcements: Fiberglass pultrusions, polymer foam, stainless steel, or aluminum; no wood.

8. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.

9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.

B. Frames: Profiles and dimensions as indicated on Drawings; same type and construction used in mechanical durability test for doors.

1. Profiles: 5-3/4 inches deep, 2 inches wide at jambs, and 2 inches wide at headers.

2. Door Stop: 5/8 inch wide, by 1-7/8 inches deep.

3. Non-Fire-Rated:

   a. Fiberglass reinforced plastic (FRP) with gel-coating matching doors.

4. Mullions: Fixed, fiberglass centerpost; 2 inches wide by 2-3/4 inches deep, nominal.

5. Corner Joints: Mitered with concealed corner blocks or angles of same material as frame; fiberglass and aluminum joined with screws; steel and stainless steel spot welded; sealed watertight with silicone sealant.

6. Hardware Cut-outs: Provide continuous backing or mortar guards of same material as frame, with watertight seal.

7. Frame Anchors: Stainless steel, Type 304; provide three anchors in each jamb for heights up to 84 inches with one additional anchor for each additional 24 inches in height.

8. Reinforcing: Provide manufacturer's standard reinforcing at hinge, strike, and closer locations.

2.4 PERFORMANCE REQUIREMENTS

A. Provide door assemblies that have been designed and fabricated in compliance with specified performance requirements.

B. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 7.5 psf.

C. Air Leakage: Maximum of 0.1 cfm per square foot at 6.27 psf differential pressure, when tested in accordance with ASTM E283.

D. Thermal Transmittance, Exterior Doors: AAMA 1503, U-value of 0.30, maximum, measured on exterior door in size required for this project.

2.5 FINISHES

A. Gel Coating: Ultraviolet (UV) stabilized polyester finish.

1. Thickness: Minimum 15 mils, 0.015 inch wet thickness, plus/minus 3 mils, 0.003 inch.
2. Color: As selected by Architect from manufacturer's standard line of colors.

2.6 HARDWARE

A. Door Hardware: See Section 087100.

2.7 ACCESSORIES

A. Stops for Glazing: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.

1. Glazed Openings: Provide removable stops on interior side.
2. Opening Sizes and Shapes: As indicated on Drawings.

B. Glazing: See Section 088000.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Clean and prepare substrate in accordance with manufacturer's directions.

C. Protect adjacent work and finish surfaces from damage during installation.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

C. Set thresholds in continuous bed of sealant.

D. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

E. Repair or replace damaged installed products.

3.4 ADJUSTING

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.5 CLEANING

A. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 083100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.3 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Field paint finish.

1.4 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products.

B. UL (FRD) - Fire Resistance Directory.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate installation with work of other trades, and obtain information on door sizes and exact locations from other trades.
2. Coordinate placement of rough-in openings with Architect in tiled walls and gypsum board ceilings.
3. Coordinate placement of access doors and panels with locations of toilet partitions and urinal screens so that doors or panels are not placed in conflict with partition or screen locations.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Product Schedule: Include types, locations, sizes, latching or locking provisions & other data pertinent to installation.

D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

E. Project Record Documents: Record actual locations of each access unit.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

C. Basis of Design: Specifications are based on access door types and model numbers by the specified basis of design manufacturer. Access door types manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements; and provided that deviations in dimensions and profile are minor, and do not detract substantially from the indicated design intent.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Babcock-Davis: www.babcockdavis.com/sle.

a. Non-Fire-Rated Units: BNW Series, areas viewable by the public.

b. Non-Fire-Rated Units: BNT Series, back of house areas.

c. Fire-Rated Units: BIW Series, areas viewable by the public.

d. Fire-Rated Units: BIT Series, back of house areas.

B. Other Acceptable Manufacturers:

1. Acudor Products Inc.: www.acudor.com.
2. Bauco Access Panel Solutions: www.accesspanelsolutions.com.
3. J. L. Industries: www.jlindustries.com.
4. Karp Associates, Inc.: www.karpinc.com.
5. Larsen's Manufacturing Co.: www.larsensmfg.com.
6. Milcor by Commercial Products Group of Hart & Cooley, Inc.: www.milcorinc.com.
7. Substitutions: See Section 01 6000 - Product Requirements.

C. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Panel Material: Steel.

2. Style: As indicated.
    a. Public Areas: Use drywall bead type frame.
    b. Back of House Areas: Exposed frame.
3. Doors:
    a. Doors for Fire-Rated Units: Double-skinned hollow panel, 20 gage minimum thickness.
    b. Doors for Non-Fire-Rated Units: Single thickness with rolled or turned in edges, 16 gage minimum thickness.
4. Frames: 16 gauge, 0.0598 inch, minimum thickness.
5. Insulation for Rated Doors: Non-combustible mineral wool or glass fiber.
6. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
    a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
7. Finish: Primed.
8. Size: Fabricate access door frame assemblies to sizes indicated on drawings or, if not indicated, to smallest size which allows free access to concealed work requiring access. Obtain Architect’s approval for rectangular sizes.
    a. Where access to controls, etc. requiring one handed operation within arm's reach is required, provide 8 by 8 inches.
    b. Where access to controls, etc. requiring two-handed operation or rotation within arm's reach is required, provide 12 by 12 inches.
    c. Where upper body access is required (such as above ceilings or beyond arm’s length) provide 18 by 18 inches.
    d. Where full body access is required (such as entering a shaft) provide 24 by 24 inches.
9. Hardware:
    a. Hinge for Fire-Rated-Units: 175 degree steel hinges with non-removable pin.
    b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    c. Latch/Lock: Tamperproof tool-operated cam latch.
    d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
    e. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Review access panel locations during wall framing rough-in to confirm location is coordinated with interior wall finishes.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

D. Adjust hardware and panels for proper operation.

E. Remove and replace panels that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Opaque Infill panels of metal.

C. Aluminum doors and frames.

D. Weatherstripping.

1.3 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 087100 - Door Hardware: Hardware items other than specified in this section.

C. Section 088000 - Glazing: Glass and glazing accessories.

1.4 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

B. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

H. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

I. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

J. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate air sealing of perimeter with adjacent air barrier materials.
2. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this Section; require attendance by all affected installers.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Selection Samples: For each color specified, submit at least 5 color chips representing Architect's designated color range.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

I. Designer's qualification statement.

J. Manufacturer's qualification statement.

K. Installer's qualification statement.

L. Specimen warranty.

1.7 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

1.8 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Integrated Exterior Mock-up: Provide mock-up including all components occurring on project. Construct to illustrate component assembly including glazing materials, weep drainage systems, flashings, attachments, anchors, and perimeter sealant for evaluation of workmanship and aesthetics.

1. Locate where directed.
2. Mock-up may remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this Section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.10 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.11 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide 20 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Kawneer North America: www.kawneer.com.

a. Interior Frame Series: TriFab VG 451, center set glass.

b. Exterior Frame Series: TriFab VG 601T, front set glass.

c. Door Style: 500 Wide Stile.

B. Other Acceptable Manufacturers:

1. Boyd Aluminum: www.boydaluminum.com/#sle.
2. Manko Window Systems, Inc: www.mankowindows.com/#sle.
3. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
4. Tubelite, Inc: www.tubeliteinc.com/#sle.
5. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Finish: Superior performing organic coatings.

a. Factory finish all surfaces that will be exposed in completed assemblies.

b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

2. Finish Color: As selected by Architect from manufacturer's standard line.

3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.

4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
9. Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.

2.3 PERFORMANCE REQUIREMENTS

A. Design Requirements: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   1. Design Wind Loads: Comply with requirements of applicable code.
   2. Member Deflection: Limit member deflection to L/175 of clear span, 3/4 inch total, or to flexure limit of glass in any direction, whichever is less, with full recovery of glazing materials.
   3. Provide reinforced mullion sections as may be required to comply with specified design requirements, for manufacturer's specified system.

B. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf.
   1. Fastener Heads must be seated and sealed against sill flashing on any fasteners that penetrate through the sill flashing.

C. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.24 psf pressure differential across assembly.

D. Condensation Resistance Factor of Framing: 60, minimum, measured in accordance with AAMA 1503.

E. Overall U-factor Including Glazing: 0.40 Btu/(hr sq ft deg F), maximum.

2.4 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken at exterior applications, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

2. Cross-Section: 2 by 4-1/2 inch nominal dimension.
3. Corner Assemblies:
    a. 90-Degree Corners: Manufacturer's standard combination of two pocket corner extrusions.
    b. Corners Other Than 90 Degrees: Manufacturer's standard varying degree pocket corner extrusions with aluminum sheet metal fillers and closures.
4. Reinforced Mullions: As required or recommended by manufacturer using manufacturer's standard profile of extruded aluminum with internal reinforcement of steel shaped structural section.

B. Glazing: See Section 088000.

C. Opaque Metal Infill Panels: Insulated, aluminum, with edges formed to fit glazing channel with gaskets.
1. Total Nominal Thickness: 4 inch.
2. Glazing Leg Nominal Thickness: 1 inch.
3. Glazing Bite: As required by manufacturer's
4. Face Sheet:
    a. Material: Aluminum.
    b. Thickness 0.032 inch.
    c. Texture: Smooth.
    d. Finish: Manufacturer's standard superior performing organic coating.
5. Face Substrate Layer: Cement Board.
6. Additional Core: 2# Density Polyisocyanurate insulation core with R-value of 6.0per inch, minimum.
7. Intermediate Substrate: Cement Board.
8. Intermediate Sheet: Same as Face Sheet.
9. Primary Core: 2# Density Polyisocyanurate insulation core with R-value of 6.0 per inch, minimum.
10. Back Substrate Layer: Gypsum Board.
11. Back Sheet:
    a. Material: Aluminum.
    b. Thickness 0.032 inch.
    c. Texture: Smooth.
    d. Finish: Manufacturer's standard superior performing organic coating.
12. Fabrication Tolerances: 0.8% of panel dimension length and width; and (+/-) 1/16" of panel thickness.

13. Thermal Performance:

    a. R-Value: 25.76, minimum.

    b. U-Value: 0.04, minimum.

14. Acceptable Products:

    a. Basis of Design: Mapes Architectural Panels; Mapes-R Plus Rabbet Edge Panels: www.mapespanels.com.

    b. Substitutions: See Section 016000 - Product Requirements.

D. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches.
2. Top Rail: 5 inches wide.
3. Vertical Stiles: 5 inches wide.
4. Bottom Rail: 10 inches wide.
5. Glazing Stops: Manufacturer's standard snap-in glazing stops with gasketing; removable from inside.

2.5 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Structural Steel Sections: ASTM A36/A36M; shop primed.

D. Fasteners: Stainless steel.

E. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

F. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch minimum thickness.

G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

H. Sealant for Setting Thresholds: Non-curing butyl type.

I. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.

J. Glazing Accessories: See Section 088000.

2.6 ACCESSORIES

A. Reinforcement: Where fasteners screw-anchor into aluminum less than 1/8 inch thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive, pressed-in splined grommet nuts.

B. Brackets: High-strength aluminum brackets and reinforcements where possible; otherwise provide non-magnetic stainless steel or galvanized steel complying with ASTM A123/A123M.

C. Bituminous Coatings: Cold-applied asphalt mastic, compounded for 30 mil thickness per coat.

D. Internal System Sealants and Gaskets: As recommended by manufacturer for use within the framing system for fabrication, assembly, and installation. Use products which will remain permanently elastic, non-shrinking, and waterproof.

2.7 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.8 HARDWARE

A. Door Hardware: As specified in Section 087100, except as specified in this Section.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Reinforce components internally for door hardware .

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

1. Install storefronts in accordance with ASTM E2112.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight end and back dams.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Install hardware using templates provided.

K. Install glass in accordance with Section 088000, using glazing method required to achieve performance criteria.

L. Install internal system sealants as installation progresses. Seal sill pan splices, end dams, water deflectors, and other components to ensure that proper water weepage paths are established and maintained within the system.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Location: Limit variation from plane or dimensioned location to 1/8 inch in 12 feet, non-cumulative, and 1/2 inch in overall length of member.

3.4 FIELD QUALITY CONTROL

A. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

B. See Section 014000 - Quality Requirements for general testing and inspection requirements.

C. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.

1. Successful Test Result: No water leakage.

2. Perform a minimum of two tests in each designated area as directed by Architect.

3. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

D. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.

1. Mock-up Testing: Perform test of mock-up prior to installation of insulation, cladding and trim but after installation of all fasteners, brackets, supports for cladding and trim, and other penetrating elements.

2. Building Testing: Perform tests on building prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements. Perform testing at 10%, 50%, and 70% completion of air barrier installation.

   a. Perform a minimum of two tests of each type in each designated area as directed by Architect.

   b. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.

   a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.

4. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 1.57 psf.

   a. Maximum allowable rate of air leakage is 0.09 cfm/sq ft.

E. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.5 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.6 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

3.7 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 085653 - SECURITY WINDOWS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Security transaction windows.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.

B. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied.

C. UL 752 - Standard for Bullet-Resisting Equipment.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.

C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.

1. For new work show required opening dimensions and allowance for field deviation.

D. Test Reports: Test reports for specific window model and glazing to be furnished, showing compliance with specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.

1. Include testing agency qualifications.
2. For structural, forced entry, and ballistic tests, provide details on method of anchorage to test frame.

E. Samples for Selection of Applied Finishes: Color charts for factory finishes.

F. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.

G. Manufacturer's Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with at least 5 years experience in the manufacture of windows of the type specified and able to provide test reports showing that their standard manufactured products meet the specified requirements; custom designed products not acceptable.

B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:

1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.
2. Failure of glazing due to excessive deflection of supporting members under wind load.

PART 2 PRODUCTS

2.1 ASSEMBLIES

A. Security and Detention Windows:

1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 016000.
2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
5. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
6. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
7. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.2 SECURITY TRANSACTION WINDOWS

A. Security Transaction Windows with Deal Tray and Voice Port:

1. Location: Built within interior wall, as indicated on drawings.
2. Type of Use: Walk-up.
3. Ballistic Resistance: Tested to meet UL 752, Level 4.
4. Window Type: Fixed.
    a. Mounting: Projected from the wall surface.
    b. Window Size: As indicated on drawings.
    c. Size of Counter Space: Manufacturer's standard size.
    d. Counter Material: 18 gauge stainless steel with #4 finish.
    e. Frame Material: Aluminum.
        1) Finish: Natural anodized.
5. Glazing: Laminated type, clear, and ballistic resistant.
6. Communication: Standard talk-through portal.
7. Basis of Design Products:
    a. Total Security Solutions; Hole and Backer Transaction Window TSS-004 L/S: www.tssbulletproof.com/..
    b. Substitutions: See Section 016000 - Product Requirements.

2.3 ASSEMBLY COMPONENTS

A. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.

1. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches or fraction thereof more than 36 inches in height or width.

B. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.

C. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.

D. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame.

1. Style: Plain curved recess welded into counter or sill.
2. Clear Opening Height: 1-1/2 inches.
3. Tray Dimensions: 12 by 8 inches, wide by deep.

E. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch minimum thickness per coat.

2.4 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that window openings are ready for installation of windows.

B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.

C. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and drawing details.

B. Install windows in correct orientation (inside/outside or secure/non-secure).

C. Anchor windows securely in manner so as to achieve performance specified.

D. Separate metal members from concrete and masonry using bituminous paint.

E. Set sill members and sill flashing in continuous bead of sealant.

3.3 CLEANING

A. Clean exposed surfaces promptly after installation without damaging finishes.

B. Remove and replace defective work.

3.4 CLOSEOUT ACTIVITIES

A. Demonstrate operation and maintenance to designated Owner personnel.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 06 Section “Rough Carpentry”.
3. Division 06 Section “Finish Carpentry”.
4. Division 08 Section “Operations and Maintenance”.
5. Division 08 Section “Hollow Metal Doors and Frames”.
6. Division 08 Section “Flush Wood Doors”.
7. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
8. Division 26 Section "Electrical”
9. Division 28 Section “Access Control Devices”.

D. Codes and References: Comply with the version adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:

    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.

5. Manufacturers:

a. Hager Companies (HA) - BB Series, 5-knuckle.
b. Ives (IV) - 5BB Series, 5-knuckle.
c. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum

overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

    a. Hager Companies (HA).
    b. Ives (IV).
    c. Pemko (PE).

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Rockwood (RO).
    c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
6. Manufacturers:

    a. Burns Manufacturing (BU).
    b. Hiawatha, Inc. (HI).
    c. Rockwood (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

a. Match Existing, Field Verify.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

a. Establish new grand master ‘Y’ under Bristol board of Education system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Software: Provide software that offers solutions for master key system design and management, key, key ring, and item issuance, cylinder and core pinning, personal records and inventories and building, door, and floor plans. Software shall come with the option for additional services that provide custom data integration, on-site and virtual training, consulting, technical support, and custom development.

1. Key Control: System shall manage all master key systems, keys, key rings, key holders and key requests. It shall provide total key control showing outstanding keys, overdue keys (with automatic notifications), key symbols, bittings, keyways, etc. and the ability to include all systems (multiple key manufacturers supported) and buildings in one database.
2. Master Keying: Software shall provide a comprehensive master key system generator compatible with multiplex systems (key sections, keyways, angles) along with a core pinning calculator. Master keying feature shall have automatic configurable key numbering and connection with key cutting machines.
3. Facility Management: Software shall reference every building, floor, and door of your facilities while identifying the operating keys of every door and generate control reports.
4. Available options shall include.

    a. Simple K Connect, cloud based access for cloud-hosted customers allowing platform access from any web browser with no installation required.
    b. Mobile Application for Key Deliveries: Display the list of keys issued, key policy, and capture the signature in the field.

5. Manufacturers:

    a. Medeco (MC) - Simple K.

B. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ML2000 Series.

b. Sargent Manufacturing (SA) - 8200 Series.
c. Schlage (SC) - L9000 Series.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1500/1600 Series.

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

a. HES (HS) - 9400/9500/9600/9700/9800 Series.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
8. Rail Sizing: Provide exit device rails factory sized for proper door width application.
9. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

    a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
    b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
    c. No catch points: addition of applied deflectors or other added components are not allowed.
    d. No visible plastic.
    e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.

f. Constructed of all stainless steel.
g. Stainless steel pullman type latch with deadlock feature.
h. Narrow or wide style exterior trim as specified in the hardware sets.
i. Ten-year limited warranty for mechanical features.

2. Manufacturers:

a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
b. Sargent Manufacturing (SA) - PE80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

2.11 SURFACE DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide sex bolt and security type fasteners. Machine screw threads only.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard..

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - DC6000 Series.
b. Norton Rixson (NO) - 7500 Series.
c. Sargent Manufacturing (SA) - 351 Series.

2.12 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48" wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48" wide. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide operators with features as follows:

   a. Non-handed with push and pull side mounting.
   b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.
   c. Activation by push button, hands-free or radio frequency devices.
   d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.
   e. Two-year limited warranty.
   f. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
      1) Simple setup with no app required.
      2) View status and make adjustments without removing the cover.
      3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
   g. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:

   a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
   b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
   c. Infinite Hold Open: Door will hold open at set position until power is turned off.
   d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
   e. Open Delay: Delays operator opening for locking hardware.
   f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.
   g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
   h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.

i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:

a. Norton Rixson (NO) - 6000 Series.

2.13 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15, Grade 1 electromagnetic door holder/releases with a minimum 25 to 40 pounds holding power and fail-safe operation; power failure releases door to close.

1. Manufacturers:

a. LCN Door Closers (LC) - SEM7800 Series.
b. Norton Rixson (NO) - 900 Series.
c. Sargent Manufacturing (SA) - 1560 Series.

2.14 DOOR STOPS AND HOLDERS

A. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Burns Manufacturing (BU).
b. Ives (IV).
c. Rockwood (RO).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.16 ELECTRONIC ACCESSORIES

A. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Power supplies shall meet all functions and features as specified herein.

a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.
b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
c. Enhanced surge immunity for input/output protection
d. Separate, dedicated battery charging circuit to keep locks cooler.
e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
f. Instant auto-switch to battery on AC loss.
g. Expandable up to 16 outputs in the standard enclosure
h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

a. Life Safety Power (LP).
b. Securitron (SU) - AQL Series.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine and wood screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. RU - Corbin Russwin
5. SA - SARGENT
6. HS - HES
7. NO - Norton Rixson
8. OT - Other
9. SU - Securitron

Hardware Sets

Set: 1.0

Doors: 002, 004, 005

2	Continuous Hinge	CFM__SLF-HD1		PE	
1	Mullion	CR910BKM		RU	
1	Rim Exit Device, Exit Only	PED5201 EO M51	630	RU	
1	Rim Exit Device	PED5259 M52 N959PT CT6R	630	RU	
3	Permanent Core	Compatible with Facility's Existing System - Emhart High Security	626	RU	
1	Mullion Cylinderr & Collar Packet	As Required x CT6R	US26D	SA	
1	Electric Strike	9600	630	HS	⚡
2	Surface Closer	DC6210 A11 M54	689	RU	
1	Mullion Gasketing	5110BL		PE	
2	Sweep	18061CNB		PE	
1	Threshold	253x3AFG		PE	
1	Wiring Diagram	WD-SYSPK			
1	Card Reader	By Security System Supplier		OT	⚡
1	Power Supply	AQL Series		SU	⚡

Notes: Door closed & locked at all times. Presenting valid credential outside allows for authorized entrance. Free egress at all times. With loss of power door remains locked.

Set: 2.0

Doors: 001, 003

2	Continuous Hinge	CFM__SLF-HD1		PE	
1	Mullion	CR910BKM		RU	
1	Rim Exit Device, Exit Only	PED5201 EO M51	630	RU	
3	Rim Exit Device	PED5259 M52 N959PT CT6R	630	RU	
1	Permanent Core	Compatible with Facility's Existing System - Emhart High Security	626	RU	
1	Mullion Cylinderr & Collar Packet	As Required x CT6R	US26D	SA	
1	Electric Strike	9600	630	HS	⚡
1	Surface Closer	DC6210 A11 M54	689	RU	
1	Automatic Opener	6061 / 6071 TBGN	689	NO	⚡

1	Mullion Gasketing	5110BL	PE
2	Sweep	18061CNB	PE
1	Threshold	253x3AFG	PE
1	Wiring Diagram	WD-SYSPK	
2	Wall Switch	700	NO
1	Card Reader	By Security System Supplier	OT
1	Power Supply	AQL Series	SU

Notes: Door closed & locked at all times. Presenting valid credential outside activates outside operator paddle & allows for authorized entrance. Remote unlock from main office. Free egress at all times. With loss of power door remains locked.

Intercom at Opening 001

Set: 3.0

Doors: 150

3	Hinge, Full Mortise, Hvy Wt	T4A3386 [NRP]	US32D	MK
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Conc Overhead Stop	1-X36	630	NO
1	Surface Closer	DC6210 A11 M54	689	RU
1	Sweep	18061CNB		PE
1	Threshold	253x3AFG		PE

Set: 3.1

Doors: 141A

3	Hinge, Full Mortise, Hvy Wt	T4A3386 [NRP]	US32D	MK
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6210 A11 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
1	Sweep	18061CNB		PE
1	Threshold	253x3AFG		PE

Set: 4.0

Doors: 001A

2	Continuous Hinge	CFM__SLF-HD1		PE
1	Mullion	CR910BKM		RU
1	Rim Exit Device, Exit Only	PED5201 EO M51	630	RU
1	Rim Exit Device	PED5259 M52 N959PT CT6R	630	RU
3	Permanent Core	Compatible with Facility's Existing System –	626	RU
1	Mullion Cylinderr & Collar Packet	As Required x CT6R	US26D	SA
1	Electric Strike	9600	630	HS
1	Surface Closer	DC6210 A11 M54	689	RU
1	Automatic Opener	6061 / 6071 TBGN	689	NO
1	Wiring Diagram	WD-SYSPK		
2	Wall Switch	700		NO
1	Card Reader	By Security System Supplier		OT
1	Power Supply	AQL Series		SU

Notes: Door closed & locked at all times. Presenting valid credential outside activates outside operator paddle & allows for authorized entrance. Free egress at all times. With loss of power door remains locked.

Intercom at Opening 001A

Set: 5.0

Doors: 002A

2	Continuous Hinge	CFM__SLF-HD1		PE
1	Mullion	CR910BKM		RU
2	Rim Exit Device	PED5210 M52 N910PT CT6R	630	RU
3	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Mullion Cylinderr & Collar Packet	As Required x CT6R	US26D	SA
2	Surface Closer	DC6210 A11 M54	689	RU

Set: 6.0

Doors: 003A

2	Continuous Hinge	CFM__SLF-HD1		PE
2	Rim Exit Device	PED5210 M52 N910PT CT6R	630	RU
3	Permanent Core	Compatible with Facility's Existing System	626	RU

1	Mullion Cylinderr & Collar Packet	As Required x CT6R	US26D	SA
1	Electric Strike	9600	630	HS
1	Surface Closer	DC6210 A11 M54	689	RU
1	Automatic Opener	6061 / 6071 TBGN	689	NO
2	Wall Switch	700		NO

Set: 7.0

Doors: 144A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Rim Exit Device	PED5259 N959PT CT6R	630	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6210 A11 M54	689	RU
3	Silencer	608		RO

Set: 9.0

Doors: 117

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Electric Strike	1600-CS	630	HS
1	Surface Closer	DC6200 / DC6210 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO
1	Wiring Diagram	WD-SYSPK		
1	Card Reader	By Security System Supplier		OT
1	Power Supply	AQL Series		SU

Notes: Door closed & locked at all times. Presenting valid credential outside allows for authorized entrance. Remote unlock from main office. Free egress at all times. With loss of power door remains locked.

Intercom at Opening 117

Set: 10.0

Doors: 121, 127A

6	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt	555	US26D	RO
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
2	Silencer	608		RO

Set: 11.0

Doors: 113, 114A, 114B

6	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt	555	US26D	RO
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6210 A11 M54	689	RU
2	Silencer	608		RO

Set: 12.0

Doors: 141, 142

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

Set: 13.0

Doors: 117A, 117B, 117C, 138

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Entrance Lock	ML2054 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Door Stop	400 / 441CU	US26D	RO

1	Gasketing	S773BL		PE

Set: 14.0

Doors: 101B, 102B, 103B, 104B, 105B, 106B, 107B, 108B, 109B, 110B, 122B, 122C, 123B, 125B, 127B, 127C, 137B, 137C, 140B, 146B, 147B, 148B, 149B

6	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Dust Proof Strike	570	US26D	RO
2	Flush Bolt	555	US26D	RO
1	Classroom Lock	ML2055 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
2	Door Stop	400 / 441CU	US26D	RO
2	Silencer	608		RO

Set: 15.0

Doors: 115A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Classroom Lock	ML2055 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
3	Silencer	608		RO

Set: 15.1

Doors: 145

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Classroom Lock	ML2055 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 A1 M54	689	RU
3	Silencer	608		RO

Set: 16.0

Doors: 122A, 138B, 140C

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Classroom Lock	ML2055 NSM CT6R	626	RU

1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

Set: 17.0

Doors: 138C, 144

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Classroom Lock	ML2055 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

Set: 18.0

Doors: 101A, 102A, 103A, 104A, 105A, 106A, 107A, 108A, 109A, 110A, 123A, 125A, 137A, 140A, 146A, 147A, 148A, 149A

2	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Privacy Lock	ML2060 NSVN V21	626	RU
1	Door Stop	400 / 441CU	US26D	RO
2	Silencer	608		RO

Set: 19.0

Doors: 117D, 138A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Privacy Lock	ML2060 NSVN V21	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

Set: 20.0

Doors: 118A

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Privacy Lock	ML2060 NSVN V21	626	RU

1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

Set: 21.0

Doors: 111, 112, 143

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Privacy Lock	ML2068 NSVN V21 CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

Set: 22.0

Doors: 119, 139

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Privacy Lock	ML2068 NSVN V21 CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Conc Overhead Stop	1-X36	630	NO
1	Surface Closer	DC6200 / DC6210 M54	689	RU
3	Silencer	608		RO

Set: 23.0

Doors: 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 115, 116, 118, 120, 122, 123, 124, 125, 126, 137, 140, 146, 147, 148, 149

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Storeroom Lock	ML2057 NSM CT6R	626	RU
1	Conc Overhead Stop	1-X36	630	NO
1	Gasketing	S773BL		PE
1	Door Bottom	314CN		PE

Set: 24.0

Doors: 117E, 117F

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Classroom Lock	ML2055 NSM CT6R	626	RU

1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Surface Closer	DC6200 / DC6210 M54	689	RU
3	Silencer	608		RO

Set: 25.0

Doors: 128, 129, 130, 131, 132, 133, 134, 135, 136

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP]	US26D	MK
1	Classroom Lock	ML2055 NSM CT6R	626	RU
1	Permanent Core	Compatible with Facility's Existing System	626	RU
1	Door Stop	400 / 441CU	US26D	RO
3	Silencer	608		RO

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Insulating glass units.

B. Monolithic glazing units.

C. Plastic films.

D. Glazing compounds.

1.3 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 081113 - Hollow Metal Doors and Frames : Frames for sidelites.

C. Section 081416 - Flush Wood Doors : Doors with glazed lites.

D. Section 084113 - Aluminum-Framed Entrances and Storefronts: Frames for storefront assemblies.

1.4 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

E. ASTM C1036 - Standard Specification for Flat Glass.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

L. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems.

M. GANA (GM) - GANA Glazing Manual.

N. GANA (LGRM) - Laminated Glazing Reference Manual.

O. GANA (SM) - GANA Sealant Manual.

P. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.

Q. NFRC 100 - Procedure for Determining Fenestration Product U-factors.

R. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

S. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1. Discuss installation requirements and limitations, coordination with other affected installers, and special applications.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Each Glazing Type: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of insulating, laminated, and decorative glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Product Test Reports: For coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

G. Preconstruction adhesion and compatibility test report.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of documented experience.

1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Provide each type of glass, primary sealant, and gasket from a single manufacturer with not less than five years documented experience in the production of required materials.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions for shipping, handling, storing, and protection of glass and glazing materials. Exercise exceptional care to prevent edge damage to glass, and damage to coatings.

1.9 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

C. Install sealants only when ambient temperature conditions can be maintained at or above 40 degrees F during installation and 48 hours immediately following installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Float Glass Manufacturers:

1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC: www.guardianglass.com/#sle.
3. Pilkington North America Inc: www.pilkington.com/na/#sle.
4. Saint Gobain North America: www.saint-gobain.com/#sle.
5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Design Pressure: Calculated in accordance with ASCE 7 and requirements in Structural Drawings.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall not be greater than the thickness of the panels when a force of 50 pounds per linear foot is applied horizontally to one panel at any point up to 42 inches above the walking surface.
4. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
5. Design glazing units to reliably perform and remain reliably engaged on all edges under all service and thermal stresses, including those associated with partial shading.
6. Limit center of glass deflection to the lesser of 3/4 inch or L/100 (where L is short side dimension of glass unit), or flexure limit of glass, whichever is less, with full recovery of glazing materials.
7. Assure and confirm compatibility of all materials in contact with each other.
8. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.

1. In conjunction with weather barrier related materials described in other sections, as follows:

a. Air Barriers: See Division 07

2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.

3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.

2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.

3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

5. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category II criteria.

6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.

1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category II impact test requirements.

2.4 INSULATING GLASS UNITS

A. Manufacturers:

1. Glass: Any of the manufacturers specified for float glass.

2. Oldcastle BuildingEnvelope: www.obe.com.

3. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units - General: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
    b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

D. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.

1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
    b. Coating: Low-E (passive type), on #2 surface.
        1) Basis of Design: Guardian Glass; SunGuard SNX 70+: www.guardianglass.com/.
4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value): 0.24, nominal.
7. Visible Light Transmittance (VLT): 66 percent, nominal.
8. Solar Heat Gain Coefficient (SHGC): 0.27, nominal.
9. Visible Light Reflectance, Outside: 14 percent, nominal.
10. Glazing Method: Dry glazing method, gasket glazing.

E. Type IG-2 - Insulating Glass Units: Spandrel glazing.

1. Applications: Exterior spandrel glazing unless otherwise indicated.
2. Space between lites filled with argon.
3. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.

b. Coating: Same as on vision units, on #2 surface.

4. Inboard Lite: Heat strengthened unless otherwise required to have tempered safety glazing for compliance with CPSC 16CFR 1201 float glass, 1/4 inch thick.

a. Tint: Clear.

b. Opacifier: Ceramic frit, on #4 surface.

c. Opacifier Color: To be selected by Architect from Manufacturer's standard range.

5. Total Thickness: 1 inch.

6. Thermal Transmittance (U-Value): 0.24, nominal.

7. Glazing Method: Dry glazing method, gasket glazing.

F. IG-3 Insulating Glass Units: Forced Entry Security Glazing.

1. Applications: Where indicated in Drawings.

2. Performance Criteria:

a. Attack Resistance Rating: HP White 5-aa1 rated for 12 minutes, minimum, with 12 pound sledge hammer.

b. Safety Glazing: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

3. Space between lites filled with argon.

4. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.

a. Tint: Clear.

b. Coating: Low-E (passive type), on #2 surface.

1) Basis of Design: Solarban 60.

5. Inboard Lite: Manufacturer's proprietary bullet-resistant laminated glass product, clear, thickness as requried to meet performance criteria, with glass interior surface.

a. Thickness: 7/16 inch.

6. Total Thickness: 1-3/16 inch nominal.

a. Coordinate glazing unit overall thickness with framing manufacturer's size limitations.

7. Thermal Transmittance (U-Value): 0.23, nominal.

8. Solar Heat Gain Coefficient (SHGC): 0.38, nominal.

9. Glazing Method: As required to meet performance criteria.

10. Products:

a. Basis of Design: School Guard Glass SG5 IGU: www.schoolguardglass.com.

b. Other Acceptable Products:

1) CHILDGARD ACCESSGARD 2118.

2) Oldcastle BuildingEnvelope ArmorGarde Plus.

3) McGrory Glass DefendEd Plus Security Glazing.

4) Substitutions: See Section 016000 - Product Requirements.

2.5 MONOLITHIC GLAZING UNITS

A. General - Combined Requirements: If a particular glass unit is indicated to comply with more than one type of requirement, such as color, safety characteristics, or other requirements. Comply with all specified requirements for each type as scheduled on Drawings.

B. Type G-1 - Monolithic Safety Glazing: Non-fire-rated.

1. Applications:

a. Glazed lites in doors, except fire doors.

b. Glazed sidelights to doors, except in fire-rated walls and partitions.

c. Glazed view windows and panels in partitions enclosing athletic activity rooms, except in fire-rated walls and partitions.

d. Other locations required by applicable federal, state, and local codes and regulations.

e. Other locations indicated on drawings.

2. Glass Type: Fully tempered safety glass as specified.

3. Tint: Clear.

4. Thickness: 1/4 inch, nominal.

C. Type G-2 - Security Glazing: Laminated glass, 2-Ply.

1. Applications: Locations as indicated on drawings.

2. Tint: Clear.

3. Thickness: 9/16 inch.

4. Outer Lite: Tempered glass.

5. Interlayer: Typeand thickness as required to meet performance criteria.

6. Inside Lite: Tempered glass.

7. Performance Criteria:

a. Attack Resistance Rating: HP White 5-aa1 rated for 12 minutes, minimum, with 12 pound sledge hammer.

b. Forced Entry Resistance: Pass ASTM F1233 tests in compliance with Forced Entry Sequence of Testing, Class Achieved 1.4: Sledge Hammer, 25 impacts.

8. Basis of Design: School Guard Glass SG5: www.schoolguardglass.com.

a. Other Acceptable Manufacturers:

1) CHILDGARD ACCESSGARD 2118.

2) Oldcastle BuildingEnvelope ArmorGarde Plus.

3) McGrory Glass DefendEd Plus Security Glazing.

2.6 PLASTIC FILMS

A. Decorative Plastic Film: Polyester type; pressure-sensitive self-adhering.

1. Application: Locations as indicated on drawings.
2. Series Type: Pattern.
3. Color: As selected by Architect from manufacturer's full range of options.
4. Thickness Without Liner: 0.002 inch.
5. Width: 58 inch.
6. Visible Light Transmittance (VLT): 58 percent, nominal.
7. Acceptable Manufacturers:

a. Manufacturers and products specified on Drawings.

b. Substitutions: See Section 016000 - Product Requirements.

2.7 GLAZING COMPOUNDS

A. General Requirements:

1. Provide black exposed glazing accessory materials, unless specifically indicated otherwise.
2. Provide materials of hardness as recommended by manufacturer for required application and condition of installation in each case. Provide only compounds which are known to be fully compatible with surfaces contacted, including glass products, seals, and glazing channel surfaces.

B. Preformed Butyl Rubber Glazing Sealant: Tape or ribbon (coiled on release paper) of polymerized butyl, or mixture of butyl and polyisobutylene, compounded with inert fillers and pigments, solvent-based with minimum 95 percent solids, thread or fabric reinforcement, tack-free within 24 hours, paintable, non-staining.

C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

D. Manufacturers:

1. Bostik Inc: www.bostik-us.com/#sle.
2. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
3. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.
4. Momentive Performance Materials, Inc: www.momentive.com/#sle.
5. Pecora Corporation: www.pecora.com/#sle.

6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.8 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application.

C. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

1. Size gaskets as required by manufacturer of glazing channel frame to provide proper pressure and bite on glazing units.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

F. Cleaners, Primers and Sealers: Type recommended by glazing material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 INSTALLATION - BUTT JOINT GLAZING METHOD (SEALANT ONLY)

A. Application - Exterior Glazed: Set glazing infills from exterior side of building.

B. Temporarily brace glass in position for duration of glazing process; mask edges of glass at adjoining glass edges and between glass edges and framing members.

C. Temporarily secure a small diameter nonadhering foamed rod on back side of joint.

D. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod, and then tool sealant surface smooth to concave profile.

E. Permit sealant to cure then remove foam backer rod, and then apply sealant to opposite side, tool smooth to concave profile.

F. Remove masking tape.

3.6 INSTALLATION - STRUCTURAL SILICONE GLAZING

A. Application - Field Glazed: Follow basic guidelines of structural silicone glazing for glazing application.

B. Provide design review of the glazing system and project details, adhesion testing, proper surface preparation, training and a quality service program.

C. Provide only structural silicone sealant, tested and manufactured for structural glazing.

3.7 INSTALLATION - PLASTIC FILM

A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch to 1/8 inch gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

3.8 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.9 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.10 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 088300 - MIRRORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Glass mirrors.

1.3 RELATED REQUIREMENTS

A. Section 102800 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.4 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

B. ASTM C1036 - Standard Specification for Flat Glass.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.

D. GANA (GM) - GANA Glazing Manual.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples, 12 x 12 inch in size, illustrating mirrors design, edging, and coloration.

E. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

F. Compatibiliy Letter: Provide compatibility letter from safety backing tape manufacturer that mastics and adhsives are compatible.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) for glazing installation methods.

1. Maintain one copy on project site.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.7 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

A. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com.
2. Lenoir Mirror Co.: www.lenoirmirror.com.
3. Trulite Glass and Aluminum Solutions: www.trulite.com.
4. Walker Glass Company Ltd: www.walkerglass.com/#sle.
5. Guardian Glass Corp: www.guardianglass.com.
6. Virginia Glass Products Corporation: www.va-glass.com
7. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: Annealed float glass; ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality Q1 (mirror select); silvering, protective coating and physical characteristics complying with ASTM C1503.

1. Thickness: 1/4 inch.
2. Edges: Flat polished.

a. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

b. Require mirror manufacturer/fabricator to perform edge treatment and sealing in factory or shop immediately after cutting to final sizes.

3. Size: As noted on Drawings.

2.3 GLAZING COMPOUNDS

A. Mastic: Provide products compatible with safety backing tape.

1. Acceptable Products:

a. Gunther Premier Plus Mastic.

b. CRL; Heavy Bodied Mirror Mastic.

c. Palmer Products Corporation; Mirro-Mastic or SuperSet.

d. Substitutions: See Section 016000 - Product Requirements.

B. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; color as selected.

2.4 ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.

C. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.

D. Shatterproof Safety Backing: Adhesive coated film complying with 16CFR1201 for impact resistance.

1. Product: CRL White Category II Shatterproof Safety Tape for Mirrors.

E. Mirror Attachment Accessories: Stainless steel J-profile channels.

F. Channel Frame: One piece, J-channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep with 90 degree mitered corners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.2 PREPARATION

A. Install mirror backing tape in accordance with manufacturer's recommendations and free of bubbles, blisters, and other surface imperfections.

B. Clean contact surfaces with solvent and wipe dry.

C. For adhesively attached mirrors, ensure that walls are free of paint and wall coverings. If walls have been painted or papered, scratch or sand through surfacing to original surface.

D. Apply bond coat to wall surface per mastic manufacturer's instructions.

3.3 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
2. Install mastic as follows:

    a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.

    b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.

    c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

3.4 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 088813 - FIRE-RATED GLAZING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.3 RELATED REQUIREMENTS

A. Section 081416 - Flush Wood Doors: Glazed lites in doors.

1.4 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants.

F. GANA (GM) - GANA Glazing Manual.

G. GANA (SM) - GANA Sealant Manual.

H. ICC (IBC) - International Building Code.

I. ITS (DIR) - Directory of Listed Products.

J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

K. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies.

L. UL (DIR) - Online Certifications Directory.

M. UL 9 - Standard for Fire Tests of Window Assemblies.

N. UL 10B - Standard for Fire Tests of Door Assemblies.

O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each of affected installers.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Each Glazing Type: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM) for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fully Tempered Safety Glass: Comply with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.2 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Kind FT - Fully Tempered Type: Comply with ASTM C1048.

2.3 GLAZING UNITS

A. Fire-Protection-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and does not block radiant heat, as required to achieve indicated fire rating period of 90 minutes or less.

1. Applications:

a. Glazing in fire-resistance-rated door assembly.

2. Glass Type: Specialty tempered float glass.

3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.

4. Safety Glazing Certification: 16 CFR 1201 Category II.

5. Glazing Method: As required for fire rating.

6. Fire-Rating Period: As indicated on drawings.

7. Markings for Fire-Protection-Rated Glazing Assemblies: Provide permanent markings on fire-protection-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction

a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.

b. "OH" - meets fire window assembly criteria, including hose stream test of NFPA 257 or UL 9 fire test standards.

c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire tests standards.

d. "XXX" - placeholder that represents fire-rating period, in minutes.

8. Acceptable Manufacturers:

a. SAFTIFIRST, a division of O'Keeffe's Inc: www.safti.com.

b. Technical Glass Products: www.fireglass.com.

c. Vetrotech North America: www.vetrotechusa.com.

d. Substitutions: See Section 016000 - Product Requirements.

2.4 ACCESSORIES

A. Setting Blocks: Calcium or aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape: Flexible tape made from spun calcium-magnesium-silica fibers in binder; designed to remain stable at temperatures up to 2,012 degrees F.

1. Thickness: As recommended by framing manufacturer for glazing application.

D. Glazing Gaskets: Flexible intumescent seals.

E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that minimum required face and edge clearances are provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.4 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from interior of building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sightline.

C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.5 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.6 PROTECTION

A. After installation, mark pane with 'X' by using removable plastic tape or paste.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 089100 - LOUVERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Louvers, frames, and accessories.

1.3 RELATED REQUIREMENTS

A. Section 076200 - Sheet Metal Flashing and Trim.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.4 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.

C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices.

D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work of this Section with installation of exterior cladding materials.
2. Coordinate work of this Section with installation of mechanical ductwork .
3. Coordinate with installation of flashings by others.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.

C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.

D. Verification Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior surfaces.

E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.7 DESIGN REQUIREMENTS

A. Design anchors and supports under direct supervision of a Professional Structural Engineer, registered in the State in which the Project is located.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this Section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Basis of Design: Drawing details are based on profiles by specified basis of design manufacturer. Similar profiles by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, and finish are minor, and do not detract from the indicated design intent.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

1. Finish: Include twenty year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Airolite Company; SCH601: www.airolite.com.

B. Other Acceptable Manufacturers:

1. Construction Specialties, Inc.: www.c-sgroup.com.
2. Greenheck: www.greenheck.com.

3. Industrial Louvers, Inc.: www.industriallouvers.com.
4. Pottorff: www.pottorff.com.
5. Ruskin: www.ruskin.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 LOUVERS

A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

1. Structural Performance: Withstand the effects of gravity loads and specified wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
2. Wind Load Resistance: Design to resist positive and negative wind load of 25 psf minimum or as otherwise indicated in Structural Drawings without damage or permanent deformation.
3. Snow Load Resistance: Withstand snow loads as required by code.
4. Intake Louvers: Design to allow maximum of 0.01 oz/sq ft water penetration at calculated intake design velocity based on design air flow and actual free area, when tested in accordance with AMCA 500-L.
5. Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
6. Screens: Provide bird screens at intake louvers and exhaust louvers.
7. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

    a. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

B. Stationary Louvers: Horizontal blade, extruded aluminum construction.

1. Free Area: 45 percent, minimum.
2. Blades: Drainable.
3. Frame: 6 inches deep, channel profile; corner joints mitered.
4. Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.
5. Aluminum Finish: Superior performing organic coatings.

2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M); manufacturer's standard alloy and temper.

2.4 FINISHES

A. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

B. Primer: Zinc chromate, alkyd type.

C. Color: As selected from manufacturer's standard colors.

2.5 FABRICATION

A. Factory assemble louvers to minimize field splicing. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

F. Provide subsills made of same material as louvers and extended sills for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.6 ACCESSORIES

A. Blank-Off Panels: Same material as louver, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.

B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.

C. Bird Screen: Interwoven wire mesh of aluminum, 14 gage, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.

D. Fasteners and Anchors: Stainless steel.

E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.

F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

B. Verify that field measurements are as indicated.

3.2 INSTALLATION

A. Install louver assembly in accordance with manufacturer's instructions.

1. Comply with ASTM E2112 for installation of air barrier materials in conjunction with installation of louvers.

B. Install louvers level and plumb.

C. Set sill members and sill flashing in continuous bead of sealant.

D. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.

E. Secure louver frames in openings with concealed fasteners.

3.3 CLEANING

A. Clean surfaces and components.

END OF SECTION

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SECTION 090000 – FINISH SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section contains finish nomenclature with regard to project finishes and a Finish Schedule.

B. Related Sections are listed in Article 3.2 - Interior Finishes Color and Pattern List.

1.3 ABBREVIATIONS

A. Abbreviations for specific finishes are listed in the Interior Finishes Product List in Article 3.2. Other Abbreviations include:

ETR	Existing to Remain
EXP	Exposed
UNF	Unfinished
MANF	MANUFACTURER

1.4 SUBMITTALS

A. Refer to and comply with the requirements of each Related Section listed in Article 3.2 - Interior Finishes Product List for specific submittals of product data, samples, shop drawings, etc.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FINISH NOTES

GENERAL NOTES

1. Refer to Article 3.2 - Color and Pattern List for definition of materials and substrates.
2. Two accent paint colors per room.
3. All interior finishes shall meet the requirements of the Connecticut fire safety code and shall be Class A.
4. See Reflected Ceiling Plans for ceiling heights and extent of ceiling types.
5. Use only manufacturers' required adhesives and sealants for all interior finishes. All adhesives used are to be environmentally safe and contain no solvents, alcohol, glycol, ammonia, carcinogens and must be a low VOC product.
6. Paint all exposed pipes, decking, hangers, fittings, wiremold, conduit, etc.
7. Doors to be Plastic Laminate faced; Finish: Wilsonart, Phantom Pearl.

FLOORING

1. All flooring to extend to meet wall and/or base of casework.
2. Flooring and base to extend into closets.
3. Provide Schluter metal transition strips at all floor transitions as scheduled in Section 3.2. Transitions to be ADA compliant. Finish: As scheduled.
4. Provide Schluter metal transition strips at all vertical terminations of tile wall terminations and backsplash tile terminations as scheduled in Section 3.2. Finish: As scheduled.
5. Provide coordinating Schluter JOLLY metal transition strips at all 90 degree corner tile wall transitions. Finish: As scheduled.
6. Provide Tarkett rubber transition strips at all floor transitions as scheduled in Section 3.2. Transitions to be ADA compliant. Finish: As scheduled.
7. Provide manufacturer approved underlayment for all flooring types called out in contract documents.
8. Refer to Floor Pattern & Finish Plans for extent of floor patterns.

MISCELLANEOUS

Finishes for Miscellaneous Items:

1. All plastic laminate to be horizontal grade.
2. Electrical Switches & Coverplates: Finish: TBD
3. Typical Bathroom Sinks: Adult Restrooms, Wall Mounted Sink: Refer to Plumbing Schedule; Child Restrooms: Custom Fabricated SS2 - Formica Solid Surface w/ Undermount Stainless Steel Basin; Refer to Detail Drawing for Construction.
4. Typical ADA Grab Bars: Finish: Stainless Steel
5. Typical Cabinets: to be plastic laminate, refer to finish schedule. Countertop and backsplash varies, refer to finish schedule..

6. Typical Cabinet Hardware: Richelieu, Style: Modern Metal Pull #8160, Size: 5-1/32" C-C, Finish: Brushed Nickel, Architect to select from manf.'s full range of finishes
7. Classroom Sink Countertop Bracket: Metal Bracket, Manf: Rakks, Style: Concealed EH Countertop Support Bracket EH-1818FM, 18" x 18" x 2"; Hidden In-Wall Flush Mount Heavy-Duty Aluminum Bracket for Floating Counters. Bracket should be screwed into blocking or studs at a minimum spacing of 48". 2" wide mounting surface provides extra support where counter sections join. Finish: Matte Silver Powder Coat. Use as necessary to provide countertop support. Note: Contractor to verify with weight & size of counter prior to ordering.
8. Reception Desk Countertop Bracket: Metal Bracket, Manf.: Rakks, Style: EHR-1818, 18" x 18" x 2" bracket should be screwed into blocking or studs at a minimum spacing of 48". 2" wide mounting surface provides extra support where counter sections join. Finish: TBD. Use as necessary to provide countertop support. Note: Contractor to verify with weight & size of counter prior to ordering.
9. Typical Exterior Windows: To have RS roller shades. Refer to finish schedule.
10 Typical Door Vision Lite Shutter: Manf.: Shelter Shutters, Style: Single Fold, Magnetic Vision Panel Covers, made from 4MM FR Corrugated Vinyl, ADA Accessible, Fire rated NFPA 701, ASTM E84 and UL 723, Finish: Black, Size: Refer to Door Schedule.
11. Typical Classroom Lockdown Shades: Manf.: School Safety Solutions, Style: Hideaway Helper Lockdown Shades, made from 100% PVC-backed blackout polyester with weighted hem bar and velcro release mechanism with extension strap, Fire rated NFPA 701, Finish: Black, Size: TBD.
11. Coat Hooks: Manf.: Richelieu, Style: Utility Hook 6513, Double hook 4-1/2", BP6513140, 22 lb. load capacity, Finish: Matte Nickel, Location: Typical on all Single Occupancy, Full Height Bathroom Doors - 1 per door.
12. Wall Corners: All exposed corners of vinyl wall covering (VWC) to have clear cornerguards. Manf: TBD, Style:TBD. Clear cornerguards to also be supplemented at exposed painted gypsum corners above WP wainscot at meal cart alcove as noted in finish plans.
13. Wainscot and Wall Covering Termination: All wall protection wainscot to be installed with aluminum J-Cap (JC12) at vertical termination (4'), aluminum Inside Corner (IC12)/Outside Corner (OC12) trim at respective conditions, and aluminum Divider Bar (DB12) where sheets meet.
14. Whiteboards. Manf.: AARCO, 350 High Performance Porcelain Markerboard, Color: High Gloss Bright White - Satin Silver Trim, Size: 48" x 72" Mounted in Portrait Orientation to include Deluxe Enclosed Box Tray with Molded End Caps along 48"W bottom, Qty. 1 per typical classrooms and resource rooms including: OT/PT. Refer to Interior Elevations for Location and Mounting Height.
15. Map Rail: Manf.: AARCO, 3" Cork Map Rail with Aluminum Frame, Color: Brown Rice - Size: 3" H x 10' W. Qty. 1 per typical classrooms and all smaller classroom/resource rooms including: OT/PT. Refer to Interior Elevations for Location and Mounting Height.
16. Tackboards. Manf.: AARCO, Cork Tackboard with Aluminum Frame. Color: Brown Rice - Size: 4' H x 6' W. Qty. 1 in Main Street Corridor by Entrance. Refer to Architectural Narrative. Refer to Interior Elevations for Location and Mounting Height.
17. Flags: Manf.: Liberty Flags, American Classroom Flags Economy (Pack of 12); Size 12" x 18" with Bracket Included. Flags: Qty 1 per typical classroom and OT/PT room. Wall Mounted; Refer to Interior Elevations for Location and Mounting Height. Mounting screws not included due to mounting surface conditions. Contractor to select and install appropriate screws for application.

END OF SECTION

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
FLOOR							
CPT - Tile Carpeting - Division 09 Section "Tile Carpeting"							
CPT1	Mannington	Notable Collection, Modular Carpet Tile, 12" x 36", Type 6,6, Solution Dyed, Tip Sheared Patterned Loop, Infinity 2 Modular Backing. XGUARD® Colorsafe® Technologies.	Style: Muse Color: Consider 33100 MUSET	Guidance Office, Secretary's Office, Principal's Office, and Conference Rooms	Installation : Horizontal Brick Ashlar Install with Infinity 2 Adhesive per manf. instructions. All primers, levelers to be as per manf. recommendation.		Kevin O'Bryan 314-276-3012
EM- Entrance Mats or Sheets - Division 12 Section "Entrance Floor Grilles"							
EM1	Matter Surfaces	Architectural Foot Grilles, Style: Mighty Track, Aluminum foot grille. 42" x 48" max panel size. With drain	Color: Aluminum	Exterior Main Entrances	Installation: Recessed		Rep: David Cassady, 781.962.7362
EM2	Matter Surfaces	Surface-Mounted Walk-off Matting, Style: Ultra Entry, Dual-strip foot grille. 48" W x 40' max length. Rolled Goods.	Insert Color: SuperNop 52 Beige Grid Color: Brown	Main Entrance Vestibules 1 & 3	Installation: On Top of Subfloor with J-Frame transition - to be installed level with adjacent floor finish.		Rep: David Cassady, 781.962.7362

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
EM- Entrance Mats or Sheets- Division 09 Section "Tile Carpeting"							
EM3	Matter Surfaces	Trilogy 20" x 20" walk off carpet tile, 139 oz/ square yard. Backing 100% post consumer recycled PET, Nylon Fiber (6) textured. Tufted loop construction, 9 /32" thickness	Color: Cremini	Vestibules 1 & 3 and Into Main Corridors; Refer to Finish Plans for Extent.	Installation: 1/4 turn installation. To be carried into corridors to extent noted in finish plans.		Rep: David Cassady, 781.962.7362
EM4	Matter Surfaces	Trilogy 20" x 20" walk off carpet tile, 139 oz/ square yard. Backing 100% post consumer recycled PET, Nylon Fiber (6) textured. Tufted loop construction, 9 /32" thickness	Color: Portobello	Vestibule 2; Refer to Finish Plans for Extent.	Installation: 1/4 turn installation. To be carried into corridors to extent noted in finish plans.		Rep: David Cassady, 781.962.7362
HVT - Homogenous Vinyl Tile - Division 09 Section "Resilient Flooring"							
HVT1	Tarkett	iQ Eminent, Homoegenous Vinyl Tile Flooring, 2mm (0.80") thickness, 12" x 24" Tile Size.	Color: 883 Sand CB	Typical Classrooms, Self Contained Classrooms, Reception, Evaluation Room, Instructional Support, Break/Work Rooms, Nurse	Installation; TBD Install with 926 Adhesive per manf. recommendation.		Rep: Gerry Grenon 603 395-4875

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
PTF - Porcelain Tile Floor - Division 09 Section "Tiling"							
PTF1	Daltile	Keystones 2"x2" Mosaic, Mesh Mounted Sheet 12" x 24", 1/4" Thickness.	Color: Cornsilk (D160)	Child Restrooms (Classroom Wing A).	Installation:Straight Joint, Grout-Laticrete, color: Hemp (27). 1/8" Recommended Grout. To be carried into classroom to extent noted in finish plans. Schluter Transitions: Floor-to-Floor: Reno U (See MTS-F1), Floor-to-Wall: DILEX-AHK (See MTS-F3)		Cleo Galanos 203-233-8585
PTF2	Daltile	Keystones 2"x2" Mosaic, Mesh Mounted Sheet 12" x 24", 1/4" Thickness.	Color: Waterfall (D169)	Child Restrooms (Classroom Wing B, Nurse, and Main Street).	Installation: Straight Joint, Grout-Laticrete, color: Hemp (27), 1/8" Recommended Grout. To be carried into classroom to extent noted in finish plans. Schluter Transitions: Floor-to-Floor: Reno U (See MTS-F1), Floor-to-Wall: DILEX-AHK (See MTS-F3)		Cleo Galanos 203-233-8585

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
PTF3	Creative Materials Corporation	Sprinkles Field Tile, 24" x 24", 8.8mm thickness, non-rectified. Install with Large Format Tile setting material (LFT)	Color: Blue	Adult Restrooms	Installation: Straight Joint, Grout-Laticrete, color: Platinum (42).Schluter Transitions: Floor-to-Floor: Reno U (See MTS-F2), Floor-to-Wall: DILEX-AHK (See MTS-F4)		Lisa Cupolo 518.469.7727
SC - Sealed Concrete Flooring - Division 09 Section "Staining and Transparent Finishing"							
SC1	Sherwin Williams	HC Wet Look	Color: N/A	Electrical Room, Custodial, Mechanical Room	2-3 coats based on porosity.		Andrew Stempel 781 556 2276
SV - Sheet Vinyl Flooring - Division 09 Section "Resilient Flooring"							
SV1	Altro	Orchestra, Sound Reduction Sheet Vinyl Flooring. 2.85mm thickness, 6'-7" Roll Width.	Color: Oboe CH2835U (Dark Tan); 1 of 3-color pattern	Gross Motor, OT/PT	Installation: 3-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		support@altro.com

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
SV2	Altro	Orchestra, Sound Reduction Sheet Vinyl Flooring. 2.85mm thickness, 6'-7" Roll Width.	Color: Rap CH2820U (Light Blue); 2 of 3-color pattern (Gross Motor); 1 of 4-color pattern (OT/PT)	Gross Motor, OT/PT	Installation: 3-color pattern (Gross Motor), 4-color pattern (OT/PT). Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		support@altro.com
SV3	Altro	Orchestra, Sound Reduction Sheet Vinyl Flooring. 2.85mm thickness, 6'-7" Roll Width.	Color: Jazz CH2824U (Green); 3 of 3-color pattern.	Gross Motor	Installation: 3-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		support@altro.com
SV4	Altro	Orchestra, Sound Reduction Sheet Vinyl Flooring. 2.85mm thickness, 6'-7" Roll Width.	Color: Turandot CH2847U (Dark Blue); 2 of 4-color pattern	OT/PT	Installation: 4-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		support@altro.com

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
SV5	Altro	Orchestra, Sound Reduction Sheet Vinyl Flooring. 2.85mm thickness, 6'-7" Roll Width.	Color: Maraca CH2855U; 3 of 4-color pattern (OT/PT)	Sensory Rooms, OT/PT	Installation: 4-color pattern (OT/PT). Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		support@altro.com
SV6	Altro	Orchestra, Sound Reduction Sheet Vinyl Flooring. 2.85mm thickness, 6'-7" Roll Width.	Color: Chimes CH2836U (Light Tan); 4 of 4-color pattern (OT/PT)	OT/PT	Installation: 4-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		support@altro.com
SV7	Tarkett	iQ Granit, Homoegenous Sheet Vinyl Flooring, 2mm thickness, 6'-6" Roll Width.	Color: Warm Sand CB (0322) - Field Color All Corridors and into adjacent storage closets, custodial closets, and data rooms.	Corridors	Installation: 4-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		Rep: Gerry Grenon 603 395-4875
SV8	Tarkett	iQ Granit, Homoegenous Sheet Vinyl Flooring, 2mm thickness, 6'-6" Roll Width.	Color: Light Sand (0323) - Accent Color 1 - All Corridors	Corridors	Installation: 4-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		Rep: Gerry Grenon 603 395-4875

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
SV9	Tarkett	iQ Granit, Homoegenous Sheet Vinyl Flooring, 2mm thickness, 6'-6" Roll Width.	Color: Pastel Green (0392) - Accent Color 2 - All Corridors	Corridors	Installation: 4-color pattern. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		Rep: Gerry Grenon 603 395-4875
SV10	Tarkett	iQ Optima, Homoegenous Sheet Vinyl Flooring, 2mm thickness, 6'-6" Roll Width.	Color: Olive Green (0838) Accent Color 3 - Main Street Corridor	Corridors	Installation: 4-color pattern with inserted custom waterjet cutouts. Refer to Floor Pattern in Finish Plans for Extent. Where heat welding is required, color match weld rods.		Rep: Gerry Grenon 603 395-4875
RES- Resinous Epoxy Floor - Division 09 Section "Fluid Applied Flooring (Resinous Flooring)"							
RES1	Sherwin Williams	Hybri-Flex AQ, Seamless 1/4" decorative quartz floor system. Moisture tolerant self-priming and self-leveling body coat topped with a double broadcast of decorative quartz aggregate and finished with an Accelera™ topcoat. With 6" high Resufloor Cove-Rez Wall Base (RESB1).	Color: Brindle	Kitchen	FRP1 to be mounted atop RESB1 6" cove base with matching trim at edges.		Sam Sacks 401 369 6564

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
BASE							
RB- Resilient Wall Base - Division 09 Section "Resilient Base and Accessories"							
RB1	Mannington	4" high resilient base. TS pure rubber wall base, Rolled goods.	Color: Carmine Gray	Typical Classroom, Millwork Base, Corridors, Nurse, OT/PT, Instructional Support Offices			Kevin O'Bryan c: 314-276-3012
RB2	Mannington	Edge Effects, Profile: Etched, 4.5" high resilient base. TP Thermoplastic Rubber wall base, Rolled goods.	Color: Carmine Gray	Admin Offices, Reception, Conference Rooms			Kevin O'Bryan c: 314-276-3012
RB3	Mannington	4" high resilient base. TS pure rubber wall base, Rolled goods.	Color: Ginger	Gross Motor			Kevin O'Bryan c: 314-276-3012
RB4	Mannington	4" high resilient base. TS pure rubber wall base, Rolled goods.	Color: Navy	Evaluation Room			Kevin O'Bryan c: 314-276-3012
RESB- Resinous Wall Base - Division 09 Section "Resilient Base and Accessories"							
RESB1	Sherwin Williams	Resufloor Cove-Res, Epoxy Integral Wall Base, 6" High, 1" Radius	Color: Brindle (To match RES1)	Kitchen			Sam Sacks 401 369 6564

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
WALL							
AWP- Acoustical Wall Panel- Division 09- Section "Sound Absorbing Units"							
AWP1	Impact Acoustics	Fylo, Acoustic Wall Panel, 1800mm x 2400mm x 24mm.	Color: 918 Deep Sea	Conference Room 117; Refer to Interior Elevations for pattern and extent.	Installation: From Ceiling to ~2'-0" AFF Using Undercover Mount System, Cut to appropriate height and staggered installation.		Alexis Pozzuto 215.932.2342
AWP2	Impact Acoustics	Fylo, Acoustic Wall Panel, 1200mm x 2800mm x 24mm.	Color: 918 Deep Sea	Conference Room 117; Refer to Interior Elevations for pattern and extent.	Installation: From Ceiling to ~2'-0" AFF Using Undercover Mount System, Cut to appropriate height and staggered installation.		Alexis Pozzuto 215.932.2342
AWP3	Impact Acoustics	Fylo, Acoustic Wall Panel, 1800mm x 2400mm x 24mm.	Color: 410 Winter Sky	Conference Room 121; Refer to Interior Elevations for pattern and extent.	Installation: From Ceiling to ~2'-0" AFF Using Undercover Mount System, Cut to appropriate height and staggered installation.		Alexis Pozzuto 215.932.2342
AWP4	Impact Acoustics	Fylo, Acoustic Wall Panel, 1200mm x 2800mm x 24mm.	Color: 410 Winter Sky	Conference Room 121; Refer to Interior Elevations for pattern and extent.	Installation: From Ceiling to ~2'-0" AFF Using Undercover Mount System, Cut to appropriate height and staggered installation.		Alexis Pozzuto 215.932.2342

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
CK- Cork Wall Tile - Division 09 Section "Wall Coverings"							
CK1	Capri Collections	Muro Gallery Wall Cork, 12" x 24" x 3mm Wall Tile, ASTM E84 Rated, PVC Free	Color: Abstract White (MWT201)	Corridor Alcoves Above Cubbies; Refer to Finish Plans and Finish Detail Sheets for extent.	Installation: Stack Bond Product to span full width from ceiling to top of cubbies.		
CR- Chair Rail - Division 09 Section "Resilient Accessories"							
CR1	Mannington	Edge Effects, Profile: Chair Rail, 4" high. TP Thermoplastic Rubber, Rolled goods.	Color: Off-White	Reception	To be installed at height specified in Interior Elevations.		Kevin O'Bryan c: 314-276-3012
CR2	Mannington	Edge Effects, Profile: Chair Rail, 4" high. TP Thermoplastic Rubber, Rolled goods.	Color: Navy	Evaluation Room	To be installed atop vertical termination of VWC2 where wallcovering meets paint. Refer to Interior Elevations.		Kevin O'Bryan c: 314-276-3012

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
CWT- Ceramic Wall Tile - Division 09 Section "Tiling"							
CWT1	Genrose	Tonalita 6"x 6" Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: Mustard	Classrooms Wing A - Component of Typical Restroom 4'H Wainscot and Sink Wall Tile. Refer to Interior Elevations for Pattern and Extent.	Installation: Straight Joint; Grout- Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1), Wall-to-Floor: DILEX-AHK (See MTS-F3)		Rep: Jamie Alwang 860-807-3072
CWT1A	Genrose	Tonalita 3"x 6" (Cut Tile) Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: Mustard	Classrooms Wing A - Component of Typical Restroom 4'H Wainscot and Sink Wall Tile. Refer to Interior Elevations for Pattern and Extent.	Installation: Straight Joint; Grout- Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1), Wall-to-Floor: DILEX-AHK (See MTS-F3)		Rep: Jamie Alwang 860-807-3072

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
CWT2	Genrose	Tonalita 6"x 6" Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: Atlas Blue	Classrooms Wing B - Component of Typical Restroom 4'H Wainscot and Sink Wall Tile, OT/PT Millwork Tile Backsplash. Refer to Interior Elevations for Pattern and Extent.	Installation: Straight Joint; Grout-Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1), Wall-to-Floor: DILEX-AHK (See MTS-F3)		Rep: Jamie Alwang 860-807-3072
CWT2A	Genrose	Tonalita 3"x 6" (Cut Tile) Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: Atlas Blue	Classrooms Wing B - Component of Typical Restroom 4'H Wainscot and Sink Wall Tile, OT/PT Millwork Tile Backsplash. Refer to Interior Elevations for Pattern and Extent.	Installation: Straight Joint; Grout-Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1), Wall-to-Floor: DILEX-AHK (See MTS-F3)		Rep: Jamie Alwang 860-807-3072

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
CWT3	Genrose	Tonalita 2"x 6" (Cut Tile) Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: White	Classrooms Wing A/B - Component of Typical Restroom 4'H Wainscot and Sink Wall Tile. Refer to Interior Elevations for Pattern and Extent.	Installation: Straight Joint; Grout-Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1), Wall-to-Floor: DILEX-AHK (See MTS-F3)		Rep: Jamie Alwang 860-807-3072
CWT4	Genrose	Tonalita 6"x 6" Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: Petrol Blue	Breakroom/Workroom Millwork Tile Backsplash.	Installation: Straight Joint; Grout-Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1)		Rep: Jamie Alwang 860-807-3072
CWT5	Genrose	Tonalita 1"x 6" Piano Listel, Ceramic wall tiles, Matte Finish, 5.8mm Thickness, Pressed Edge.	Color: White	Classrooms Wing A/B - Component of Typical Restroom 4'H Wainscot and Sink Wall Tile. Refer to Interior Elevations for Pattern and Extent.	Installation: Straight Joint; Grout-Laticrete, color: Iron (97) Schluter Transitions: Vertical and Horizontal Terminations: JOLLY (See MTS-W1), Wall-to-Floor: DILEX-AHK (See MTS-F3)		Rep: Jamie Alwang 860-807-3072

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
FRP- Fiberglass Reinforced Panels - Division 09 Section "Wall Protection"							
FRP1	Marlite	Standard FRP Panels, Texture: Smooth, Thickness: 0.090", Size: 4' x 8'. With matching Marlite trims as required: Edge M370 at tops of all panels, Division trim M365 between all panels, Inside corners M350 at all inside corners, Outside corner M360 at all outside corners.	Color: S 100G White	Typical these locations: Storage, ALL Custodial Closets, Kitchen	Full height and width with matching trim at seams and edges. Refer to Finish plans for extent. Panels installed ABOVE 6" high resinous flash cove base.		Dan Keffer 330.260.7627
P - Interior Painting - Division 09 Section "Painting" ***(See 09 29 00 for Finish Gypsum Board Levels Unless Otherwise Noted)***							
P1	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Westhighland White (SW 7566) LRV 86	General Classroom Walls, General Office Walls	Low VOC		Andrew Stempel 781 556 2276
P2	Sherwin Williams	Pro Industrial Multi-Surface Acrylic - Semi Gloss - B66T01554-16	Color: Keystone Gray (SW 7504) LRV 29	Trim/ Frame Color - Typical	Low VOC		Andrew Stempel 781 556 2276
P3	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Gossamer Veil (SW 9165) LRV 62	Corridors and Vestibules General (Above Wainscot)	Low VOC		Andrew Stempel 781 556 2276
P4	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Sunbeam Yellow (SW 0078) LRV 67	Accent Color 1 (Corridor Canopies Classroom Wing A, Cubby Frame Classroom Wing B) Refer to Interior Elevations for Extent	Low VOC		Andrew Stempel 781 556 2276

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
P5	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Dockside Blue (SW 7601) LRV 43	Accent Color 2 (Corridor Canopies Classroom Wing B, Cubby Frame Classroom Wing A), Sensory Rooms All Walls. Refer to Interior Elevations for Extent	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276
P6	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Sunbeam Yellow (SW 0078) LRV 67	Accent color 1 (Teaching Wall Classroom Wing A, Millwork Frame Classroom Wing B)	Low VOC		Andrew Stempel 781 556 2276
P7	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Dockside Blue (SW 7601) LRV 43	Accent color 1 (Teaching Wall Classroom Wing B, Millwork Frame Classroom Wing A)	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276
P8	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00153	Color: Inky Blue (SW 9149) LRV 15	Accent Color: Reception, Admin Offices, Break Room / Work Room, Instructional Support Offices; Refer to Finish Plans and Interior Elevations for Extent	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
P9	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Drift of Mist (SW 9166) LRV 69	General Walls: Reception, Admin Offices, Break Room / Work Room, Instructional Support Offices; Refer to Finish Plans and Interior Elevations for Extent	Low VOC		Andrew Stempel 781 556 2276
P10	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00153	Color: Denim (SW 6523) LRV 14	Conference Room 117	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276
P11	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00153	Color: Daphne (SW 9151) LRV 32	Conference Room 121	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276
P12	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Hinting Blue (SW 6519) LRV 68	Evaluation Room Above Chair Rail and VWC Wainscot	Low VOC		Andrew Stempel 781 556 2276
P13	Sherwin Williams	Pro Industrial Waterbased Catalyzed Epoxy B73W00361-16	Color: Compatible Cream (SW 6387) LRV 61	Nurse	Low VOC		Andrew Stempel 781 556 2276

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
P14	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Dancing Green (SW 6716) LRV 58	Gross Motor Color 1 Above Wainscot, Refer to Interior Elevations for Extent	Low VOC		Andrew Stempel 781 556 2276
P15	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00151	Color: Jetstream (SW 6492) LRV 60	Gross Motor Color 2 Above Wainscot, Refer to Interior Elevations for Extent	Low VOC		Andrew Stempel 781 556 2276
P16	Sherwin Williams	Scuff Tuff Interior Water Based Enamel - Eg Shel - S24W00153	Color: Favorite Jeans (SW 9147) LRV 35	OT/PT	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276
P17 (Exterior)	Sherwin Williams	Sher-Cryl HPA - Semi Gloss - B66T00354-16	Color: Black Magic (SW 6991) LRV 3	Exterior Exposed Structural Steel Beams	Low VOC Minimum of 3 coats		Andrew Stempel 781 556 2276
P18	Sherwin Williams	Pro Industrial Waterbased Catalyzed Epoxy - B73W00361-16	Color: Westhighland White (SW 7566) LRV 86	Restroom General Paint	Low VOC		Andrew Stempel 781 556 2276

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
PWT- Porcelain Wall Tile - Division 09 Section "Tiling"							
PWT1	Genrose	Estrella, 6.5" Star, Porcelain Wall Tile, 8mm thickness, Pressed Edge, Matte Finish.	Color: Almond Mist	Component of Mosaic Tile Pattern: Typical full height at all drinking fountains. Refer to Elevations, Finish Plans, and Finish Details sheet for pattern, location and extent.	Installation: Mosaic with PWT2, Grout-Laticrete, color: Autumn Green Schluter Transitions: Wall-to-Floor: Schluter DILEX-AHK (See MTS-F5)		Rep: Jamie Alwang 860-807-3072
PWT2	Genrose	Estrella, 5" Cross, Porcelain Wall Tile, 8mm thickness, Pressed Edge, Matte Finish.	Color: Sahara Sand	Component of Mosaic Tile Pattern: Typical full height at all drinking fountains. Refer to Elevations, Finish Plans, and Finish Details sheet for pattern, location and extent.	Installation: Mosaic with PWT1, Grout-Laticrete, color: Autumn Green Schluter Transitions: Wall-to-Floor: Schluter DILEX-AHK (See MTS-F5)		Rep: Jamie Alwang 860-807-3072
PWT3	Genrose	Estrella, 2.5" x 12", Porcelain Wall Tile, 8mm thickness, Pressed Edge, Matte Finish.	Color: Sahara Sand	Component of Mosaic Tile Pattern: Typical full height at all drinking fountains. Refer to Elevations, Finish Plans, and Finish Details sheet for pattern, location and extent.	Installation: Framed around PWT1/2 Mosaic, Grout-Laticrete, color: Autumn Green Schluter Transitions: Wall-to-Floor: Schluter DILEX-AHK (See MTS-F5)		Rep: Jamie Alwang 860-807-3072

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
PWT4	Genrose	Tonalita, 4" x 12", Porcelain Wall Tile, 7.5mm thickness, Matte Finish.	Color: Petrol Blue	Full Ht and Width at Wet Wall in Adult Single Occupancy Restrooms; Used as PTB on other 3 walls single course.	Installation: Horizontal, Straight-Joint Grout - Laticrete, Color: Iron (97), Schluter Transitions: Wall-to-Floor: Schluter DILEX-AHK (See MTS-F5), Horizontal Termination: JOLLY (See MTS-W3)		Rep: Jamie Alwang 860-807-3072
WP- Wall Protection - Division 09 Section "Wall Protection"							
WP1	Koroseal	Traffic Patterns, Decorative Wall Protection, 4' W x 8' L .	Color: Digital Print of Timberline II, Color: Simply White.	Typical corridors and Vestibules - 4' high wainscot.	Installation: Sheet/Grain to Run Horizontally at 4' H; Installed with aluminum J-Trim at 4' Horizontal Termination, Divider Bars Beteween Sheets, and Inside/Outside Corner Trims as applicable.		Sarah Farrell 413.313.1346

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
WP2	Koroseal	Traffic Patterns, Decorative Wall Protection, 4' W x 8' L .	Color: Digital Print of Timberline II, Color: Maple.	Gross Motor Room - 4' high wainscot.	Installation: Sheet/Grain to Run Horizontally at 4' H; Installed with aluminum J-Trim at 4' Horizontal Termination, Divider Bars Beteween Sheets, and Inside/Outside Corner Trims as applicable.		Sarah Farrell 413.313.1346
WP3	CS Acrovyn	Rigid wall protection, .040" thickness, 4' x 8' sheets, butt jointed with color matched caulk with matching top Acrovyn Wainscot trim. Suede texture. PVC free	Color: Blue Veil (#1487)	Classroom Wing B - Corridor - Meal Cart Alcove	Applied Full Ht and Width on back wall and interior of wing walls. Refer to finish plans and interior elevations for extent.		
VWC- Vinyl Wallcovering - Division 09 Section "Wall Protection"							
VWC1	Koroseal	Inwood, Vinyl Wallcovering - 52"-54" W, Rolled Goods.	Color: Pearl (SG23-01)	Reception - Accent Wall	Refer to Interior Elevations; Installation: Straight Match; Level 4 Gypsum Finish required at all surfaces receiving VWC1 wallcovering. Clear cornerguards full ht at all exposed corners.		Sarah Farrell 413.313.1346

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
VWC2	AiNO	Playground (102538), Vinyl Wallcovering - 51" W, 12.75" V, 12.75" H Repeat, Type II, 20 oz, Class A Fire Rated, Rolled Goods.	Color: Splash (01-11)	Evaluation Room - 4'H Wainscot	Refer to Interior Elevations; Installation: Straight Match; Level 5 Gypsum Finish required at all surfaces receiving VWC2 wallcovering. CR2 Chair rail to be installed atop vertical termination. Clear cornerguards full ht at all exposed corners.		Tiina Martin 630.649.8077
CEILING							
ACT- Acoustic Ceiling Tile- Division 09 Section "Acoustical Panel Ceiling"							
ACT1	USG	Mars High- NRC/High CAC Acoustical Panels, Size: 24" x 24" x 7/8", with Fineline Bevel edge, Class A fire rating, 0.85 NRC & Minimum CAC of 35, with grid system Centricitee DXT	Color: White, Grid Color: White	General			Rep: Sandra K. Niesyn 860.490.5604
ACT2	USG	Clean Room ceiling USG Sheetrock brand lay in gypsum ceiling panels with ClimaPlus performance. 2' x 2' ceiling tile x 1/2" thick CAC 35. Square edge tile. Item 3260. 77 LR, with grid system DONN DXLA , 15/16" Square Edge.	Color: White	Kitchen			Rep: Sandra K. Niesyn 860.490.5604

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
ACC- Acoustic Ceiling Cloud - Division 09 Section "Acoustical Panel Ceiling"							
ACC1	Impact Acoustics	Forest, Acoustical Ceiling Clouds, 47.24" x 47.24", 0.90" Thickness, 100% PET, ASTM E-84 Fire Rated. Mounted with manufacturer recommended suspension system.	Color: Nordic Pine (311)	Main Street Corridor and Gross Motor Room	Installed to mimic tree canopy effect in both corridor and gross motor room. Install with L-Bracket and M6 bolts when MEP obstructs mounting location.		Alexis Pozzuto 215.932.2342
ACC2	Impact Acoustics	Forest, Acoustical Ceiling Clouds, 47.24" x 47.24", 0.90" Thickness, 100% PET, ASTM E-84 Fire Rated. Mounted with manufacturer recommended suspension system.	Color: Moss (439)	Main Street Corridor and Gross Motor Room	Installed to mimic tree canopy effect in both corridor and gross motor room. Install with L-Bracket and M6 bolts when MEP obstructs mounting location.		Alexis Pozzuto 215.932.2342
ACC3	Impact Acoustics	Round, Acoustical Ceiling Clouds, Custom Size, 4'-0" Diameter, 0.90" Thickness, 100% PET, ASTM E-84 Fire Rated. Mounted with manufacturer recommended suspension system.	Color: Moss (439)	Main Street Corridor and Gross Motor Room	Installed to mimic tree canopy effect in both corridor and gross motor room. Install with L-Bracket and M6 bolts when MEP obstructs mounting location.		Alexis Pozzuto 215.932.2342

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
ACC4	Impact Acoustics	Round, Acoustical Ceiling Clouds, Custom Size, 3'-0", 0.90" Thickness, 100% PET, ASTM E-84 Fire Rated. Mounted with manufacturer recommended suspension system.	Color: Moss (439)	Main Street Corridor and Gross Motor Room	Installed to mimic tree canopy effect in both corridor and gross motor room. Install with L-Bracket and M6 bolts when MEP obstructs mounting location.		Alexis Pozzuto 215.932.2342
ACC5	Impact Acoustics	Round, Acoustical Ceiling Clouds, Custom Size, 2'-4", 0.90" Thickness, 100% PET, ASTM E-84 Fire Rated. Mounted with manufacturer recommended suspension system.	Color: Nordic Pine (311)	Main Street Corridor and Gross Motor Room	Installed to mimic tree canopy effect in both corridor and gross motor room. Install with L-Bracket and M6 bolts when MEP obstructs mounting location.		Alexis Pozzuto 215.932.2342
ACC6	Impact Acoustics	Round, Acoustical Ceiling Clouds, Custom Size, 1'-4", 0.90" Thickness, 100% PET, ASTM E-84 Fire Rated. Mounted with manufacturer recommended suspension system.	Color: Moss (439)	Main Street Corridor and Gross Motor Room	Installed to mimic tree canopy effect in both corridor and gross motor room. Install with L-Bracket and M6 bolts when MEP obstructs mounting location.		Alexis Pozzuto 215.932.2342
ACP - Acoustical Ceiling Panels - Division 09 Section "Acoustical Panel Ceiling"							
ACP1	Impact Acoustics	Track, Ceiling Panel, Archisonic Riftcut (Printed), 47" x 110" Panel Size, 1.5" Thickness, 100% PET, ASTM E-84 Class A Fire Rated. NRC 0.6, ISO 0.65. Refer to RCPS for extent.	Color: Honey (244)	Main Lobby - Refer to RCPS for extent.	Suspended Installation, Refer to Architectural Spec.		Alexis Pozzuto 215.932.2342

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
EXP - Exposed Ceiling - Division 09 Section "Painting"							
EXP1	Sherwin Williams	Dryfall- Eggshell finish	Color: Dockside Blue	Above Tree - Exposed MEP Structure, Roof Deck	Low VOC		Andrew Stempel 781 556 2276
PGB - Painted Gypsum Board Ceiling - Division 09 Section "Painting"							
PGB1	Sherwin Williams	Pro Mar 200 HP Interior Acrylic - Flat finish - B30W02951	Color: Extra White (SW 7006) LRV 86	General	Low VOC		Andrew Stempel 781 556 2276
PGB2	Sherwin Williams	Pro Mar 200 HP Interior Acrylic - Flat finish - B30W02951	Color: Sunbeam Yellow (SW 0078) LRV 67	Cubby Alcoves Underside Main Street and Classroom Wing B, Classroom Canopies Classroom Wing A	Low VOC		Andrew Stempel 781 556 2276
PGB3	Sherwin Williams	Pro Mar 200 HP Interior Acrylic - Flat finish - B30W02951	Color: Dockside Blue (SW 7601) LRV 43	Ceiling and Soffit Interior by Tree (Corridor and Gross Motor), Cubby Alcoves Underside Classroom Wing A, Classroom Canopies Main Street and Classroom Wing B	Low VOC		Andrew Stempel 781 556 2276

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
MISCELLANEOUS							
RP1- Resin Panel - Division 06 "Interior Architectural Woodwork"							
RP1	3Form	Varia Resin Panel, 1/2" thick. Post mounted panels. Allowance Qty 2 - 4' x 8' panels	Style: Fray Color: Baltic	Reception Desk Accent	Refer to Mllwork Elevations for extent.		
PC - Privacy Curtain - Division 10 Section "Cubicles"							
PC1	Inpro	Privacy Curtain, Pattern: Mesmerize, Antimicrobial, Stain Resistant. 7'-0" length with Mesh Header.	Color: Delicate Track/Hook Style: Refer to Architectural Spec.	Nurse - CT1 on RCPS	Track and Hooks: Refer to Architectural Spec		
PL - Plastic Laminate - Division 06 Section "Interior Architecural Woodwork"							
PL1	Wilsonart	High Pressure laminate, 4' x 8' and 4' x 10' sheet sizes. .9mm thick. Horizontal grade. Edge banding to be 3mm thick PVC; radius corners.	Color: Mission Maple with Matching Edgeband	Typical Millwork - Wardrobe and Lower Cabinets (for two toned approach)			
PL2	Wilsonart	High Pressure laminate, 4' x 8' and 4' x 10' sheet sizes. .9mm thick. Horizontal grade. Edge banding to be 3mm thick PVC; radius corners.	Color: White Tigris with Matching Edgeband	Typical Millwork - horizontal countertops (locations without sinks)			
PL3	Wilsonart	High Pressure laminate, 4' x 8' and 4' x 10' sheet sizes. .9mm thick. Horizontal grade. Edge banding to be 3mm thick PVC; radius corners.	Color: Pepperdust with Matching Edgeband	Typical Millwork - Upper Cabinets (for two toned approach)			

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
RS- Roller Shades - Division 12 Section " Roller Window Shades"							
RS1	Draper	Manual Roller shades: SheerWeave SW2500, 1% Openess Factor, Micro-Perforated fabric. Clutch chain operated. With small wall headbox and standard hem bar with sealed end	Fascia Color: Ivory, Shade Cloth color: Beige/Pearl Grey	Typical Exterior Windows (ALL windows excluding main corridors)	With wall mounted cleat (typical)		Eric Guffey, Direct: 765.856.1300
SS- Solid Surface - Division 12 Section "Simulated Stone Countertops"							
SS1	Hanex	Solid Surface, 30" x 144" sheet size x (1/2") thickness with built-up bevel eased edge	Color: EP White	Window Sills	Refer to Millwork Drawings		
SS2	Formica	Solid Surface, 30" x 144" sheet size x (1/2") thickness with built-up bevel eased edge. With stainless steel undermount sink.	Color: Tumbled Glass (413)	Typical @ Millwork Countertops with Sinks & Nurse	Refer to Millwork Drawings		
SS3	Wilsonart	Solid Surface, 60" x 120" sheet size x (1/2") thickness with built-up bevel eased edge	Color: Cliffside Travertine, From manf. full range of colors including premium.	Reception Desk Countertop	Refer to Millwork Drawings		

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
WD - Wood - Division 06 Section "Interior Architecural Woodwork"							
WD1	TBD	Maple wood, stained to match architect's sample	Color: TBD	Bench Seat Surrounding Tree trunk			
WD2	Osborne Wood Products	1" Bead Wooden Decorative Flexible Tambour Panel (93" Length), Red Oak stained to match architect's sample	Color: TBD, stained to match architect's sample	Surround of Tree Trunk in Corridor and Gross Motor Room			
WF - Privacy Window Film - Division 08 Section "Openings"							
WF1	Solyx	Breeze, Privacy Window Film, 58" W Roll Width, Privacy Level 2.	Style: Breeze SGD-6009	Conference Rooms Interior Storefront	Installation: Self-Adhesive; Installed as band spanning center of storefront. Refer to interior elevations for extent.		
TS- Tackable Surface - Division 10 "Visual Display Surfaces"							
TS1	Forbo (AARCO)	Map Rail - Bulletin Board with Burlap Back Surface and Aluminum Frame. 1⁄4" VIC Cork Laminated to 1⁄4" High Density MDF Refer to elevations for sizes prior to ordering & installation.	Color: Brown Rice	Classrooms & OT/PT	Refer to Interior Elevations for Location and Size		
TS2	Forbo (AARCO)	Map Rail - Bulletin Board with Burlap Back Surface and Aluminum Frame. 1⁄4" VIC Cork Laminated to 1⁄4" High Density MDF Refer to elevations for sizes prior to ordering & installation.	Color: Brown Rice	Main Street Corridor	Refer to Interior Elevations for Location and Size		

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
RTS- Resilient Transition Strip - Division 09 "Resilient Wall Base and Accessories"							
RTS1	Tarkett	Resilient Wheel Traffic Transitional Mouldings; .080” (2 mm) to .080” (2 mm) material, 2-1/2" (6.35 cm) cap with 1-3/4" (4.45 cm) wide support base, wheel traffic design. 12' Rolled Goods. To be applied with Tarkett 946 Premium Contact Adhesive (Non-porous surfaces).	Style: CTA-(XX)-Y Color: Fawn (80)	Flooring Transition where HVT1 <--> SV7-10, Typical Classrooms, Self Contained Classrooms, Reception, Evaluation Room, Instructional Support, Break/Work Rooms, Data, Storage to Corridors and threshold to classroom closets.	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Gerry Grenon 603 395-4875
RTS2	Tarkett	Resilient Adaptor Mouldings, ADA Compliant;5/16″ (7.94mm) carpet to 1/16″ (1.57mm) to 1/8″ (3.18mm) resilient materials, 1-5/8″ (4.13cm) cap with 7/16″ (6.35mm) wide support, Anti-rock design for roller traffic.12' Rolled Goods. To be applied with Tarkett 946 Premium Contact Adhesive (Non-porous surfaces).	Style: CTA-(XX)-D Color: Fawn (80)	Flooring Transition where EM3 <--> HVT1 **OR** SV7-10, Outside Vestibules 1 & 3 at Main Corridor, Vestibule 1 to Main Office, and Main Corridor to Nurse; Refer to Finish Plans for flooring extents.	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Gerry Grenon 603 395-4875

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
RTS3	Tarkett	Resilient Wheel Traffic Transitional Mouldings; 1/4" (6.35 mm) to .080" (2.0 mm) material, 2-1/2" (6.35 cm) cap with 1-3/4" (4.45 cm) wide support base, wheel traffic design. 12' Rolled Goods. To be applied with Tarkett 946 Premium Contact Adhesive (Non-porous surfaces).	Style: CTA-(XX)-HT Color: Fawn (80)	Flooring Transition where CPT1 <--> SV7-10 **OR** HVT1, Guidance Office, Secretary's Office, Principal's Office to Main Office and Conference Rooms to Corridors; Refer to Finish Plans for locations and extents.	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Gerry Grenon 603 395-4875
RTS4	Tarkett	Resilient Wheel Traffic Transitional Mouldings; 1/8" (3.17 mm) to .080” (2 mm) material, 2-1/2” (6.35 cm) cap with 1-3/4" (4.45 cm) wide support base, wheel traffic design. 12' Rolled Goods. To be applied with Tarkett 946 Premium Contact Adhesive (Non-porous surfaces).	Style: CTA-(XX)-X Color: Fawn (80)	Flooring Transition where SV1-6 <--> SV7-10, Gross Motor, Sensory Rooms, and OT/PT to Corridors	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Gerry Grenon 603 395-4875
RTS5	Tarkett	Resilient Reducer Mouldings, ADA Compliant; .080˝ (2.03 mm) reducer with 1-1/8˝ (2.86 cm) taper, 3ft. (.91 m) lengths. To be applied with Tarkett 946 Premium Contact Adhesive (Non-porous surfaces).	Style: RRS-(XX)-B Color: Fawn (80)	Flooring Transition where Sealed Concrete (SC1) <--> SV7-10 **OR** HVT1, Mechanical Room to Corridor and Electrical Room to Break Room	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Gerry Grenon 603 395-4875

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
RTS6	Tarkett	Resilient Wheel Traffic Transitional Mouldings; 1/8" (3.17 mm) to 1/8" (3.17 mm) material, 2-1/2" (6.35 cm) cap with 1-3/4" (4.45 cm) wide support base, wheel traffic design. 12' Rolled Goods. To be applied with Tarkett 946 Premium Contact Adhesive (Non-porous surfaces).	Style: CTA-XX-N Color: Fawn (80)	Flooring Transition where SV1-6 <--> SV1-6 Gross Motor, OT/PT to Storage Room	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Gerry Grenon 603 395-4875
MTS-F- Metal Transition Strip (Floor and Cove) - Division 09 "Tiling"							
MTS-F1	Schluter	RENO-U, Edge Protection Profile for Abuting Tile to Lower Transitions; 5/32" (4mm) Leading Edge and 5/16"(8mm) Receiving Height . 8' 2-1/2" Length.	Style: EBU 80 Finish: Brushed Stainless Steel	Flooring Transition where HVT1 **OR** SV7-10 <--> PTF1/2 Typical Classrooms and Self Contained Classrooms and Children's Restrooms including Nurse	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872
MTS-F2	Schluter	RENO-U, Edge Protection Profile for Abuting Tile to Lower Transitions; 5/32" (4mm) Leading Edge and 3/8"(10mm) Receiving Height . 8' 2-1/2" Length.	Style: EBU100 Finish: Brushed Stainless Steel	Flooring Transition where HVT1 **OR** SV7-10 <--> PTF3 Typical Adult Restrooms to Corridors	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872

3.2 INTERIOR FINISHES PRODUCT LIST

PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
MTS-F3	Schluter	DILEX-AHK, Color-coated Coveshaped Aluminum Profile with 3/8" (10 mm) radius and 5/16" (8mm) Receiving Height. 8' 2-1/2" Length. To be installed with associated connectors, inner corners, outer corners, and end caps as necessary.	Style: AHK1S80TSBG Finish: Greige	Flooring/Wall Transition where CWT1/2 <--> PTF1/2 Typical Children's Restrooms, Typical Classrooms, and Self-Contained Classrooms	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872
MTS-F4	Schluter	DILEX-AHK, Color-coated Coveshaped Aluminum Profile with 3/8" (10 mm) radius and 3/8" (10mm) Receiving Height. 8' 2-1/2" Length. To be installed with associated connectors, inner corners, outer corners, and end caps as necessary.	Style: AHK1S100TSBG Finish: Greige	Flooring/Wall Transition where PWT4 <--> PTF3 Typical Adult Restrooms	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872
MTS-F5	Schluter	DILEX-AHKA, Color-coated Coveshaped Aluminum Profile with 3/8" (10 mm) radius and 3/8" (10mm) Receiving Height. 8' 2-1/2" Length. To be installed with associated connectors, inner corners, outer corners, and end caps as necessary.	Style: AHKA100TSI Finish: Ivory	Flooring/Wall Transition where PWT1-3 <--> SV7-10 Typical Water Fountains	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872
MTS-F6	Profilitec	Zerotec ZRN60, Stainless Steel Transition Trim with 8.5mm ramp length and 3/8" (10mm) and 1/4" (6mm) Receiving Heights. 8' 10" Length.	Style: ZRN60/100IL270 Finish: Stainless Steel (IL - Polished)	Flooring Transition where RES1 <--> PTF3 Kitchen/Servery to Adjoining Restroom	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Joe Rolston 732-503-0343

3.2 INTERIOR FINISHES PRODUCT LIST							
PRODUCT CODE	MANF.	PRODUCT DESCRIPTION	COLOR	TYPICAL LOCATION	NOTES/ SUSTAINABLE ATTRIBUTES	REV. DATE	MANF. CONTACT INFORMATION
MTS-F7	Profilitec	Zerotec ZLT25, Anodized Aluminum Transition Trim with 22mm total ramp length and 3/32" (2.5mm) and 1/4" (6mm) Receiving Heights. 8' 10" Length.	Style: ZLT25/60ASF270 Finish: Aluminum (AS- Silver)	Flooring Transition where RES1 <--> SV1-6 **OR** SV7-10 Kitchen/Servery to Gross Motor Room **OR** Adjacent Corridor	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Joe Rolston 732-503-0343
MTS-W- Metal Transition Strip (Wall) - Division 09 "Tiling"							
MTS-W1	Schluter	Jolly Edge Trim, Color Coated Aluminum Edge Trim with 5/16" (8mm) Receiving Height. 8' 2-1/2" Length. To be installed with associated connectors and outer corner pieces as necessary.	Style: J80TSBG Finish: Greige	Vertical and Horizontal Wall Tile Terminations for CWT1-5 where tile spans to floor. Typical Classrooms, Self Contained Classrooms, and Children's Restrooms (Including Nurse)	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872
MTS-W2	Schluter	Jolly Edge Trim, Color Coated Aluminum Edge Trim with 1/4" (6mm) Receiving Height. 8' 2-1/2" Length. To be installed with associated connectors and outer corner pieces as necessary.	Style: J60TSBG Finish: Greige	Vertical Wall Tile Terminations for CWT4 where tile terminates to align with upper cabinets.	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0872
MTS-W3	Schluter	Jolly Edge Trim, Color Coated Aluminum Edge Trim with 3/8" (10mm) Receiving Height. 8' 2-1/2" Length. To be installed with associated connectors and outer corner pieces as necessary.	Style: J100TSBG Finish: Greige	Horizontal Wall Tile Terminations for PWT4 where tile acts as wall base. Typical Adult Restrooms (Non-Wet Walls)	Subcontractor to review transition selection for compatibility; Substitutions to be reviewed by architect.		Rep: Joey Sonntag 413 768 0873

3.5 REVISIONS

A. This section has been revised as follows:
Rev. No. Date Revision

END OF SECTION

SECTION 090561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:

1. Resilient flooring.
2. Carpet tile.
3. Thin-set tile.
4. Other adhesively applied flooring.

B. Smoothing compound, leveling compound, and patching compound.

C. Preparation of concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Adhesive bond testing.

F. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

1. Perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

G. Patching compound.

H. Remedial floor coatings.

1.3 RELATED REQUIREMENTS

A. Section 024119 - Selective Demolition : Removal of existing floor finishes on concrete slabs to be refinished.

B. Section 033000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.4 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens).

B. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

C. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete.

D. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

E. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application.

F. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

G. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

H. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

I. ASTM F2873 - Standard Practice for the Installation of Self-Leveling Underlayment and the Preparation of Surface to Receive Resilient Flooring.

J. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Smoothing Compound, Leveling Compound, Patching Compound, Adhesive, and Floor Covering Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer’s required substrate surface absorption/porosity test methods.
3. Manufacturer’s required concrete surface profile (CSP).
4. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

1. Manufacturer's qualification statement.

2. Certificate: Manufacturer's certification of compatibility with types of flooring and adhesive applied over remedial product.
3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
4. Manufacturer's installation instructions.
5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

D. Testing Agency's Report:
1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect.
8. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

F. Floor Moisture Testing Technician Certificate: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician- Grade I certificate.

G. Copy of RFCI (RWP).

1.7 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

E. Floor Moisture Testing Technician Qualifications: International Concrete Repair Institute (ICRI) Concrete Slab Moisture Testing Technician Certification- Grade I.

F. Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.9 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

1.10 WARRANTY

A. Provide manufacturer's warranty covering flooring delamination failures for 10 years minimum.

1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.1 MATERIALS

A. Self-Leveling Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Type: Cementitious moisture-, mildew-, and alkali-resistant.

2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.

3. Compressive Strength: Minimum 3000 psi after 28 days, tested per ASTM C109/C109M.

B. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Type: Cementitious moisture-, mildew-, and alkali-resistant compound and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
4. Acceptable Manufacturers:
    a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
    b. TEC Specialty Products LLC; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
    c. LATICRETE International, Inc; SKIM LITE: www.laticrete.com/#sle.
    d. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
    e. Schonox HPS North America; Schonox SL Moisture Resistant Floor Patch and Skim Coat.
    f. Sika; Level SkimCoat.
    g. Mapei.
    h. Substitutions: See Section 016000 - Product Requirements.

C. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

D. Remedial Floor Coating, Two-Component: Single-layer coating resistant to water vapor transmission meeting flooring manufacturer's emission limits, resistant to alkalinity (pH) level found, and suitable for flooring adhesion without further treatment.
1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
2. Use product recommended by flooring manufacturer. In the absence of a recommendation from flooring manufacturer, use testing agency recommendation. In the absence of testing agnency recommendation, use one of the following systems.
3. Acceptable Products:
    a. Allied Construction Technologies, Inc; AC Tech 2170 FC: www.actechperforms.com/#sle.
    b. ARDEX Engineered Cements; ARDEX MC RAPID: www.ardexamericas.com/#sle.
    c. Floor Seal Technology, Inc; MES 100: www.floorseal.com/#sle.
    d. ISE Logik Industries; MVEC 710 with MVBP 600.

e. LATICRETE International, Inc; LATICRETE VAPOR BAN E: www.laticrete.com/#sle.

f. Sika Corporation; Sikafloor Moisture Tolerance Epoxy Primer: www.sikafloorusa.com/#sle.

g. USG Corporation; Durock CoverPrep: www.usg.com/#sle.

h. UZIN UTZ NORTH AMERICA, INC; UZIN PE 460 with UZIN PE 280: https://us.uzin.com/#sle.

i. Substitutions: See Section 016000 - Product Requirements.

E. Remedial Colloidal Silica Floor Treatment: Clear, penetrating floor treatment intended by its manufacturer to vapor-proof concrete slabs by closing capillary system of concrete, and eliminating route of moisture vapor emission while preserving mechanical key for adhesive bonding.

1. Acceptable Products:

a. Spray-Lock Concrete Protection; SCP 327: www.concreteprotection.com.

b. Substitutions: See Section 016000 - Product Requirements.

F. Water Vapor Emission Controlling Curing Compound: Single-component curing compound for preventative water vapor emission control for newly placed concrete.

1. Coordinate with curing requirements specified in 033000 - Cast-in-Place Concrete.
2. Comply with ASTM C309 and ASTM C1315, Type I Class A or C.
3. Acceptable Products:

a. Creteseal Concrete Waterproofing Products, Inc.; Creteseal 2000: www.creteseal.com.

b. Floor Seal Technology, Inc.; VaporSeal 309 System: www.floorseal.com.

c. SINAK Corporation; VC5: www.sinak.com.

d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:

1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:

a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.

b. Removal of existing floor covering.

2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:

a. Remove existing coatings and curing agents from surface according to recommendations of remedial coating manufacturer.

b. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.

3. Preliminary cleaning.

4. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.

5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.

6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.

7. Substrate surface porosity tests.

8. Specified remediation, if required.

9. Patching, smoothing, and leveling, as required.

10. Other preparation specified.

11. Adhesive bond and compatibility test.

12. Protection.

B. Remediations:

1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.

2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.4 MOISTURE VAPOR EMISSION TESTING

A. Not required for concrete floor slabs containing moisture vapor reduction admixture.

B. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

C. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

D. For concrete floor slabs without moisture vapor reduction admixture, test in accordance with ASTM F1869 and as follows.

E. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

F. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

G. Report: Report the information required by the test method.

3.5 INTERNAL RELATIVE HUMIDITY TESTING

A. Not required for concrete floor slabs containing moisture vapor reduction admixture.

B. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

C. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

D. For concrete floor slabs without moisture vapor reduction admixture, test in accordance with ASTM F2170 Procedure A and as follows.

1. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.6 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.7 SUBSTRATE SURFACE ABSORPTION (POROSITY) TESTING

A. Test in accordance with ASTM F710 and F3191.

B. Follow the appropriate installation instructions for the substrate surface porosity conditions. If the selected material is not compatible with the substrate surface profile, select a different material compatible with substrate surface porosity conditions and flooring material.

C. Report the information required by the test method.

3.8 PREPARATION

A. Prepare concrete substrate surfaces in accordance with ASTM F710.

B. See individual floor covering section(s) for additional requirements.

C. Comply with requirements and recommendations of floor covering manufacturer.

D. Verify appropriate concrete surface profile (CSP) is present for material to be installed.

E. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

F. Do not fill expansion joints, isolation joints, or other moving joints.

3.9 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

B. In the absence of adhesive and flooring manufacturer’s written instructions, test in accordance with ASTM F3311.

C. Report the results of the adhesive bond and compatibility tests and note any concerns over adhesion.

3.10 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of manufacturer.

B. Curing compounds and membrane forming products are usually considered unacceptable by flooring and adhesive manufacturers. If such materials are used, either obtain the approval of the flooring and adhesive manufacturers prior to use.

3.11 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.3 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Exterior wall stud framing.

B. Section 061000 - Rough Carpentry: Wood blocking within stud framing.

C. Section 092900 - Gypsum Board: Execution requirements for anchors for attaching work of this section.

1.4 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.

B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A413/A413M - Standard Specification for Carbon Steel Chain.

E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

F. ASTM A645/A645M - Standard Specification for Pressure Vessel Plates, 5 % and 51 2 % Nickel Alloy Steels, Specially Heat Treated.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

H. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

K. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.

L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

N. ASTM E413 - Classification for Rating Sound Insulation.

O. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

D. Evaluation Reports: Submit evaluation reports for framing, tracks, anchors, and fasteners from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

B. Manufacturer Qualifications: Comply with one of the following:

1. Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.
2. Member of Supreme Steel Framing System Association (SSFSA): www.ssfsa.com/#sle.

C. Code-Compliance Certification of Studs and Tracks: Provide framing members certified in accordance with the product-certification program of the the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202 "Code of Standard Practice."

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:

1. CEMCO: www.cemcosteel.com/#sle.
2. ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
3. Jaimes Industries: www.jaimesind.com/#sle.
4. Marino: www.marinoware.com/#sle.
5. MBA Building Supplies, Inc.: www.mbastuds.com.
6. MRI Steel Framing LLC: www.mristeelframing.com.
7. State Building Products, Inc.: http://www.statebp.com.
8. Steel Construction Systems: www.steelconsystems.com/#sle.
9. The Steel Network, Inc: www.SteelNetwork.com/#sle.
10. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Design Requirements: Design metal framing to comply with performance requirements, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.

1. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members" and ASTM A645/A645M, Section 10.

B. Performance Requirements:

1. Interior Suspended Gypsum Board Ceilings, Soffits, and Bulkheads: Design and install to provide deflection of not more than L/360 of distance between supports.
2. Interior Metal Stud/Gypsum Board Assemblies: Design and install to withstand lateral loading (air pressure) of 5 psf with deflection limit not more than L/240 of partition height.
3. Interior Metal Stud/Gypsum Board Assemblies at Locations with Ceramic Tile or Other Hard Surface Finishes: Design and install to withstand lateral loading (air pressure) of 5 psf with deflection limit not more than L/360 of partition height.
4. Where documents indicate a stud size, size shall be considered minimum. Increase gage to meet minimum performance requirements.
5. Accommodate building structure deflections in connections to structure.

C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E90 and classified according to ASTM A413/A413M by an independent testing agency.

2.3 FRAMING MATERIALS

A. Fire Rated Assemblies: Comply with applicable code and tested according to ASTM E 119 and as scheduled in Drawings.

B. Loadbearing Studs: As specified in Section 054000.

C. Non-Loadbearing Framing System Components: ASTM C645, galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated.

1. Protective Coating: ASTM A653/A653M, G40, (Z120); or coating with equivalent corrosion resistance, hot-dip galvanized unless otherwise indicated.

a. Galvannealed products are unacceptable.

2. Studs: C shaped with flat or formed webs.

a. Minimum Base-Steel Thickness: 0.033 inch (20-gage drywall) unless otherwise indicated.

b. Minimum Base-Steel Thickness at Wall Tile: 0.033 inch.

c. Minimum Base-Steel Thickness at Opening Jambs: 0.033 inch.

3. Runners: U-shaped, sized to match studs.

a. Minimum Base-Steel Thickness: Same as studs.

4. Equivalent Gauge Studs and Runners:

a. High strength, roll-formed and embossed with surface deformations to stiffen the framing members so they are structurally comparable to conventional ASTM C645 steel studs and tracks.

b. Minimum Base Steel Thickness: 0.0181 inch (20 EQ).

c. Prohibited Locations: High-strength (EQ) studs may not be used at the following locations:

1) Walls at vestibules or other areas expected to be exposed to wind loads greater than 5 psf.

2) Walls to receive cement backer board, wall tile or other inflexible finishes.

3) Walls to receive abuse resistant or impact resistant gypsum board.

4) Walls used to support countertop construction, casework, audio/visual equipment, or other similar elements.

5) Walls greater than 15 feet in height.

5. Ceiling Carrying Channels: C shaped (Main Runners).

a. Minimum Base-Steel Thickness: 0.053 inch.

b. Minimum Depth: 1-1/2 inches.

c. Minimum flange width: 1/2 inch.

6. Ceiling Furring Channels (Furring Members):

a. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

b. Steel Studs and Runners: 0.0296-inch minimum base-steel thickness.

c. Equivalent Gauge Studs and Runners: 0.0181 inch (20 EQ) minimum base-steel thickness.

d. Hat-Shaped, Rigid Furring Channels: 0.0296-inch minimum base-steel thickness, 7/8-inch deep.

7. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

a. Minimum Base-Steel Thickness: 0.0296 inch.

8. Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum uncoated-steel thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

D. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung, non-rated system unless otherwise rnoted, composed of main beams and cross-furring members that interlock.

1. Where fire-rated grid system may be required by authorities having jurisdiction provide hanger wire suspension 8-inches off fire breaks in accordance with system manufacturer's written guidelines.

E. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

F. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

G. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

H. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code when evaluated in accordance with AISI S100.

2. Material: ASTM A653/A653M steel sheet, SS Grade 50.

3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

I. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

1. Products:

a. ClarkDietrich; BlazeFrame Firestop Deflection Track: www.clarkdietrich.com/#sle.

b. Fire Trak Corp.; Fire Trak System.

c. Metal-Lite, Inc; The System.

d. Slip Trak Systems; SLP-TRK.

e. Steel Network, Inc. (The); VertiTrack Series.

f. Substitutions: See Section 016000 - Product Requirements.

J. Preformed Top Track Firestop Seal:

1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

2. Products:

a. Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com/#sle.

b. Specified Technologies Inc; SpeedFlex TTG Track Top Gasket: www.stfirestop.com/#sle.

c. Substitutions: See Section 016000 - Product Requirements.

K. Non-Loadbearing Framing Accessories:

1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.

a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.

b. Products:

1) ClarkDietrich; Pony Wall (PW): www.clarkdietrich.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

3. Bracing and Bridging: ASTM A653/A653M G90 galvanized steel; for lateral bracing of wall studs with slots for engaging on-module studs.

4. Framing Connectors: ASTM A653/A653M steel clips; secures cold rolled channel to wall studs for lateral bracing.

5. Flexible Wood Backing: Fire-retardant-treated wood with sheet steel connectors.

a. Products:

1) ClarkDietrich; Danback: www.clarkdietrich.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

6. Sheet Metal Backing: 0.0538 inch thick, galvanized.

7. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

8. Fasteners: ASTM C1002 self-piercing self-tapping screws.

9. Anchorage Devices: Powder actuated.

10. Touch-Up Primer for Corrosion Protected Surfaces: SSPC-Paint 20 Type I - Inorganic.

L. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.

1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2. Tape Thickness: 1/4 inch.

3. Products:

a. Armacell LLC; ArmaComfort MTD: www.armacell.us/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

M. Acoustic Insulation and Sealant: As specified in Section 092900 - Gypsum Board.

N. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.4 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

C. Examine areas and substrates for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

3.3 INSTALLATION OF STUD FRAMING

A. Install non-structural members in accordance with ASTM C754.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install bracing at terminations in assemblies.

1. For interior non-load bearing walls indicated to terminate above suspended ceilings provide 20-gauge stud diagonal bracing of walls at door openings, corner wall intersections and at maximum 10’-0” intervals to structural supports or substrates above. Otherwise extend framing full height to structural supports or substrates above suspended ceilings.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

E. Extend partition framing to structure where indicated and to ceiling in other locations.

F. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

G. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

H. Align and secure top and bottom runners at 24 inches on center unless otherwise indicated.

I. At partitions indicated with an acoustic rating:

1. Install acoustic insulation, sealants, and accessories as described in 092900 - Gypsum Board.

2. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.

3. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

J. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

1. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

K. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

L. Install studs vertically at spacing indicated on drawings unless otherwise required to meet performance requirements.

M. Install studs so flanges within framing system point in same direction.

N. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

O. Align stud web openings horizontally.

P. Secure studs to tracks using crimping method. Do not weld.

Q. Stud splicing is not permissible.

R. Fabricate corners using a minimum of three studs.

S. Install double studs at wall openings, door and window jambs, not more than 2 inches from each side of openings.

1. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

T. Brace stud framing system rigid.

U. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.

V. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

W. Furring: Coordinate with sound isolation clip spacing and locations. Lap splices a minimum of 6 inches.

X. Use backing/blocking for reinforcement of the following:

1. Framed openings.
2. Wall mounted cabinets.
3. Plumbing fixtures.
4. Toilet accessories.
5. Wall mounted door hardware.
6. Wall mounted televisions or other equipment.

3.4 CEILING AND SOFFIT FRAMING

A. Contractor’s Option: At the Contractor’s option suspended ceiling systems may be either suspended steel framing system or grid suspension system.

B. Comply with requirements of ASTM C754.

C. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

D. Install furring independent of walls, columns, and above-ceiling work.

E. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated.

1. Hanger spacing not to exceed 48 inches on center.

F. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to steel roof deck.

5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

G. Space main carrying channels at maximum 48 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.

H. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

I. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

J. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.

K. Laterally brace suspension system.

L. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

M. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

N. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

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SECTION 092900 - GYPSUM BOARD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Cementitious backing board.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.3 RELATED REQUIREMENTS

A. Section 061600 - Sheathing: Exterior wall sheathing.

B. Section 078400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.

C. Section 092216 - Non-Structural Metal Framing.

1.4 REFERENCE STANDARDS

A. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.

B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

F. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

J. ASTM C1193 - Standard Guide for Use of Joint Sealants.

K. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board.

M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

O. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

Q. ASTM E413 - Classification for Rating Sound Insulation.

R. GA-216 - Application and Finishing of Gypsum Panel Products.

S. GA-226 - Application of Gypsum Board to Form Curved Surfaces.

T. UL (FRD) - Fire Resistance Directory.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Install service utilities in an orderly and expeditious manner.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on gypsum board, accessories, joint finishing system, and acoustic insulation and sealants.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

C. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

D. Protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with requirements of ASTM C840 or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. American Gypsum Company: www.americangypsum.com.
2. CertainTeed Corporation: www.certainteed.com.
3. Georgia-Pacific Gypsum: www.gpgypsum.com.
4. National Gypsum Company: www.nationalgypsum.com.
5. USG Corporation: www.usg.com.
6. Substitutions: See Section 016000 - Product Requirements.

2.2 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC as indicated in Drawings calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. NFPA Assemblies: Provide completed exterior assemblies tested in accordance with NFPA 285 where indicated.

D. Fire Rated Assemblies: Provide completed assemblies tested according to ASTM E 119 and as scheduled in Drawings.

1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.3 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board unless otherwise required below.
    a. Glass mat faced gypsum panels are required for all pre-rock applications and gypsum installation prior to building being enclosed.
3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
    b. Mold resistant board is required in areas subject to wetting, steam, or high humidity.
4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
5. At Above Grade Assemblies Indicated to Comply with NFPA 285: Use Type X board for interior drywall.
6. Thickness:
    a. Vertical Surfaces: 5/8 inch.
    b. Ceilings: 5/8 inch, unless otherwise noted.
    c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
7. Mold-Resistant, Paper-Faced Products:
    a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
    b. American Gypsum Company; M-Bloc Type C: www.americangypsum.com/#sle.
    c. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
    d. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.

e. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond EVOLVE XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.

f. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.

g. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.

h. USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels 5/8 in. (15.9 mm): www.usg.com/#sle.

i. Substitutions: See Section 016000 - Product Requirements.

B. Tile Backing Board:

1. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.

2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.

a. Thickness: 1/2 inch.

b. Products:

1) Custom Building Products; Wonderboard Lite: www.custombuildingproducts.com.

2) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.

3) USG Corporation; DUROCK: www.usg.com/#sle..

4) Substitutions: See Section 016000 - Product Requirements.

2.4 GYPSUM BOARD ACCESSORIES

A. Sound Attenuation Insulation: ASTM C665; mineral fiber or glass fiber batt, friction fit type, unfaced.

1. Thickness: As indicated on Drawings, minimum 2 inches.

2. Fire-Rated Assemblies: Use insulation type required by indicated tested assembly.

B. Sound Isolation Tape: Elastomeric foam tape for sound decoupling.

1. Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2. Tape Thickness: 1/4 inch.

C. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

1. Products:

a. Franklin International, Inc; Titebond Acoustical Smoke & Sound Sealant: www.titebond.com/#sle.

b. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com/#sle.

c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.

d. Pecora Corporation; AC-20 FTR.

e. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.

f. Grabber Construction Products; Acoustical Sealant GSC.

g. Accumetric LLC; BOSS 826 Acoustical Sound Sealant.

h. USG Corporation; SHEETROCK Acoustical Sealant.

i. Substitutions: See Section 016000 - Product Requirements.

2. Color of exposed acoustical joint sealants: Match adjacent surface.

D. Acoustical Outlet Box Pads:

1. Minimum thickness - 1/8 inch.
2. Adhesion - adheres readily to metal or plastic.
3. Service temperature - 30 degrees to 200 degrees F.
4. Shall contain no asbestos.
5. Minimum shelf life - 1 year.
6. Non Fire-Rated Products:

a. Lowry's Outlet Box Pads as manufactured by Harry A. Lowry & Associates, Inc., Sun Valley, CA.

b. Sound Pad #68 as manufactured by L.H. Dottie Co., City of Commerce, CA.

7. Fire-Rated Products:

a. Flamesafe FSP 1077 Putty Pads as manufactured by W.R. Grace & Co., Hartfield, PA.

b. Putty Pads as manufactured by Specified Technologies Inc., Somerville, NJ.

c. Hilti CP617 Putty Pads as manufactured by Hilti, Tulsa, OK.

d. 3M Fire Barrier Moldable Putty Pads type MPP-X to fit box size as manufactured by 3M, St. Paul, MN.

e. Metacaulk ® Putty Pads as manufactured by RectorSeal, Houston, TX.

E. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, rigid plastic, or composite, unless noted otherwise.

1. Types: As detailed or required for finished appearance.

2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead, L-bead, LC-bead, and Casing Bead at exposed panel edges.
3. Acceptable Products:
    a. Same manufacturer as framing materials.
    b. ClarkDietrich (Finishing Accessories) www.clarkdietrich.com
    c. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
    d. Stockton Products: www.stocktonproducts.com/#sle.
    e. Trim-tex, Inc: www.trim-tex.com/#sle.
    f. Substitutions: See Section 016000 - Product Requirements.

F. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and cornersexterior and glass-mat gypsum.
2. Tape: 2 inch wide, creased paper tape for joints and cornersfor interior gypsum board.
3. Tape for Tile Backing Panels: As recommended by panel manufacturer.
4. Joint Compound: Drying type, vinyl-based, ready-mixed.

G. Finishing Compound: Surface coat and primer, takes the place of skim coating.

H. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

I. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

J. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

K. Screws for Fastening of Gypsum Panel Products to Wood Framing or Blocking: Type W screws, corrosion resistant. Nails not permitted.

L. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

M. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

N. Adhesive for Attachment to Metal:
1. Products:
    a. Franklin International, Inc; Titebond Drywall Construction Adhesive: www.titebond.com/#sle.
    b. Liquid Nails, a brand of PPG Architectural Coatings: www.liquidnails.com/#sle.

c. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ACOUSTIC ACCESSORIES INSTALLATION

A. General: Limit installation of outlet boxes and other penetrations to one penetration per stud bay. Seal all penetrations and gaps with acoustic sealant, outlet box pads, or other acoustic shielding materials as approved by Architect in accordance with manufacturer's written instructions and tested assembly instructions.

B. Preparation for acoustic sealant:

1. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

2. Joint Priming: Prime joint substrates where recommended by acoustical-joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

C. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

D. Sound Isolation Tape: Apply to vertical studs and top and bottom tracks/runners in accordance with manufacturer's instructions.

E. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

F. Acoustic Sealant: Install as follows:

1. Comply with ASTM C919, ASTM C1193, and manufacturer's written recommendations for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

2. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3. Place one bead continuously on substrate before installation of perimeter framing members.
4. Place continuous bead at perimeter of each layer of gypsum board.
5. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

G. Acoustical Outlet Box Pads: Install as follows within acoustic partitions:
1. Remove any water, excess dust, dirt and oil from the surfaces.
2. Comply with manufacturer's written instructions and UL requirements.
3. Ensure the entire surface is covered. Seal around conduit where it connects to outlet box using manufacturer's recommended materials.

3.3 BOARD INSTALLATION

A. Comply with ASTM C840 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

C. Form control and expansion joints with space between edges of adjoining gypsum panels.

D. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

E. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

F. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

G. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

H. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

I. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108/A118/A136.1 and manufacturer's instructions.

J. Installation on Metal Framing: Use screws for attachment of gypsum board.

K. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around and through assemblies, including sealing partitions above acoustical ceilings.

L. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
   2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.5 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish, walls to receive wallcoverings, and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish, unless otherwise indicated.
   3. Level 3: Walls to receive textured wall finish.
   4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   6. Level 0: Temporary partitions.
   7. Level 0: Surfaces indicated to be finished in later stage of project.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.6 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.7 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

B. Repair damage from construction operations.

END OF SECTION

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SECTION 093000 - TILING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Non-ceramic trim.

D. Accessories, setting, and grouting materials.

1.3 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 090561 - Common Work Results For Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

C. Section 092900 - Gypsum Board: Tile backer board.

1.4 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).

B. ASTM C627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.

C. ASTM F2873 - Standard Practice for the Installation of Self-Leveling Underlayment and the Preparation of Surface to Receive Resilient Flooring.

D. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation.

E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.

1.5 DEFINITIONS

A. DCOF: Dynamic Coefficient of Friction.

B. Module Size: Actual tile size, with minor facial dimension as measured by ASTM C499, plus joint width indicated.

C. Facial Dimension: Actual tile size, with minor facial dimension as measured by ASTM C499.

D. Large Format Tile: Any tile unit that maintains an edge of 15 inches or greater in any dimension.

E. Slip-Resistant: Installed flooring surface which has a wet coeffecient of friction of 0.42, minimum, as measured according to ANSI 323.3 (BOT-3000E DCOF AcuTest).

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate location of tiling movement joints on concrete floor substrates with locations of concrete floor expansion and control joints; align substrate joints and tiling system joints where required by specified reference standards.

B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this Section; require attendance by all affected installers.

1. Review installation procedures and coordination requirements.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Verification Samples:

1. Full-sized units of each type and composition of tile and for each color and finish specified. For ceramic mosaic tile in color blend patterns, provide one full sheet of each specified color blend.

2. Full-sized units of each type of trim and accessory for each color and finish specified.

3. Grout color samples for each type and color specified.

D. Concrete Sub-floor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Installer's Qualification Statement:

1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation; www.tile-assn.com/#sle

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Tile: 5 percent of each size, color, and surface finish combination.

1.8 QUALITY ASSURANCE

A. Maintain one copy of ANSI A108/A118/A136, TCNA (HB), and TCNA (HB-GP) on-site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications:

1. Company specializing in performing tile installation, with minimum of five years of documented experience.

a. Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA).

D. Provide materials obtained from only one manufacturer for each type and color of tile, and for each type of mortar, grout, adhesive, and sealant.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 FIELD CONDITIONS

A. Comply with referenced standards and manufacturer's recommendations for protection and maintenance of environmental conditions during and after installation.

B. Do not install solvent-based products in an unventilated environment.

C. Maintain ambient and substrate temperature of 50 degrees F during installation, and for at least seven days after installation. Maintain higher temperatures for proprietary mortars and grouts when recommended by manufacturer.

D. Vent temporary heaters to the exterior to prevent damage to tile work due to carbon dioxide accumulation.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace materials that fail within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of 2 years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all tile and trim types listed in this section.
2. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Wet Dynamic Coefficient of Friction (DCOF): For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM A 137.1-2012 Section 9.6.1:

1. For materials installed on walkway surfaces, provide products with the following values as determined by testing identical products per ANSI B101.3-2012:

a. Level (Horizontal) Surface: DCOF of 0.42 or greater, wet.

b. Ramp Surfaces: Minimum, wet DCOF of 0.51 or greater, wet.

B. Break Strength: ASTM C 648.

1. Wall Tiles: 90 lbf.
2. Floor Tiles: 250 lbf.

C. Bond Strength: ASTM C 482; 50 psi minimum.

2.3 TILING MATERIALS

A. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

B. Ceramic Tile: ANSI A137.1, standard grade.

1. Color(s): As indicated.

C. Porcelain Tile: ANSI A137.1, standard grade.

1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Color(s): As indicated.

2.4 TRIM AND ACCESSORIES

A. Metal Trim: Type and finish as scheduled, style and dimensions as indicated on drawings, for setting using tile mortar or adhesive. Provide trim height to match tile and setting bed thickness.

B. Accessible Thresholds and Transitions: Provide transitions between tile surfaces and adjoining finished floor surfaces. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining floor surfaces, with transition edges beveled on a slope not exceeding 1:2.

2.5 SETTING MATERIALS

A. Modified Dry Set Cement Mortar Bond Coat: ANSI A118.4 and ANSI A118.11.

1. Applications: Use this type of bond coat where no other type of bond coat is indicated.
2. Products:

a. ARDEX Engineered Cements; X 3+: www.ardexamericas.com/#sle.

b. LATICRETE International, Inc; 4-XLT: www.laticrete.com/#sle.

c. Mapei Corporation; Keraflex Plus: www.mapei.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2.6 GROUTS

A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.

1. Applications: Use this type of grout where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Color(s): As indicated on drawings.
4. Acceptable Products:

a. ARDEX Engineered Cements; ARDEX FL (Sanded) or FGC (Unsanded): www.ardexamericas.com/#sle.

b. LATICRETE International, Inc.; LATICRETE PermaColor: www.laticrete.com.

c. Mapei Corporation; Ultracolor Plus FA: www.mapei.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2.7 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation and Waterproofing Membrane: Material complying with ANSI A118.10 and ANSI A118.12; intended as waterproofin, suitable for installation over green and existing concrete:

1. Crack Resistance: No failure at 1/16 inch gap, minimum.
2. Water Resistance: Passes.

3. Fluid or Trowel Applied Type:

a. Material: Synthetic rubber or Acrylic.

b. Thickness: 40 mils, maximum.

c. Products:

1) ARDEX; S1-K: www.ardex.com/.

2) LATICRETE International, Inc; HYDRO BAN 1: www.laticrete.com/#sle.

3) Mapei Corporation; Mapelastic AquaDefense: www.mapei.com/#sle.

4) Substitutions: See Section 016000 - Product Requirements.

B. Self-leveling Underlayment: Flowable, pre-formulated, water-mixed latex-Portland cement-based material; self-leveling to provide flat, level surface on tiling substrates, and meeting the requirements of ASTM C627.

1. Applications: On concrete substrates.

2. Acceptable Manufacturers:

a. ARDEX; TL1000.

b. LATICRETE International, Inc.; 86 Latilevel Thin Pour: www.laticrete.com.

c. Mapei Corporation; Novoplan 2 Plus with Primer T: www.mapei.com/.

d. Substitutions: See Section 016000 - Product Requirements.

C. Backing Board: Specified in Section 092900 - Gypsum Board.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

1. Large Format Tile Installations Greater than 500 Square Feet: When specified tile is 24 by 24 inches or larger, or when planks exceed 30 inches in the long dimension, install 1/4 inch application of self-leveling underlayment under the entire installation.

2. At all other tile installations, Tile contractor shall be responsible for floor prep up to 25% of the total area to be tiled at an average of 1/8 inch thickness, using pourable or trowelable materials supplied by the setting system manufacturer.

B. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Under Thinset Tile: F(F) of 35; F(L) of 25.

C. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

D. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

E. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 090561.
2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
3. Follow moisture and alkalinity remediation procedures in Section 090561.

F. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Prepare floor substrates for installation of flooring in accordance with Section 090561.

D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Blending: For tile exhibiting color or pattern variations within the ranges of accepted submittals, verify that tile has been blended so that tile units taken from one package show same range in colors or patterns as those taken from other packages.

C. Floor System Coverage: Where specified for individual setting methods, install floor tile units with 95 percent mortar coverage, minimum, by complying with applicable special requirements for back buttering of tile units in referenced ANSI A108 specifications.

D. Wall System Coverage: Where specified for individual setting methods, install wall tile units with 95 percent mortar coverage, minimum, by complying with applicable special requirements for back buttering of tile units in referenced ANSI A108 specifications.

E. Install crack isolation membrane to comply with ANSI A118.10 and membrane manufacturer's written instructions for full floor coverage.

F. Movement Joints: Comply with TCNA (HB) Method EJ171F requirements for locations, spacing, and installation of applicable movement joints, whether or not specifically indicated or detailed on Drawings, and as follows:

1. Field Joint Spacing - Interior: Maximum 24 feet on center in each direction; reduce spacing to maximum 10 feet on center in areas exposed to direct sunlight or moisture.

2. Field Joint Spacing - Exterior and Above-Ground Concrete Slabs: Maximum 12 feet on center in each direction.
3. Joint Width: Match adjacent grouted joint widths, unless TCNA EJ171 requires a specific joint width based on joint location or joint service conditions.
4. Apply sealant joint to junction of tile and dissimilar materials and junction of dissimilar planes, including but not limited to floor to wall joints, corners, and metal trim and non-ceramic accessory items.
5. Keep movement joints free of setting adhesive and grout.
6. Where metal trims are not specified, form internal angles and corners square, not grouted, with sealant joint.
7. Where metal trims are not specified, form external angles and corners square, not grouted, with sealant joint.
8. Apply specified sealant to joints.

G. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

H. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly.
1. Where floor and wall tile are of same dimensional module, align floor and wall joints.

I. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

J. Install non-ceramic trim in accordance with manufacturer's instructions.

K. Sound tile after setting. Replace hollow sounding units.

L. Keep control and expansion joints free of mortar, grout, and adhesive.

M. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

N. Grout tile joints, except where movement joints are indicated or specified.

O. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

P. Allow completed tiling assemblies to cure full 72 hours before allowing heavy foot or equipment traffic on final installations.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113.
1. Provide 95 percent coverage of setting mortar over tile back surfaces, minimum.
2. Use full coverage crack isolation membrane under all tile unless other underlayment is indicated.

3.5 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244 .

1. Provide 95 percent coverage of setting mortar over tile back surfaces, minimum.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method w243.

1. Provide 95 percent coverage of setting mortar over tile back surfaces, minimum.

C. Grout with high performance grout.

3.6 TOLERANCES

A. Comply with applicable requirements of ANSI A108.2, unless otherwise specified in this Section.

B. Flatness - Finished Tiling Surfaces:

1. Ceramic Tile: 1/4 inch in 10 feet.

C. Lippage - Adjacent Tile Units:

1. Wall Tile and Mosaic Tile: 1/32 inch; joint width 1/16 inch to 1/8 inch; 1 x 1 inch to 6 x 6 inch tile size.

2. Pressed Floor Tile and Porcelain Tile: 1/32 inch; joint width 1/16 inch to less than 1/4 inch; all tile sizes.

3.7 CLEANING

A. Clean tile and grout surfaces.

B. Remove grout efflorescence as required with product approved by tile and grout manufacturer.

C. Use cleaning materials and procedures as permitted by the tile and grout manufacturer's written instructions. Protect metal surfaces, iron, and vitreous fixtures from effects of acid cleaning. Flush surfaces with clean water before and after acid cleaning.

D. Leave finished installation clean and free of cracked, chipped, broken, un-bonded, or otherwise defective tile work.

3.8 PROTECTION

A. Do not permit traffic over finished floor surface for minimum 7 days after installation.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

END OF SECTION

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.3 RELATED REQUIREMENTS

1.4 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

1. Do not install acoustical units until after interior wet work is dry.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples minimum 6 x 6 inch in size illustrating material and finish of acoustical units.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.7 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

C. System Installer Qualifications: Company specializing in the installation of products specified in this Section with minimum three years documented experience.

1.8 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 20 to 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS

A. Interior Suspended Ceilings, Soffits, and Bulkheads: Maintain deflection of not more than L/360 of distance between supports.

B. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.3 ACOUSTICAL CEILINGS

A. Acoustical Units - General: ASTM E1264, Class A.

1. Provide units with manufacturer's proprietary anti-humidity, sag-resistant composition and anti-microbial treatment to inhibit the propagation of mold and mildew.

B. Acoustical Panels: Painted mineral fiber, with the following characteristics:

1. Classification: ASTM E1264 Type A

a. Form: A2.1, nodular.

b. Pattern: "G" - smooth.

2. Thickness: 7/8 inches.

3. Light Reflectance: 85 percent, minimum, determined in accordance with ASTM E1264.

4. NRC Range: 0.95, minimum, determined in accordance with ASTM E1264.

5. Ceiling Attenuation Class (CAC): 30, minimum, determined in accordance with ASTM E1264.

6. Panel Edge: As indicated in finish schedule on drawings.

7. Color: White.

8. Suspension System: Exposed grid.

C. Acoustical Panels: Gypsum panel ceiling tiles with factory-laminated vinyl facing, with the following characteristics:

1. Application(s): Kitchen.

2. Classification: ASTM E1264 Type XX.

a. Pattern: "G" - smooth.

3. Size: 24 by 24 inches.

4. Thickness: 1/2 inch.

5. Light Reflectance: 77 percent, determined in accordance with ASTM E1264.

6. Panel Edge: Square.

7. Color: White.

8. Suspension System: Exposed grid.

2.4 SUSPENSION SYSTEMS

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

1. Materials:

a. Steel Grid: ASTM A653/A653M, G30 coating, except provide not less than G60 coating for severe or wet environments.

B. Exposed Suspension System: Hot-dipped galvanized steel grid.

1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.

2. Profile: Tee; 15/16 inch face width unless otherwise indicated.

3. Finish: Baked enamel.
4. Color: White, unless otherwise indicated.

2.5 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
1. Size: As required for installation conditions.
2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
3. At Circular Penetrations: Provide edge moldings fabricated to diameter required to fit penetration precisely.

E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

C. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.3 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.4 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.
2. Make field cut edges of same profile as factory edges; finish cut edges to match factory finished edges if cut edge is exposed to view.
3. Double cut and field paint exposed reveal edges to match factory finished edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

G. Install hold-down clips on panels within 10 ft of an exterior door.

3.5 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.6 CLEANING

A. Clean surfaces.

B. Replace damaged or abraded components.

END OF SECTION

SECTION 096500 - RESILIENT FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2

1.3 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Installation accessories.

1.4 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 090561 - Common Work Results For Flooring Preparation: Independent agency testing of concrete slabs, cleaning, or preparation; moisture and alkalinity testing and remediation procedures.

C. Section 096513 - Resilient Wall Base and Accessories .

1.5 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.

C. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing.

D. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing.

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, minimum 6 x 12 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Flooring Material: Additional quantity equivalent to 5 percent of each type and color.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Deliver and store materials in manufacturer's original unopened containers, with brand names and production lot numbers clearly marked.

E. Do not double stack pallets.

1.9 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

B. Install resilient flooring and accessories after other finishing operations, including painting have been completed.

C. Do not install resilient flooring over concrete slabs until slabs have been fully cured, and are sufficiently dry to achieve proper bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

1.10 WARRANTY

A. Resilient Flooring: Provide manufacturer's warranty, as follows:

1. Materials: Minimum 15 years from date of purchase, covering manufacturing defects and wear due to normal foot traffic.

2. Installation: Minimum 2 years from date of installation; warrant entire installation against loss of adhesion to substrates.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SHEET FLOORING

A. Homogenous Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.

1. Minimum Requirements: Comply with ASTM F1913.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648, NFPA 253, ASTM E648, or NFPA 253.

3. Seams: Heat welded.

4. Color: As scheduled.

B. Heterogenous Vinyl Sheet Flooring: Color and pattern throughout wear layer thickness, with backing.

1. Minimum Requirements: Comply with ASTM F1303, Type II, with Class A fibrous backing.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648, NFPA 253, ASTM E648, or NFPA 253.

3. Seams: Heat welded.

4. Color: As scheduled..

C. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.3 TILE FLOORING

A. Homogenous Vinyl Tile: Homogeneous, with color extending throughout thickness.

1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648, NFPA 253, ASTM E648, or NFPA 253.

3. Size: As scheduled.

4. VOC Content Limits: As specified in Section 016116.

5. Color: As scheduled.

2.4 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Adhesives: Waterproof; types recommended by flooring manufacturer.

1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

C. Resilient Wall Base, Edge Strips, and Accessories: Specified in Section 096513.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Minimum F(F) Floor Flatness Values:

1. Under Resilient Flooring: F(F) of 35.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 090561.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3. If flooring manufacturer does not reccomend specific remediation materials and procedures, follow moisture and alkalinity remediation procedures in Section 090561.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

B. Clean substrate.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:

1. Spread only enough adhesive to permit installation of materials before initial set.
2. Fit joints and butt seams tightly.
3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

1. Resilient Strips: Attach to substrate using adhesive.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4 INSTALLATION - SHEET FLOORING

A. Cut curvilinear patterns and shapes in flooring by waterjetting.

B. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

C. Seal seams by heat welding where indicatedor required by manufacturer for applicable flooring products.

3.5 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install flooring in pattern as indicated in drawings. Allow minimum 1/2 full size tile width at room or area perimeter.

C. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until Date of Substantial Completion.

END OF SECTION

SECTION 096513 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Resilient wall base.

B. Resilient edge and transition strips.

C. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 096500 - Resilient Flooring.

C. Section 096813 - Tile Carpeting.

1.4 REFERENCE STANDARDS

A. ASTM F1861 - Standard Specification for Resilient Wall Base.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: If basis of design color is not provided, submit manufacturer's complete set of color samples for Architect's selection.

D. Verification Samples: Submit two samples, minimum 4x4 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Wall Base: 24 linear feet of each type and color.

3. Clearly identify each package.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Deliver and store materials in manufacturer's original unopened containers, with brand names and production lot numbers clearly marked.

E. Protect roll materials from damage by storing on end.

F. Do not double stack pallets.

1.8 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a minimum temperature of 65 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

B. Install resilient accessories after other finishing operations, including painting have been completed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set.

1. Profile: Style B, Cove.
2. Group: I (solid, homogeneous).
3. Height: As scheduled.
4. Thickness: 0.125 inch.
5. Finish: Satin.
6. Length: Roll.
7. Color: As indicated on drawings.
8. Accessories: Premolded external corners and internal corners.

B. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; top set.
1. Profile: Smooth.
2. Group: I (solid, homogeneous).
3. Height: As scheduled.
4. Thickness: 0.25 inch.
5. Finish: Matte.
6. Length: Roll.
7. Color: As indicated on drawings.
8. Accessories: Premolded external corners and internal corners.

2.3 ACCESSORIES

A. Subfloor Filler: Type recommended by adhesive material manufacturer; in accordance with Section 090561 - Common Work Results For Flooring Preparation.

B. Adhesives: Waterbased type recommended by flooring manufacturer.
1. Compatible with materials being adhered; maximum VOC content of 50 g/L.

C. Moldings and Edge Strips: Homogeneous vinyl or rubber type; tapered or bullnose edge.
1. Profiles: As scheduled in drawings, selected by flooring heights.
2. Color: As scheduled..

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.2 PREPARATION

A. Prepare substrates as recommended by flooring and adhesive manufacturers.

B. Remove substrate ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

1. Prohibit traffic until filler is fully cured.

C. Clean substrate.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:

1. Spread only enough adhesive to permit installation of materials before initial set.

2. Fit joints and butt seams tightly.

3.4 INSTALLATION - RESILIENT BASE

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Fit joints tightly and make vertical. Install in longest lengths possible; maintain minimum dimension of 18 inches between joints.

C. Miter internal corners. At external corners, use premolded units.

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.

D. Install base on solid backing. Bond tightly to wall and floor surfaces.

E. Do not stretch wall base during installation.

F. Scribe and fit to door frames and other interruptions.

3.5 INSTALLATION - RESILIENT ACCESORIES

A. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

1. Attach to substrate using manufacturer's recommended adhesive.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

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SECTION 096700 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.3 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

B. Section 090561 - Common Work Results For Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.4 REFERENCE STANDARDS

A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.5 DEFINITIONS

A. DCOF: Dynamic Coefficient of Friction.

B. Slip-Resistant: Installed flooring surface which has a wet coeffecient of friction of 0.42, minimum, as measured according to ANSI B101.3 (DCOF Slip Resistance Test).

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting at least one week prior to the start of the work of this Section; require attendance by all affected installers, manufacturer, Contractor, and Architect.

1. Discuss installation testing, prep, procedures, details, and other pertinent issues.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples for Selection: Submit samles showing range of options for color, texture, and aggregate for each system.

D. Samples for Verification: Submit two samples, 12 x 12 inch in size illustrating color and pattern for each floor material for each color specified.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Manufacturer's Certificate: Provide letter of certification from manufacturer stating that installer is a certified applicator and is familiar with manufacturers required procedures for application of specified finish system

1. Slip-Resistance: Certify that specified floor finish system, when installed, comply with specified requirements for slip-resistance.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

H. Manufacturer's Qualification Statement.

I. Applicator's Qualification Statement.

J. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this Section.

1. Minimum five years of documented experience.
2. Approved by manufacturer.

C. Basis of Design: Specifications are based on flooring types by the specified basis of design manufacturer. Flooring types manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements; and provided that deviations in composition, construction, performance, and finish are minor and do not detract substantially from the indicated design intent.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

B. Store resin materials in a dry, secure area.

C. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.10 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

D. Concrete substrate shall be properly cured for a minimum of 28 days.

1.11 WARRANTY

A. Fluid-applied Flooring: Provide manufacturer's warranty, as follows:

1. Materials: Minimum 2 years from Date of Substantrial Completion.

2. Installation: Minimum 2 years from Date of Substantial Completion; warrant entire installation against loss of adhesion to substrates.

PART 2 PRODUCTS

2.1 FLOORING SYSTEMS

A. Fluid-Applied Flooring: Polyurethane cement slurry base coat(s) with broadcast aggregate and slip-resistant granules.

1. Aggregate: Quartz granules.

2. System Thickness: 1/4 inch, nominal, when dry.

3. Texture: Slip resistant.

4. Sheen: High gloss.

5. Color: As scheduled.

6. Acceptable Manufacturers:

a. Basis of Design: As indicated in Section 090000 - Finish Schedule.

b. Substitutions: See Section 01 60 00-Product Requirements.

2.2 ACCESSORIES

A. Base Caps: Zinc or plastic with projecting base of 1/8 inch; color as selected.

1. Substitutions: See Section 01 6000 - Product Requirements.

B. Cant Strips: Molded material compatible with flooring.

C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 090561.
2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Prepare concrete surfaces according to ICRI 310.2R.

C. Prepare concrete surfaces according to manufacturer's guidelines.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

F. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - ACCESSORIES

A. Install cant strips at base of walls where flooring is to be extended up wall as base.

B. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.

C. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
    a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply primer to surfaces required by flooring manufacturer at manufacturer's recommended rate.

C. Apply each coat to minimum thickness required by manufacturer.
1. Mix and apply mortar and base coat(s) as indicated for flooring system and at coverage rates recommended in writing by manufacturer. Screed mortar materials, compact and smooth, with steel finishing trowels.
2. Aggregate: Broadcast in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer
3. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

D. Finish to uniform, level surface.

3.5 TERMINATIONS

A. Chase edges to “lock” the coating system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal coating onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Treat floor drains by chasing the coating to lock in place at point of termination.

3.6 JOINTS AND CRACKS

A. Treat control joints to bridge potential cracks and to maintain monolithic protection.

B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.7 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

3.8 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Entrance mats.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 090561 - Common Work Results For Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation; moisture and alkalinity testing and remediation procedures.

C. Section 096513 - Resilient Wall Base and Accessories.

D. Section 124813 - Entrance Floor Mats and Frames.

1.4 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

C. CRI (GLP) - Green Label Plus Testing Program - Certified Products.

D. CRI 104 - Standard for Installation of Commercial Carpet.

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

G. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

C. Basis of Design: Design is based on specified basis of design manufacturer. Similar systems by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in performance, materials, finish, texture and color are minor, and do not detract from the indicated design intent.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104 section for "Storage and Handling."

B. Deliver carpeting materials in original mill protective wrapping, with mill register numbers and tags attached.

C. Store inside, in well ventilated area, protected from weather, moisture, and soiling.

1.8 FIELD CONDITIONS

A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and Manufacturer’s installation instructions.

1. All material used in sub-floor preparation and repair shall be recommended by the flooring manufacturer and shall be chemically and physically compatible with the flooring system.

B. Stage materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

D. Ventilate installation area during installation and for 72 hours after installation.

E. Do not commence with carpet installation until painting and finishing work is complete and ceilings and overhead work has been tested, approved, and completed.

F. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.9 WARRANTY

A. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 CARPET TILE MATERIALS

A. General: Comply with recycled content, adhesives and sealants, volatile organic compound (VOC), and flooring system product requirements specified in Section 6000 and Section 01 6116 as applicable.

B. Tile Carpeting: Nylon 6,6 tufted, tip-sheared pattern loop, manufactured in one color dye lot.

1. Tile Size: As scheduled.

2. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.

3. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").

4. Face Weight: 18 oz/sq yd, minimum.

5. Primary Backing Material: Vinyl composite.

C. Entrance Mats: Nylon 6.6 textured tufted loop with vinyl composite material backing reinforced with fiberglass with antimicrobial additives.

1. Size: As scheduled.
2. Color: As scheduled.
3. Thickness: 9/32 inch, nominal.
4. Total Weight: 139 oz/sq yd.
5. Performance:

a. Smoke Density: Pass (flaming and non-flaming), in accordance with ASTM E662.

b. Critical Radiant Flux: Class 1, in accordance with AATCC 134.

c. Static Control: < 3 kV, in accordance with AATCC 134.

d. Color Fastness to Light: 4, in accordance with AATCC 16.

e. Dimensional Stability: -0.2% to +0.2%, in accordance with EN986.

2.3 ACCESSORIES

A. Subfloor Filler: Type recommended by flooring material manufacturer, in accordance with Section 090561 - Common Work Results For Flooring Preparation.

B. Transitions: As scheduled.

C. Resilient Wall Base and Accessories: Specified in Section 096513.

D. Adhesives: Recommended by carpet tile manufacturer; releasable type; compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified.

E. Miscellaneous Materials: Provide other items recommended by carpet manufacturer and installer for the indicated conditions of carpet use, and as required for complete installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 090561.

2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

3. If flooring manufacturer does not reccomend specific remediation materials and procedures, follow moisture and alkalinity remediation procedures in Section 090561.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. General: Comply with CRI 104 sections for "Site Conditions" and "Floor Preparation" for preparing substrates indicated to receive carpet tile installation.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

F. Vacuum clean substrate.

G. There will be no exceptions to the provisions stated in the Manufacturer’s installation instructions.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Locate change of color or pattern between rooms under door centerline.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, alcoves, and similar openings.

I. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

3.5 PROTECTION

A. Protect installed carpet tile to comply with CRI 104.

1. Do not use plastic protection. Use kraft paper, corrugated box material or hardboard as recommended by carpet tile manufacturers.

B. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 097200 - WALL COVERINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Surface preparation.

B. Wall coverings.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 092900 - Gypsum Board: Preparation of substrates to receive wall coverings.

C. Section 099123 - Interior Painting: Priming of substrate surfaces.

1.4 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics.

D. ASTM F3008 - Standard Specification for Cork Floor Tile.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wall covering and adhesive.

C. Shop Drawings: Indicate wall elevations with seaming layout.

D. Samples: Submit two samples of wall covering, 24 x 24 inch in size illustrating color, finish, and texture.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Wall Covering Materials: 25 linear feet of each color and pattern of wall covering; store where directed.
3. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages or containers clearly labeled to identify manufacturer, brand name, quality and grade, and fire hazard classification.

B. Inspect roll materials at arrival on site, to verify acceptability.

C. Store materials in a well ventilated area protected from weather, moisture, soiling, and extreme temperatures and humidity. Maintain temperature is storage area above 40 degrees F.

D. Protect packaged adhesive from temperature cycling and cold temperatures.

E. Do not store roll goods on end.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

2.2 WALL COVERINGS

A. General Requirements:

1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.

B. Wall Coverings:

1. Woven fabric-backed vinyl roll stock:

a. Comply with ASTM F793/F793M, Category V, Type II.

b. Total Thickness: 0.029 inch, minimum.

c. Total Weight: 35 oz per linear yard.

d. Roll Width: 52-54 inches.

e. Backing: Woven, osnaburg fabric.

f. Color: As scheduled.

g. Pattern: As scheduled.

h. Pattern Match: Straight.

2. Fabric-backed vinyl roll stock:

a. Comply with ASTM F793/F793M, Category V, Type II.

b. Total Weight: 20 oz per linear yard.

c. Roll Width: 51 inches.

d. Backing: Non-woven, synthetic fabric.

e. Color: As scheduled.

f. Pattern: As scheduled.

g. Pattern Match: Straight.

C. Wall Covering: PVC-Free Cork.

1. Panel Size: As scheduled.

2. Cork Thickness: 3 millimeter, minimum.

3. Panel Edge Treatment: Square.

4. Trim: Manufacturer's standard trim shapes.

5. Surface Texture: As scheduled.

D. Adhesive: Manufacturer's standard water-based contact adhesive; adhesives not approved by manufacturer are not permitted.

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

F. Substrate Primer and Sealer: Free of volatile organic compounds (VOC); wall covering manufacturer's recommended or approved type.

PART 3 EXECUTION

3.1 EXAMINATION - ALL PRODUCT TYPES

A. Verify that substrate surfaces are ready to receive work, and conform to requirements of the wall covering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch/ft.

3.2 EXAMINATION - CORK WALL COVERING

A. Consult all associated product literature concerning installation, adhesive maintenance and warranty prior to installation of material.

B. Allow all trades to complete work prior to installation.

C. Deliver all materials to the installation location in its original packaging with labels intact.

D. Do not stack pallets to avoid damage.

E. Remove any plastic and strapping from product after delivery.

F. Do not remove material from packaging or store outside of packaging until ready for installation.

G. Ensure that all adhesives intended for installation are approved for use with material.

H. Ensure installation area and material storage conditions are between 65° F (19° C) and 85° F (30° C) and 45% and 55% RH for at least 72 hours before, during and after installation.

I. Ensure HVAC system is operational and fully functioning at normal operating conditions.

J. Protect installation area from extreme climate changes, such as heat, freezing and humidity, as well as direct sunlight for at least 72 hours before, during and after installation.

K. Ensure all substrate preparation requirements have been performed, read and/or understood by all interested parties.

L. Do not proceed with installation until all conditions have been met.

3.3 PREPARATION - VINYL WALL COVERING

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this Section. Remove existing coatings that exhibit loose surface defects.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

G. Vacuum clean surfaces free of loose particles.

3.4 PREPARATION - CORK WALL COVERING

A. All substrates must be:

1. clean, smooth, permanently dry, flat, structurally sound, free of visible water or condensation, dust, sealers, residual adhesives and adhesive removers, solvents, wax, oil, grease, asphalt, gypsum compounds, visible alkaline salts or excessive efflorescence, mold, mildew and all other extraneous coating, film, material or foreign matter.

B. Substrate must be a structurally sound interior wall surface, such as dry plaster, cured drywall, fiber-reinforced plastic (FRP) panels, fiberglass, exterior grade plywood (Group 1, CC type), concrete, metal and masonry.

C. All cracks, voids, divots, grout lines and imperfections must be filled with a patch or filler suitable for the substrate.

D. Prime gypsum board surfaces with primer color that coordinates with the cork color prior to installation to avoid white primers increasing the appearance of natural and acceptable size varaiation and shrinkage during installation and seasonal environmental changes.

E. All substrates that have been painted must be sanded with 100-150 grit sandpaper to create a surface profile and promote adhesion.

1. Failure to sand painted surfaces may result in bond failure or excessive movement.

F. When installing directly over a resinous products, such as an epoxy paint, ensure that coating is dry to the touch and has cured for the prescribed length of time.

1. Substrate must be clean, dry, sound and free of contaminates.

2. Sand the surfaces of the substrate with 100-150 grit sandpaper to create a surface profile and promote adhesion.

3. Resinous substrates are non-porous – follow all installation instructions, flash times for non-porous substrates.

3.5 INSTALLATION - VINYL WALL COVERING

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges. Do not razor cut on gypsum board surfaces.

E. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Butt edges tightly.

G. Horizontal seams are not acceptable.

H. Do not seam within 2 inches of internal corners or within 6 inches of external corners.

I. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.

J. Do not install wall covering more than 1/4 inch below top of resilient base.

K. Cover spaces above and below windows, above doors, in pattern sequence from roll.

L. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.6 INSTALLATION - CORK WALL COVERING

A. Stir adhesive to ensure a homogeneous and continuous consistency; close adhesive container when not in use.

1. Be sure to only pour out adhesive that will be immediately used, as dried adhesive cannot be reused; do not return adhesive that has been poured out to the original container.

B. Precoating: Pre-coat tiles with adhesive the day prior to coating the substrate.

1. Store tiles front to back in the original packaging until final installation.
2. Do not all precoated surfaces to make contact with each other to prevent full adhesion.
3. Install tiles within 24 hours of being precoated.

C. Apply adhesive with a paint roller evenly to both the back of the tile and the substrate, ensure even coverage and a consistent, glossy film on both surfaces.

1. Apply an additional coat to areas of uneven adhesive coverage.
2. Prevent excessive adhesive build-up.

D. Allow adhesive to dry on both surfaces prior to installation; immediately remove excessive adhesive from the tile face or fixtures with water and a pH neutral cleaner.

1. Wait for adhesive to turn from white to transparent/clear; approximate drying time to the touch is 30 to 60 minutes.

E. Install tile within 60 to 90 minutes, after adhesive is dry.

1. Adhesive will form an immediate bond once contact is made between the two surfaces.

2. Avoid sliding or forcing tiles into place.

F. Use a soft, non-marking rubber mallet with a minimum 2 inch surface area to carefully set each and every cork tile after installation in order to ensure that cork tile makes full contact with substrate.

1. Set the corners, edges and centers of all tiles in order to establish complete contact and proper adhesive bond.

G. Visually inspect installation to ensure that material has not shifted and that adhesive has not been compressed onto the surface.

H. Clean excessive adhesive or adhesive residue from the surface of the material per adhesive recommendations.

1. Do not apply abrasive or solvent based cleaners directly to material.

3.7 CLEANING

A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.

B. Reinstall wall plates and accessories removed prior to work of this Section.

3.8 PROTECTION

A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

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SECTION 098430 - SOUND-ABSORBING WALL AND CEILING UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Sound-absorbing wall units.

B. Sound-absorbing ceiling units.

C. Mounting accessories.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

1.4 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, panel layout and attachment hardware.

D. Selection Samples: Manufacturer's color charts for fabric covering, indicating full range of colors and patterns available.

E. Verification Samples: Fabricated samples of each type of panel specified; 12 by 12 inch, showing construction, edge details, and finish.

F. Test Reports: Certified test data from an independent test agency verifying that panels meet specified requirements for acoustical and fire performance.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with at least three years of documented experience.

B. Basis of Design: Specifications are based on products by specified basis of design manufacturer. Products manufactured by other acceptable manufacturers are permitted, subject to compliance with specified requirements, and provided that deviations in design, performance, composition, color, and profile are minor, and do not detract substantially from the indicated design intent.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical units from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until units are needed for installation.

B. Store units flat, in dry, well-ventilated space; do not stand on end.

C. Protect edges from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 FELTED SOUND-ABSORBING UNITS

A. Felt Wall Panels, Notched:

1. Material: Recyled polyester (PET) felt.
2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
3. Noise Reduction Coefficient (NRC): 0.40 minimum when tested in accordance with ASTM C423.
4. Backing: None.
5. Thickness: 1 inch, nominal.
6. Surface pattern: As scheduled.
7. Color: As scheduled.
8. Mounting: Manufacturer's recommended tape on all panel edges and vertically every 12 inches on center.

B. Felt Ceiling Panels:

1. Material: Recyled polyester (PET) felt.

2. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
3. Noise Reduction Coefficient (NRC): 0.70 minimum when tested in accordance with ASTM C423.
4. Backing: None.
5. Thickness: 1 inch, nominal.
6. Edges: Square
7. Surface pattern: As scheduled.
8. Color: As scheduled.
9. Mounting: Suspended.

2.3 FABRICATION

A. Tolerances: Fabricate to finished tolerance of plus or minus 1/16 inch for thickness, overall length and width, and squareness from corner to corner.

B. Factory-applied finishes on wood veneer panels to be uniform, smooth, and without blemishes.

2.4 ACCESSORIES

A. Back-Mounting Accessories: Manufacturer's standard accessories for concealed support, designed to allow panel removal, and as follows:
1. Two-part clip and base-support bracket system; brackets designed to support full weight of panels and clips designed for lateral support, with one part mechanically attached to back of panel and the other attached to substrate.

B. Ceiling-Suspended Accessories: Manufacturer's standard accessories at locations as indicated on each acoustical unit, sized appropriately for weight of acoustical unit.
1. Provide galvanized wire for suspension from ceiling at heights as indicated.

C. Fixing Clips: Manufacturers standard for application as indicated.

D. Panel Tapes and Adhesive: Acceptable to acoustical panel manufacturer for application as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical units. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install acoustical units in locations as indicated, following manufacturer's installation instructions.

B. Install mounting accessories and supports in accordance with shop drawings.

C. Align panels accurately, with edges plumb and top edges level. Scribe to fit accurately at adjoining work and penetrations.

3.3 CLEANING

A. Clean units upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

3.4 PROTECTION

A. Provide protection of installed acoustical panels until Date of Substantial Completion.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the Architect.

END OF SECTION

SECTION 099113 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Non-metallic roofing and flashing.
6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
7. Weathering steel.
8. Floors, unless specifically indicated.
9. Ceramic and other types of tiles.
10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco, unless otherwise noted.
11. Glass.
12. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 099123 - Interior Painting.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

D. SCAQMD 1113 - Architectural Coatings.

E. SSPC-SP 1 - Solvent Cleaning.

F. SSPC-SP 2 - Hand Tool Cleaning.

G. SSPC-SP 6 - Commercial Blast Cleaning.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, siding, and factory finished metals, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. PPG Paints: www.ppgpaints.com/#sle.
2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
3. Benjamin Moore: www.benjaminmoore.com.

C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

    a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

    b. SCAQMD 1113 Rule.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including applications listed below.

1. Two top coats and one coat primer.

    a. If flash rusting occurs, use two coats of primer.

2. Exterior Acrylic Urethane, Water Based.

    a. Application: Galvanized steel railings.

    b. Products:

        1) Sherwin Williams Pro Industrial Acrolon 100 HS Waterbased Urethane.

3. Exterior Urethane Alkyd Enamel.

    a. Application: Steel railings.

    b. Products:

        1) Sherwin Williams Pro Industrial Urethane Alkyd Enamel.

4. Exterior Light Industrial Coating, Water Based.

    a. Application: Primed and galvanized metals (doors, fences, lintels, etc).

    b. Products:

        1) PPG Paints Pitt-Tech Plus WB DTM Industrial Enamel.

        2) Benjamin Moore Super Spec HP DTM Acrylic.

        3) Sherwin Williams Pro Industrial DTM Acrylic B66 Series.

5. Top Coat Sheen:

    a. Flat: MPI gloss level 1; use this sheen for overhead surfaces.

    b. Satin: MPI gloss level 4; use this sheen at wood, cementitous or masonry substrates unless otherwise noted.

    c. Semi-Gloss: MPI gloss level 5; use this sheen at metal substrates unless otherwise noted.

6. Primer: As recommended by top coat manufacturer for specific substrate.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Alkali Resistant Water Based Primer.

    a. Products:

        1) Pittsburgh Paints: 4-603XI Perma-Crete Interior/Exterior Alkali Resistant Primer. (MPI #3)

        2) Benjamin Moore Ultra Spec Acrylic High-Build Masonry Primer.

        3) Sherwin Williams Loxon Concrete & Masonry Primer (MPI #3).

4) Substitutions: Section 016000 - Product Requirements.

2. Interior/Exterior Latex Block Filler.

a. Products:

1) Kilz Pro-X p50 Block Filler Primer.

2) Pittsburgh Paints: 6-15XI Speedhide Masonry Hi Fill Latex Block Filler. (MPI #4)

3) Benjamin Moore Ultra Spec High-Build Masonry Block Filler.

4) Sherwin Williams B25W25 Preprite Block Filler. (MPI #4).

5) Substitutions: Section 016000 - Product Requirements.

3. Water Based Primer for Galvanized Metal.

a. Products:

1) Pittsburgh Paints: 4020 PF Pitt-Tech Plus Interior/Exterior Waterborne Acrylic Primer Finish DTM Industrial Enamel. (MPI #134).

2) Sherwin Williams Pro-Cryl Universal Metal Primer B-66 Series.

3) Substitutions: Section 016000 - Product Requirements.

4. Rust-Inhibitive Water Based Primer.

a. Products:

1) Benjamin Moore: MO4 Acrylic Metal Primer.

2) ICI Paints: Devoe Coatings DevFlex 4020PF Direct to Metal Primer & Flat Finish.

3) PPG Industries: 90-708 Series, Pitt-Tech One-Pack Interior/Exterior Industrial Primer.

4) Sherwin Williams: DTM Acrylic Primer Finish B66W1.

5) Substitutions: Section 016000 - Product Requirements.

5. High-Build Universal Metal Primer.

a. Products:

1) Sherwin Williams: Kem Kromik Universal Metal Primer.

2) Substitutions: Section 016000 - Product Requirements.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 099113.1 – EXTERIOR PAINTING (SITE/CIVIL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

B. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Exterior galvanized metal bollards.

B. Related Sections include the following:

1. Division 05 Section “Shop-Applied Coatings for Metal” for factory-applied metal primer for exterior metal framing and fabrications.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
2. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Benjamin Moore & Co.
2. ICI Paints.
3. PPG Architectural Finishes, Inc.
4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Gloss): MPI #9 (Gloss Level 6).

1. VOC Content: E Range of E1.

    a. Benjamin Moore: Benjamin Moore - Urethane Alkyd Gloss Enamel; No. M22.
    b. ICI Paints: Devoe Coatings - Devguard Alkyd Enamel; No. 4308-0100.

2. VOC Content: E Range of E2.

    a. PPG: Speedhide I - Ext. Alkyd Enamel – Gloss; No. 6-282.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Galvanized-Metal Substrates:

1. Alkyd System: MPI EXT 5.3B.

a. Intermediate Coat: Exterior alkyd enamel matching topcoat.
b. Topcoat: Exterior alkyd enamel (gloss).

END OF SECTION 099113.1

SECTION 099113 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Non-metallic roofing and flashing.
6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
7. Weathering steel.
8. Floors, unless specifically indicated.
9. Ceramic and other types of tiles.
10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco, unless otherwise noted.
11. Glass.
12. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 099123 - Interior Painting.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

D. SCAQMD 1113 - Architectural Coatings.

E. SSPC-SP 1 - Solvent Cleaning.

F. SSPC-SP 2 - Hand Tool Cleaning.

G. SSPC-SP 6 - Commercial Blast Cleaning.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, siding, and factory finished metals, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. PPG Paints: www.ppgpaints.com/#sle.
2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
3. Benjamin Moore: www.benjaminmoore.com.

C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:

    a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

    b. SCAQMD 1113 Rule.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including applications listed below.

1. Two top coats and one coat primer.

    a. If flash rusting occurs, use two coats of primer.

2. Exterior Acrylic Urethane, Water Based.

    a. Application: Galvanized steel railings.

    b. Products:

        1) Sherwin Williams Pro Industrial Acrolon 100 HS Waterbased Urethane.

3. Exterior Urethane Alkyd Enamel.

    a. Application: Steel railings.

    b. Products:

        1) Sherwin Williams Pro Industrial Urethane Alkyd Enamel.

4. Exterior Light Industrial Coating, Water Based.

    a. Application: Primed and galvanized metals (doors, fences, lintels, etc).

    b. Products:

        1) PPG Paints Pitt-Tech Plus WB DTM Industrial Enamel.

        2) Benjamin Moore Super Spec HP DTM Acrylic.

        3) Sherwin Williams Pro Industrial DTM Acrylic B66 Series.

5. Top Coat Sheen:

    a. Flat: MPI gloss level 1; use this sheen for overhead surfaces.

    b. Satin: MPI gloss level 4; use this sheen at wood, cementitous or masonry substrates unless otherwise noted.

    c. Semi-Gloss: MPI gloss level 5; use this sheen at metal substrates unless otherwise noted.

6. Primer: As recommended by top coat manufacturer for specific substrate.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Alkali Resistant Water Based Primer.

    a. Products:

        1) Pittsburgh Paints: 4-603XI Perma-Crete Interior/Exterior Alkali Resistant Primer. (MPI #3)

        2) Benjamin Moore Ultra Spec Acrylic High-Build Masonry Primer.

        3) Sherwin Williams Loxon Concrete & Masonry Primer (MPI #3).

4) Substitutions: Section 016000 - Product Requirements.

2. Interior/Exterior Latex Block Filler.

a. Products:

1) Kilz Pro-X p50 Block Filler Primer.

2) Pittsburgh Paints: 6-15XI Speedhide Masonry Hi Fill Latex Block Filler. (MPI #4)

3) Benjamin Moore Ultra Spec High-Build Masonry Block Filler.

4) Sherwin Williams B25W25 Preprite Block Filler. (MPI #4).

5) Substitutions: Section 016000 - Product Requirements.

3. Water Based Primer for Galvanized Metal.

a. Products:

1) Pittsburgh Paints: 4020 PF Pitt-Tech Plus Interior/Exterior Waterborne Acrylic Primer Finish DTM Industrial Enamel. (MPI #134).

2) Sherwin Williams Pro-Cryl Universal Metal Primer B-66 Series.

3) Substitutions: Section 016000 - Product Requirements.

4. Rust-Inhibitive Water Based Primer.

a. Products:

1) Benjamin Moore: MO4 Acrylic Metal Primer.

2) ICI Paints: Devoe Coatings DevFlex 4020PF Direct to Metal Primer & Flat Finish.

3) PPG Industries: 90-708 Series, Pitt-Tech One-Pack Interior/Exterior Industrial Primer.

4) Sherwin Williams: DTM Acrylic Primer Finish B66W1.

5) Substitutions: Section 016000 - Product Requirements.

5. High-Build Universal Metal Primer.

a. Products:

1) Sherwin Williams: Kem Kromik Universal Metal Primer.

2) Substitutions: Section 016000 - Product Requirements.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

G. Sand metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Materials for backpriming woodwork.

D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
2. Prime surfaces to receive wall coverings.
3. Mechanical and Electrical:

    a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

    b. In finished areas, paint shop-primed items.

    c. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

    d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

E. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.

7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
10. Glass.
11. Acoustical materials, unless specifically indicated.
12. Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Shop-primed items.

B. Section 064000 - Architectural Woodwork: Items to receive transparent finish in the field.

C. Section 081113 - Hollow Metal Doors and Frames: Shop-primed items to receive paint in the field.

D. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

E. Section 099113 - Exterior Painting.

1.4 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.5 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.

D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

F. SCAQMD 1113 - Architectural Coatings.

G. SSPC-SP 1 - Solvent Cleaning.

H. SSPC-SP 2 - Hand Tool Cleaning.

I. SSPC-SP 6 - Commercial Blast Cleaning.

J. SSPC-SP 13 - Surface Preparation of Concrete.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

3. Allow 30 days for approval process, after receipt of complete samples by Architect.

4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals, wood cabinets, and wood doors, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.

2. Label each container with color in addition to the manufacturer's label.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. SCAQMD 1113 Rule.
   c. Architectural coatings VOC limits of the State in which the Project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. LATEX PAINTS

1. Two top coats and one coat primer.
2. Institutional Low Odor/VOC Interior Latex.

B. WATERBASED EPOXY PAINTS

1. Two top coats and one coat primer.
2. Waterbased Epoxy.

C. ACRYLIC PAINTS

1. Two top coats over shop primer, except where special primer is recommended by manufacturer.
2. Acrylic Enamel for Metal Surfaces (Non-Railing).
3. Acrylic Enamel for Wood Surfaces.
4. Acrylic Dry Fall for Overhead Conditions.

D. TRANSPARENT FINISHES

1. Transparent Stain and Varnish for Non-Traffic Wood Surfaces:

    a. One coat of stain.

        1) Stain Products:

            a) Pittsburgh Paints Deft Interior Oil-Based Wood Stain, DFT400 Series.

            b) Sherwin Williams Minwax Performance Series Tintable Wood Stain 250 VOC.

            c) Benjamin Moore Benwood Interior Waterborne Wood Stain.

            d) Rust-Oleum Varathane Interior WB Wood Stain (MPI 186)

    b. Two coats of polyurethane.

        1) Polyurethane Products:

            a) Pittsburgh Paints Deft Interior/Exterior Water Based Polyurethane Satin, DFT259.

            b) Sherwin Williams Minwax Water-Based Oil-Modified Polyurethane, Satin.

            c) Benjamin Moore Benwood Stays Clear Acrylic Polyurethane.

            d) Rust-Oleum Varathane Crystal Clear WB Polyurethane Satin (MPI 128)

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Alkali Resistant Water Based Primer.

    a. Products:

        1) Pittsburgh Paints Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603XI. (MPI #3)

        2) Sherwin-Williams Loxon Concrete and Masonry Primer Sealer, LX02W50. (MPI #3)

        3) Benjamin Moore High Build Acrylic Masonry Primer, 068.

        4) Rust-Oleum Zinsser Bulls Eye 123 Acrylic Primer (MPI #3).

2. Interior/Exterior Latex Block Filler.

    a. Products:

        1) Kilz Pro-X p50 Block Filler Primer.

2) PPG Paints Speedhide Masonry Hi Fill Latex Block Filler, 6-15XI .

3) Sherwin-Williams PrepRite Block Filler.

4) Zinsser by Rust-Oleum Corporation Block Filler 2X High Build Primer for Concrete: www.rustoleum.com/#sle. (MPI #4)

3. Interior Drywall Primer Sealer.

a. Products:

1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI.

2) Zinsser by Rust-Oleum Corporation Drywall Primer: www.rustoleum.com/#sle.

3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer, B28 Series.

4) Benjamin Moore Ultra Spec 500 Primer 534.

4. Interior Rust-Inhibitive Water Based Primer.

a. Products:

1) Pittsburgh Paints Pitt-Tech Plus Interior/Exterior EP DTM Waterborne Acrylic Primer/Finish, 90-1908. (MPI #107)

2) Rust-Oleum Corporation Commercial Universal Acrylic Primer: www.rustoleum.com/#sle. (MPI #107)

3) Sherwin-Williams Pro-Cryl Universal Waterbased Primer.

4) Benjamin Moore Ultra Spec HP Acrylic Metal Primer, HP04.

5. Interior Water Based Primer for Galvanized Metal.

a. Products:

1) Pittsburgh Paints Pitt-Tech Plus EP DTM Industrial Primer, 90-1912. (MPI #134)

2) Sherwin-Williams Pro-Cryl Universal Waterbased Primer.

3) Benjamin Moore Ultra Spec HP Acrylic Metal Primer, HP04.

4) Rust-Oleum Corporation Commercial Universal Acrylic Primer: www.rustoleum.com/#sle. (MPI #107)

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
3. Clean concrete according to ASTM D4258. Allow to dry.
4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.
3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

J. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
2. Prepare surface according to SSPC-SP 2.

K. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

L. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions.

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Mechanical Work: Painting of mechanical work includes the following:

1. Interior Occupied Areas: Unless otherwise indicated, paint the following when exposed to view in finished construction:

a. Structural supports for mechanical equipment.

b. Mechanical equipment (except pre-finished equipment).

c. Piping, pipe hangers, and supports.

d. Ductwork.

e. Insulation on pipe and ductwork.

f. Accessory items.

g. Fire suppression system piping.

J. Electrical Work: Painting of electrical work includes the following:

1. Interior Occupied Areas: Unless otherwise indicated, paint the following when items exposed to view in finished construction:

a. Structural supports for electrical equipment.

b. Electrical equipment (except pre-finished equipment).

c. Conduit and fittings, panels and boxes, and wiremold.

d. Panelboards, including telephone equipment.

e. Accessory items.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.6 SCHEDULE - PAINT SYSTEMS

A. Naming Convention:

1. Substrate - Interior or Exterior - Opaque or Transparent - #Coats/Topcoat Type.

B. Paint Cmu-I-OP-3L - CMU Substrates, Latex Enamel (Eggshell):

1. Block Filler: Block Filler 10 mils DFT.
2. Intermediate Coat: Latex Enamel, 1.6 mils DFT.
3. Topcoats: Latex Enamel, 1.6 mils DFT.

C. Paint M-I-OP-3AU-Steel Railings, Opaque, 3 Coat (Semi-gloss):

1. Prime Coat: Rust-Inhibitive Water Based Primer, 3.0 mils DFT.
2. Intermediate Coat: Acrylic Urethane, 1.8-3.5 mils DFT.
3. Topcoats: Acrylic Urethane, 1.8-3.5 mils DFT.

D. Paint M-I-OP-3AE - Steel Substrates, Acrylic Enamel (Semi-gloss):

1. Prime Coat: Rust-Inhibitive Water Based Primer, 3.0 mils DFT.
2. Intermediate Coat: Acrylic Enamel, 1.4 mils DFT.
3. Topcoats: Acrylic Enamel, 1.4 mils DFT.

E. Paint Mo-I-OP-3AD - Steel Substrates, Acrylic Dry-Fall (Exposed Overhead Steel - Flat):

1. Prime Coat: Rust-Inhibitive Water Based Primer, 3.0 mils DFT.
2. Intermediate Coat: Interior Acrylic Dry-Fall, 3.0-4.5 mils DFT.
3. Topcoats: Interior Acrylic Dry-Fall, 3.0-4.5 mils DFT.

F. Paint G-I-OP-3L - Gypsum Board Substrates, Latex Enamel (Ceilings - Flat; Walls - Eggshell, Unless Otherwise Noted):

1. Prime Coat: Interior Latex Primer Sealer, 1.4 mils DFT.
2. Intermediate Coat: Latex Enamel, 1.6 mils DFT.
3. Topcoats: Latex Enamel, 1.6 mils DFT.

G. Paint G-I-OP-3WE - Gypsum Board Substrates, Waterbased Epoxy:

1. Prime Coat: Interior Latex Primer Sealer, 1.4 mils DFT.
2. Intermediate Coat: Waterbased Epoxy, 1.6 mils DFT.
3. Topcoats: Waterbased Epoxy, 1.6 mils DFT.

H. Primer G-I-P-1L -Gypsum Board Substrates to Receive Wall Covering, Primer, 1 Coat:

1. Prime Coat: Interior Latex Primer Sealer, 1.4 mils DFT.

I. Varnish Wd-I-TR-PV - Wood Paneling Substrates, Varnish (Satin):

1. Stain: Interior Oil Stain.
2. Intermediate Coat: Polyurethane Varnish, 1.4 mils DFT.
3. Topcoats: Polyurethane Varnish, 1.4 mils DFT.

END OF SECTION

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. High performance coatings for steel railings and exterior steel fabrications.

B. Surface preparation.

1.3 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting: Requirements for mechanical and electrical equipment surfaces.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.

C. SCAQMD 1113 - Architectural Coatings.

D. SSPC-SP 1 - Solvent Cleaning.

E. SSPC-SP 2 - Hand Tool Cleaning.

F. SSPC-SP 6 - Commercial Blast Cleaning.

1.5 SUBMITTALS

A. Product Data: Provide complete list of all products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. Cross-reference to specified coating system(s) product is to be used in; include description of each system.

3. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.

B. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

C. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

F. Restrict traffic from area where coating is being applied or is curing.

1.9 WARRANTY

A. Correct defective Work within a five year period after Date of Substantial Completion.

B. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide high performance coating products from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. High-Performance Coatings:

1. PPG Paints: www.ppgpaints.com/#sle.
2. Sherwin-Williams Company: www.protective.sherwin-williams.com/industries/#sle.
3. Tnemec Company, Inc: www.tnemec.com/#sle.

2.2 HIGH-PERFORMANCE COATINGS

A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0, maximum, when tested in accordance with ASTM E84.

2.3 TOP COAT MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

1. Lead Content: Not greater than 0.06 percent by weight of total nonvolatile content.
2. Chromium Content, as Hexavalent Chromium, Zinc Chromate, or Strontium Chromate: None.
3. Volatile Organic Compound (VOC) Content:

a. Provide coatings that comply with the most stringent requirements specified in the following:

1) 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

2) SCAQMD 1113 Rule.

3) Architectural coatings VOC limits of State in which the project is located.

b. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

4. Minimum Number of Top Coats: Two unless additional top coats are required or recommended by manufacturer to achieve uniform color and coating.

5. Colors: As indicated.

B. Acrylic Coating for Exterior Galvanized Steel Fabrications:

1. Product Characteristics:

a. Prime Coat: 3.0 mils DFT.

b. Intermediate Coat: 3.0 mils DFT.

c. Topcoat: 3.0 mils DFT.

2. Top Coat(s): One component acrylic.

a. Sheen: Gloss.

b. Products:

1) Sherwin-Williams; Sher Cryl HPA.

2) Substitutions: Section 01 60 00 - Product Requirements.

3. Primer: As recommended by coating manufacturer for specific substrate.

C. Urethane Coating for Exterior Galvanized Steel Fabrications:

1. Product Characteristics:

a. Prime Coat: 3.0 mils DFT.

b. Intermediate Coat: 3.0 mils DFT.

c. Topcoat: 3.0 mils DFT.

2. Top Coat(s): Polyurethane, Two-Component.

a. Sheen: Gloss.

b. Products:

1) Sherwin-Williams; Acrolon 218 HS; MPI #72, 174: www.protective.sherwin-williams.com/#sle.

2) Tnemec Company, Inc; Series 1095 Endura-Shield: www.tnemec.com/#sle.

3) Substitutions: Section 016000 - Product Requirements.

3. Top Coat(s): Acrylic Urethane, Water Based, Two-Component.

a. Sheen: High Gloss.

b. Products:

1) Sherwin-Williams; Pro Industrial Waterbased Acrolon 100: www.protective.sherwin-williams.com/#sle.

2) Substitutions: Section 016000 - Product Requirements.

4. Primer: As recommended by coating manufacturer for specific substrate.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

F. Test shop-applied primer for compatibility with subsequent cover materials.

G. Proceed with coating application only after unacceptable conditions have been corrected.

1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

a. Products:

1) Great Lakes Laboratories; Clean & Etch or approved equal.

2. Prepare surface according to SSPC-SP 2.

E. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.3 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.4 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

A. Protect finished work from damage.

END OF SECTION

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SECTION 101100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Porcelain enamel steel markerboards.

B. Tackable wall panels.

1.3 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Blocking and supports.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on each product and its accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Samples: Submit two samples minimum 2 by 2 inch in size illustrating materials and finish, color and texture of each finished surface material.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for specified products.

PART 2 PRODUCTS

2.1 VISUAL DISPLAY UNITS

A. Porcelain Enamel Steel Markerboards:
   1. Basis of Design: As indicated in Section 090000 - Finish Schedule.
      a. Substitutions: See Section 016000 - Product Requirements.

B. Framed Tackable Wall Panels: Linoleum-modified cork; Factory-fabricated.
   1. Basis of Design: As indicated in Section 090000 - Finish Schedule.
      a. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.2 PREPARATION

A. Acclimatize tackable wall panels by removing from packaging in installation area not less than 24 hours before application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Install tackable wall panels in accordance with manufacturer's recommendations on specified substrates with concealed attachments.

3.4 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 101400 - SIGNAGE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Building identification signs.

E. Dimensional letter signs.

F. Signs required for Building Code compliance and building occupancy.

1.3 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

B. ADA Standards - 2010 ADA Standards for Accessible Design.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on Drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.

3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.7 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Flat Signage:

1. ASI Sign Systems, Inc.: www.asisign.com.
2. FASTSIGNS: www.fastsigns.com/#sle.
3. Inpro: www.inprocorp.com/#sle.
4. Signs of Our Times: www.signsofourtimes.com/.
5. Substitutions: See Section 016000 - Product Requirements.

B. Acceptable Manufacturers - Dimensional Letter Signage:

1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com/#sle.
2. Gemini; Cast Metal: www.geminimade.com/.
3. Impact Signs Inc.; Cast Aluminum Letters: www.impactsigns.com/.
4. Substitutions: See Section 016000 - Product Requirements.

2.2 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs:

1. Sign Type: Flat signs with graphic symbols and panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
3. Character Height: 1 inch.
4. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers indicated on the drawings, and braille.
5. Interior Rooms: Identify with room names and numbers to be determined later, not those shown on the Drawings, and braille.

C. Interior Directional and Informational Signs:

1. Sign Type: Flat signs with panel media as specified.
2. Allow for 20 signs 4 inches high by 16 inches long.
3. Tactile Exit Signs: Identify with either "EXIT" or "EMERGENCY EXIT" and braille.
    a. Locations: Adjacent to each door to an egress stairway, exit passageway, and exit discharge.
4. Where suspended, ceiling mounted, or projecting from wall signs are indicated, provide two-sided signs with same information on both sides.

D. Emergency Evacuation Maps:

1. Allow for one map per classroom and lobby.
2. Map content to be provided by Owner.
3. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

E. Code-Required Door and Room Signs: Provide all signs required by Authority Having Jurisdiction (AHJ) for building occupancy; determine requirements and report to Owner and Architect prior to making specified submittals. Include cost of these signs in Contract Sum.

F. Building Identification Signs:

1. Use individual metal letters.
2. Mount on outside wall in location indicated on Drawings.
3. Finish: As selected by Architect.
4. Mounting: Minmum 2" standoffs.

2.3 FLAT SIGNAGE

A. Flat Signs: Signage media without frame.

1. Material: Plastic or acrylic having a non-glare finish.

2. Edges: Square.
3. Corners: Square.
4. Wall Mounting of One-Sided Signs: Tape adhesive.
5. Wall and Ceiling Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.
6. Suspended Mounting: Stainless steel suspension cables, cable clamps, and ceiling fastener suitable for attachment to ceiling construction indicated.
7. Signs Mounted on Glass: Where signs are mounted on glass, provide blank back-panel of matching size and material to conceal mounting unless otherwise noted.

B. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: As selected by Architect from manufacturer's standard range.
4. Character Color: Contrasting color as selected.

2.4 DIMENSIONAL LETTER SIGNAGE

A. Metal Letters:
1. Metal: Aluminum casting.
2. Metal Thickness: Manufacturer's standard for letter size.
3. Letter Height: As indicated on drawings.
4. Text and Typeface:
a. Character Font: Helvetica, Arial, or other sans serif font.
b. Character Case: Upper case only.
5. Finish: As selected by Architect from manufacturer's full range.
6. Mounting: Concealed screws with stand-offs.

2.5 ACCESSORIES

A. Mounting Devices: Except as specified for each sign type, provide mounting devices specifically recommended by manufacturer for indicated application; concealed upon finished installation.

B. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

C. Exposed Screws: Stainless steel.

D. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Locate signs where indicated:

1. Emergency Evacuation Maps: Locate in each classroom, and other locations indicated on Drawings.

2. If no location is indicated obtain Architect's instructions.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

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SECTION 101426 – POST AND PANEL SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. Non-illuminated post and panel signs.

1.3 COORDINATION

A. Furnish templates and tolerance information for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For post and panel/pylon signage.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

C. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by the manufacturer.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify locations of embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image.
c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Movements: For exterior signs, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 POST AND PANEL/PYLON SIGNS

A. Post and Panel Sign: Sign of single-panel configuration; with smooth, uniform surfaces and support assembly; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Laminated, Aluminum-Sheet Sign Panels: Aluminum sheet laminated to both sides of acrylic core sheet with painted edges.

a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
b. Surface-Applied Graphics: Applied vinyl film.

2. Posts: Flanged U-Channel Post

a. Carbon steel, ASTM A499 Grade 60 and chemical requirements of ASTM A1.
b. ConnDOT Type “A” post: 3.00 pounds/lf
c. Retainer spacer strap: Glavanized stee, ASTM A123. Formed and dimensioned as shown on the drawings.
d. Post assembled in ConnDOT “breakaway” configuration, Type 1, as indicated on the drawings. Breakaway feature shall conform to ConnDOT and AASHTO “Roadside Design Guide” and have adequate strength to carry the sign at 60 mile per hour wind loadings.

3. Text and Typeface: typeface as indicated by manufacturer's designation and variable content as scheduled.

2.3 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Copper Sheet: ASTM B 152/B 152M.

D. Steel Materials:

1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial or forming steel.
2. Bolts for Steel Framing: ASTM A 307 or ASTM A 325 (ASTM A 325M) as necessary for design loads and connection details.
3. For steel exposed to view on completion, provide materials having flat, smooth surfaces without blemishes. Do not use materials whose surfaces exhibit pitting, seam marks, roller marks, rolled trade names, or roughness.

E. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.

F. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.

3. Exposed Metal-Fastener Components, General:

a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant, Allen-head or one-way-head slots unless otherwise indicated.

4. Inserts: Furnish inserts to be set by other trades into concrete or masonry work.

B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

C. Anchoring Materials:

1. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for exterior applications.
2. Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
3. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs in the shop to the greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in locations concealed from view after final assembly.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed joints of flux, and dress exposed and contact surfaces.
4. Conceal fasteners and anchors unless indicated to be exposed; locate exposed fasteners where they will be inconspicuous.
5. Internally brace signs for stability and for securing fasteners.

B. Sign Message Panels: Construct sign-panel surfaces to be smooth and to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally from corner to corner.

1. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
2. Increase panel thickness or reinforce with concealed stiffeners or backing materials as needed to produce surfaces without distortion, buckles, warp, or other surface deformations.
3. Continuously weld joints and seams unless other methods are indicated; grind, fill, and dress welds to produce smooth, flush, exposed surfaces with welds invisible after final finishing.

C. Post Fabrication: Fabricate posts designed to withstand wind pressure indicated for Project location and of lengths required for installation method indicated for each sign.

1. Aluminum Posts: 2-3/8” OD Pipe (Sch 40), coated, extruded-aluminum tubing unless otherwise indicated, with brackets or slots to engage sign panels. Include post caps, fillers, spacers, junction boxes, access panels, reinforcement where required for loading conditions, and related accessories required for complete installation.
2. Direct Burial: Fabricate posts 36 inches (910 mm) longer than height of sign to permit direct burial and embedment in concrete foundations or concrete-filled postholes.

2.6 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

2.8 METALLIC-COATED STEEL FINISHES

A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A 780/A 780M.

B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretretaing, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).

2.9 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, and prepare for coating according to coating manufacturer's written instructions.

1. For Baked-Enamel or Powder-Coat Finish: After cleaning, apply a conversion coating compatible with the organic coating to be applied over it.

B. Factory Prime Finish: After surface preparation and pretreatment, apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer.

C. Baked-Enamel or Powder-Coat Finish: After cleaning and pretretaing, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using installation methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to accessibility standard.
3. Before installation, verify that sign components are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.3 INSTALLING POSTS

A. Vertical Tolerance: Set posts plumb within a tolerance of 1/16 inch in 3 feet.

B. Direct-Burial Method and Concrete Footing:

1. Excavation: Excavate posthole to dimensions indicated. Reconstruct subgrade that is not firm, undisturbed, or compacted soil, or that is damaged by freezing temperatures, frost, rain, accumulated water, or construction activities by excavating an additional 12 inches (300 mm), backfilling with satisfactory soil or well-graded aggregate, and compacting to original subgrade elevation.
2. Setting in Earth: Set post in position, support to prevent movement.
3. Setting in Cast-in-Place Concrete: Set post in position, support to prevent movement, and place concrete for concrete foundation as indicated.
4. Setting in Preformed Hole in Concrete Foundation: Form or core drill holes in concrete foundation not less than 3/4 inch larger than outside dimension of post for installing posts in concrete. Set post in position, shim to prevent movement, and fill annular space between post and hole with nonshrink, nonmetallic grout, mixed and placed to comply with manufacturer's written instructions.

a. Leave anchorage joint exposed with 1/8-inch anchoring material sloped away from post.

3.4 FINISH AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101426

SECTION 102123 - CUBICLE CURTAINS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Surface mounted overhead curtain track and guides.

B. Cubicle curtains.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 095113 - Acoustical Panel Ceilings: Suspended ceiling system to support track.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for curtain fabric characteristics and tracks.

C. Shop Drawings: Indicate a reflected ceiling plan view of curtain track, hangers and suspension points, attachment details, schedule of curtain sizes.

D. Selection Samples: Submit two fabric samples, minimum 6x6 inch in size illustrating manufacturer's full range of available fabric colors and patterns, for selection.

E. Verification Samples: Submit 12 by 12 inch sample patch of curtain cloth with representative top, bottom, and edge hem stitch detail, heading with reinforcement and carrier attachment to curtain header.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

G. Maintenance Data: Include recommended cleaning methods and materials and stain removal methods.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Curtains: Two of each type and size.
3. Extra Carriers: Two.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept curtain materials on site and inspect for damage.

B. Store curtain materials on site and deliver to Owner for installation when requested.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.
2. Substitutions: See Section 016000 - Product Requirements.

2.2 TRACKS AND TRACK COMPONENTS

A. Tracks: Extruded aluminum sections; one piece per track run.

1. Profile: Channel.
2. Mounting: Surface.
3. Structural Performance: Capable of supporting vertical test load of 50 lbs without visible deflection of track or damage to supports, safely supporting moving loads, and sufficiently rigid to resist visible deflection and without permanent set.
4. Track End Stop: To fit track section.
5. Track Bends: Minimum 12 inch radius; fabricated without deformation of track section or impeding movement of carriers.
6. Finish on Exposed Surfaces: As selected by Architect from standard options.

B. Curtain Carriers: Nylon slider to accurately fit track; designed to eliminate bind when curtain is pulled; fitted to curtain to prevent accidental curtain removal; minimum 3 carriers per foot of track length.

C. Wand: Plastic, attached to lead carrier, for pull-to-close action.

D. Installation Accessories: Types required for specified mounting method and substrate conditions.

2.3 CURTAINS

A. Cubicle Curtains:

1. Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
2. Inherently flame resistant or flameproofed; capable of passing NFPA 701 test.
3. Material: Close weave polyester; anti-bacterial, self deodorizing, sanitized, and preshrunk.
4. Colors and Patterns: As scheduled..

B. Open Mesh Cloth: Open weave to permit air circulation; flameproof material, manufacturer's standard color.

C. Attachment of Curtain Fabric to Open Mesh Cloth: Manufacturer's standard sewn seam.

D. Curtain Fabrication:

1. Manufacture curtains of one piece, sized 20 percent wider than track length. Terminate curtain 15 inches from floor with hemmed edge.
2. Length of curtain to end 15 inches above finished floor.
3. Railroad fabric without vertical seams.
4. Pattern match fabric with vertical seams.
5. Include open mesh cloth at top minimum 20 inches of curtain for room air circulation.
    a. If jurisdictional authority or applicable code requires additional open mesh cloth at top for fire sprinkler system distribution, provide required open dimension to achieve compliance.
6. Curtain Heading: Web reinforced band of open mesh cloth with metal grommet holes for carriers spaced 6 inches on center.
7. Seams and Hems: Manufacturer's standard fabrication method for securely sewn and finished seams and hems.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work of this Section.

B. Verify that field measurements are as indicated.

3.2 INSTALLATION

A. Install curtain track to be secure, rigid, and true to ceiling line.

B. Secure track to ceiling system.

C. Install end cap and stop device.

D. Install curtains on carriers ensuring smooth operation.

END OF SECTION

SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Chair rails.

B. Corner guards.

C. Protective wall covering.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 097200 - Wall Coverings: Terminating wall covering at wall and door protection.

1.4 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions and anchorage details.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

1. Submit two sections of corner guards, 12 inches long.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.3 PRODUCT TYPES

A. Chair Rails: Factory- or shop-fabricated, with preformed end caps and internal and external corners:

1. Material: High impact co-extruded thermoplastic rubber, color as selected from manufacturer's standard colors.
2. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
3. Mounting: Surface.
4. Return rail to wall.

B. Corner Guards - Surface Mounted:

1. Material: High impact vinyl with full height extruded aluminum retainer.
2. Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Width of Wings: 2 inches.
5. Corner: Radiused.
6. Color: As selected from manufacturer's standard colors.
7. Length: One piece.
8. Preformed end caps.

C. Protective Wall Covering:

1. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
2. Thickness: 3/32 inch.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Color: As selected from manufacturer's standard colors.
5. Texture: Smooth.
6. Accessories: Provide manufacturer's standard color-matched trim and moldings.
7. Mounting: Adhesive.

D. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

E. Terminations: Provide end cap terminations as indicated in Section 090000 - Finish Schedule.

2.4 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as instructed by the manufacturer.

B. Verify that substrate surfaces for adhered items are clean and smooth.

1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

C. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position top of bumper rail 36 inches from finished floor.

C. Position corner and edge guards 4 inches above finished floor to ceiling, unless otherwise indicated on Drawings.

D. Terminate rails 1 inch short of door openings and intersecting walls.

3.3 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.4 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 102800 - WASHROOM ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Commercial toilet accessories.

B. Utility room accessories.

C. Under-lavatory pipe supply covers.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 09 22 16: Placement of reinforcement for backing plate reinforcement.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

F. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.

G. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

H. ASTM C1036 - Standard Specification for Flat Glass.

I. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

B. Coordinate locations of accessories with other work to avoid interference, and to assure proper operation and servicing of accessory units.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.7 QUALITY ASSURANCE

A. Provide accessories by the same manufacturer for each type of accessory unit. For units exposed in the same areas, provide matching finishes.

B. Comply with ASTM F446 for grab bars and accessories, anchorage, test methods, and performance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver accessories to site until rooms in which they are to be installed are ready to receive them.

B. Pack accessories individually in a manner to protect accessory and its finish.

PART 2 - PRODUCTS

2.1 WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated by Bobrick Washroom Equipment, Inc. or a comparable product by one of the following:

1. AJW.
2. American Specialties, Inc.
3. Bradley Corporation.

B. Grab Bar:

1. Basis-of-Design Product: Bobrick; B-6806.99 Series.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 18 gauge.
    a. Finish: Smooth, No. 4, satin finish on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: Provide in straight lengths, in sizes indicated.

C. Mirror Unit:

1. Basis-of-Design Product: Bobrick; B-290 Series.
2. Frame: Stainless-steel angle, 0.05 inch thick, 3/4 inch x 3/4 inch angle with vertical-grain satin finish, one-piece roll-formed construction.
    a. Corners: Welded and ground smooth.
    b. Backing: Galvanized steel fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
    a. Wall bracket of 20 gauge galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Mirror: No. 1 quality, 1/4-inch select float glass, with all edges protected by plastic filler strips.
    a. Provide protective backing of full-size, shock absorbing, water resistant, nonabrasive, 3/16-inch thick polyethylene padding.
5. Sizes: As indicated.

D. Robe Hook:

1. Basis-of-Design Product: Bobrick; B-6707.
2. Mounting: Surface mounted.
3. Material and Finish: Stainless steel, No. 4 finish (satin).
    a. Flange and Support Arm: 22 gauge stainless steel with concealed 16 gauge stainless steel mounting bracket, all-welded construction. Secure to wall plate with stainless steel setscrew.
    b. Concealed Wall Plate: 16 gauge stainless steel.
    c. Cap: 10 gauge stainless steel, welded to support arm.

E. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick; B-254.
2. Mounting: Surface mounted.
3. Receptacle: Removable.

4. Material and Finish: Stainless steel, No. 4 finish (satin).

    a. Cabinet: 22 gauge stainless steel, all-welded construction. Provide towel tray with hemmed opening to dispense towels without tearing.

    b. Door: 22 gauge stainless steel, secured to cabinet with a full-length stainless steel piano-hinge.

    c. Disposal Panel: 22 gauge stainless steel with bottom edge hemmed for safety. Panel is secured to door with a spring-loaded, full-length stainless steel piano hinge. Equip with the international handicapped accessible graphic symbol for identifying sanitary napkin disposal.

    d. Waste Receptacle: Leak-proof, rigid molded polyethylene, with a 1.2 gallon capacity.

2.2 BATHROOM ACCESSORIES (DISTRICT STANDARD)

A. Product Installation: Subject to compliance with requirements, contractor to provide blocking and installation of owner supplied products below. Products will be provided by the owner to the job site for installation by the contractor.

1. Toilet Tissue (Roll) Dispenser:

    a. Basis-of-Design Product: Geogia-Pacific; 56509.

    b. Description: Double-roll dispenser.

    c. Mounting: Surface mounted.

2. Towel (Roll) Dispenser:

    a. Basis-of-Design Product: Hillyard; PAP432190.

    b. Description: Hands-free roll towel dispenser.

    c. Mounting: Surface Mount.

3. Liquid-Soap Dispenser:

    a. Basis-of-Design Product: Hillyard; HIL22304.

    b. Description: One dispenser with 4 output options

    c. Mounting: Surface mounted.

    d. Capacity: 42 fl oz.

2.3 CUSTODIAL ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide products indicated by Bobrick Washroom Equipment, Inc. or a comparable product by one of the following:

1. AJW.

2. American Specialties, Inc.
3. Bradley Corporation.

B. Mop and Broom Holder:

1. Basis-of-Design Product: Bobrick; B-224.
2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
3. Length: 36 inches.
4. Hooks: Three.
5. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
6. Material and Finish: Stainless steel, No. 4 finish (satin).
    a. Shelf: Not less than 18 gauge stainless steel.
    b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.4 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
    a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
    b. Comply with ICC A117.1.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.5

2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.

D. Verify that field measurements are as indicated on drawings.

E. See Section 09 22 16 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F446.

3.4 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.5 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 104116 - EMERGENCY KEY BOXES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fire department lock boxes for emergency key storage.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for specified specialty items, marked to clearly show products to be furnished for this project.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

PART 2 PRODUCTS

2.1 FIRE DEPARTMENT LOCK BOX

A. Fire Department Lock Box: Heavy-duty, type as recommended by fire department, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers.

1. Application: Building mounted locations.
2. Capacity: Holds 10 keys.
3. Finish: As selected by Architect from manufacturer's standard options.
4. Include location stickers as required by local jurisdiction.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specified items in accordance with manufacturer's instructions and applicable jurisdictional requirements.

1. Confirm required location with authority having jurisdiction prior to installation.

B. Use templates provided by item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

D. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as required for proper installation and operation.

E. Install at 5'-0" above finish floor or as otherwise indicated by Authorities Having Jurisdiction.

3.2 ADJUSTING

A. Adjust hardware for smooth operation.

B. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

C. Replace units which cannot be adjusted and lubricated to operate freely and smoothly.

3.3 PROTECTION

A. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.3 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.4 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

B. FM (AG) - FM Approval Guide.

C. NFPA 10 - Standard for Portable Fire Extinguishers.

D. UL (DIR) - Online Certifications Directory.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product data for each item.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.6 QUALITY ASSURANCE

A. Basis of Design: Specifications are based on specialty types and model numbers by the specified basis of design manufacturer. Specialty types manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements, and provided that deviations in dimensions and profile are minor, and do not detract substantially from the indicated design intent.

1.7 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:
1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
2. Ansul, a Tyco Business: www.ansul.com/#sle.
3. Fire-End & Croker Corporation: www.croker.com/#sle.
4. Kidde, a unit of United Technologies Corp.: www.kidde.com.
5. Larsen's Manufacturing Co.: www.larsensmfg.com.
6. Oval Brand Fire Products: www.ovalfireproducts.com/#sle.
7. Potter-Roemer: www.potterroemer.com/#sle.
8. Pyro-Chem, a Tyco Business: www.pyrochem.com.
9. Substitutions: See Section 016000 - Product Requirements.

B. Basis of Design - Cabinets:
1. Larsen's Manufacturing Co.: www.larsensmfg.com.
a. Fire Extinguisher Cabinets: Architectural Series, 2409 semi-recessed.

C. Other Acceptable Cabinet Manufacturers:
1. Activar Construction Products Group: www.activarcpg.com/#sle.
2. Fire-End & Croker Corporation: www.croker.com/#sle.
3. Kidde, a unit of United Technologies Corp.: www.kidde.com.
4. Oval Brand Fire Products: www.ovalfireproducts.com/#sle.
5. Potter-Roemer: www.potterroemer.com/#sle.
6. The Williams Brothers Corporation of America: www.wbdoors.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.

1. Stored Pressure Operated: Deep Drawn.
2. Class: A:B:C type.
3. Size: 5 pound 10 pound.
4. Finish: Baked polyester powder coat red color.
5. Temperature Range: -65 degrees F to 120 degrees F.

C. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.

1. Class: K type.
2. Size: 1.6 gallons.
3. Finish: Polished stainless steel.
4. Temperature range: Minus 20 degrees F to 120 degrees F.

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Fire Rated Cabinet Construction: Fire rating to match wall rating.

1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

D. Cabinet Configuration: Semi-recessed type, unless otherwise indicated or specified.

1. Sized to accommodate scheduled items and accessories.
2. Semi-Recessed Cabinets: Maximum 4 inch projection from wall surface, including handles and other components.
3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

1. Glazing Style: Provide Vertical Duo door.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: Baked enamel, white color.

I. Finish of Cabinet Interior: White colored enamel.

2.4 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced red lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Fire Extinguisher Cabinets: Install cabinets plumb and level in wall openings, maximum 30 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Mount extinguishers as scheduled.

E. Position signage at locations required by Authorities Having Jurisdiction.

3.3 SCHEDULES

A. Dry Chemical Type: Class ABC.
   1. Locations: All areas except food service areas.
   2. Mounting: In cabinets, except use wall brackets in areas not accessible to public and where cabinets are not shown.

B. Wet Chemical Type: Class K.
   1. Locations: Food service kitchen.
   2. Mounting: Wall bracket mounting.

END OF SECTION

SECTION 105116 - WOOD LOCKERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Wood lockers.

1.3 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood base construction.

B. Section 061000 - Rough Carpentry: Wood blocking and nailers.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

E. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes, fittings, and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan, combination lock code, and key codes.

D. Samples: Submit two samples of wood veneer panel, 6 by ____ inch in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store lockers in a dry, ventilated area until ready for installation.

1.8 FIELD CONDITIONS

A. Ambient Conditions: Maintain temperature and relative humidity within range recommended by wood locker manufacturer during and after installation of lockers.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Jonti-Craft, Inc.: www.jonti-craft.com/

B. Substitutions: See Section 016000 - Product Requirements.

2.2 LOCKER APPLICATIONS

A. Open-Front Student Lockers: Wood veneer-faced lockers, free-standing with matching closed base.

1. Configuration: Single tier.
2. Dimensions:
    a. Height and Width: Manufacturer's standard.
    b. Depth: Sufficient to prevent tipping.
3. Fittings:
    a. Hat shelf.
    b. Hooks: One double prong.
    c. Single shoe shelf.
4. Basis of Design Products:

a. Standard Lockers: Neat-N-Trim 2687JC.

b. Large Lockers: Trim-N-Tidy 2713JC.

2.3 WOOD LOCKERS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Accessibility: Comply with ICC A117.1 and ADA Standards.

C. Lockers: Factory assembled, made of hardwood plywood panels with dowleled and glued joints; fully finished inside and out; each gang of lockers capable of standing on its own.

1. Species: Manufacturer's standard..
2. Wood Finish: Manufacturer's standard stain and clear sealer.
3. Interior Finish: Match locker exterior wood species and finish.
4. Edge Profiles: Radiused, smooth.
5. Toe Kick: Size and proximity to floor sufficient to prevent pinching of hands and feet.
6. Where locker ends or sides are exposed, finish the same as fronts or provide extra panels to match fronts.

D. Component Thicknesses:

1. Doors: 3/4 inch minimum thickness.
2. Locker Body: Tops, bottoms, sides, and shelves 3/4 inch; backs 1/2 inch; minimum.
3. Toe Kick Plates: 1/2 inch minimum thickness.

E. Coat Hooks: Stainless steel; attached with tamperproof screws.

2.4 MATERIALS

A. Adhesives Used for Assembly: Comply with VOC requirements for adhesives and sealants; see Section 016116.

B. Wood-Based Materials:

1. Certified as sustainably harvested; see Section 016000.
2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

C. Hardwood Plywood: Veneer core; HPVA HP-1 grade as indicated, species as indicated, clear, compatible grain and color, no defects.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases and embedded anchors are properly sized.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Place and secure on prepared base.

C. Install lockers plumb and square.

D. Secure lockers with anchor devices to suit substrate materials.

E. Bolt adjoining locker units together to provide rigid installation.

F. Touch up damaged finish to match original, using materials provided by fabricator; replace components that cannot be refinished like new.

G. Replace components that do not operate smoothly.

3.3 CLEANING

A. Clean locker interior and exterior surfaces.

END OF SECTION

SECTION 107516 – GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section includes:

1. Ground-set flagpoles made from aluminum.
2. American Flag.

B. Related Sections:

1. Division 00 Section “Subsurface Information” for geotechnical report.
2. Division 03 Section “Site Cast-in-Place Concrete” for flagpole footing.
3. Division 26 Section “Exterior Lighting” for lighting attached to flagpole.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include

documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.

1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is New Haven, Connecticut.
2. Base flagpole design on polyester, nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone or Entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Flagpole.
    b. Eder Flag Manufacturing Company, Inc.
    c. Morgan-Francis Flagpoles and Accessories.
    d. Pole-Tech Company Inc.

B. Exposed Height: 30 feet (9 m).

C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

D. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

E. Cast Aluminum Base: Provide cast aluminum octagonal base Model No. MF 3380-1 with anodized finish to match color of flagpole as manufactured by Morgan-Francis Flagpoles and Accessories, 9850 East 30th Street, Indianapolis, IN 46229 (800) 814-9568 or approved equal.

2.4 FITTINGS

A. Cast Aluminum Ball Finial: Sized as indicated.

1. Cast aluminum with gold anodic finish.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.
2. Plastic Halyard Flag Clips: Made from injection-molded, UV-stabilized, acetal resin (Delrin). Clips attach to flag and have two eyes for inserting both runs of halyards. Furnish two per halyard.

    a. Product: Subject to compliance with requirements, provide "Quiet Halyard" flag clasp by Acme/Lingo Flagpoles LLC.

C. Flagpole Lights

1. Basis-of-Design Product: Subject to compliance with requirements, provide Weatherproof Flagpole 12-inch LED Downlight as manufactured by Eagle Mountain Flag & Flagpole or a comparable product, as approved by the Landscape Architect:
2. Requirements:

    a. As indicated on Site Lighting Schedule on Site Electrical Drawings.
    b. Housing Material: Cylinder fabricated from 6063-T6aluminum.

c. Mounting Bracket: Cast aluminum that fits snuggly to butt diameter of flagpole.
d. Wiring: Internal to flagpole with electrical harness.
e. Lights: Manufacturer's standard light fixture configured for downward illumination.
f. Truck Finish: To match flagpole
g. Dome Finish: Gold
h. Power Supply: In-ground driver adjacent flagpole.

D. American Flag:

1. Material: Nylon.
2. Construction: Sewn stripes, embroidered stars, constructed with heavy canvas heading material, 4 rows of stitching at the fly end, and rugged brass grommets. Flag shall be designed for outdoor use and to resist fading and fraying.
3. Size: 4 feet by 6 feet.

2.5 MISCELLANEOUS MATERIALS

A. Drainage Material: Crushed stone or crushed or uncrushed gravel; coarse aggregate.

B. Elastomeric Joint Sealant: Multicomponent nonsag urethane, single-component nonsag urethane, or single-component neutral-curing silicone joint sealant as recommended by flagpole manufacturer and complying with requirements in Section 07 9200 "Joint Sealants."

PART 3 - EXECUTION

3.1 PREPARATION

A. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

B. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.

C. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to reinforcement.

D. Place concrete, as specified in Section 03 3000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

E. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

B. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten

retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107516

SECTION 108210 - EQUIPMENT SCREENS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Pre-formed metal panel equipment screens.

B. Attachment frame system.

C. System accessories.

D. Design engineering of equipment screen system.

1.3 RELATED SECTIONS

A. Section 051200 - Structural Steel Framing : Structural framing to support screen panels.

B. Section 075323 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM): Flashing of screen support roof penetrations.

C. Section 084113 - Aluminum-Framed Entrances and Storefronts: Framing color requirements for equipment screen cladding to match.

1.4 PRICE AND PAYMENT PROCEDURES

A. See Section 012300 - Alternates, for product alternates affecting this Section.

1.5 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

1.6 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this Section.

1. Require attendance of parties directly concerned with the work of this Section, including those who are required to coordinate with the work, and those who are required to protect the work upon completion. Include the manufacturer's technical representative.

2. Review installation procedures and coordination required with related work, and conditions which could affect successful performance of the Work.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate system and panel layout plan and elevations, component connection details, clearance dimensions, tolerances, frame details, and details of interface with adjacent construction and equipment.

C. Product Data: Provide data describing system characteristics, standard detail sheets, and system limitations.

D. Selection Samples: Submit samples of available panel colors for selection.

E. Certificate: Submit manufacturer's certification that products meet or exceed specified requirements.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum three years of experience.

C. Perform design under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State in which the Project is located.

D. Basis of Design: Drawing details are based on screen and support profiles by specified basis of design manufacturer. Similar profiles by other acceptable manufacturers are permitted, subject to compliance with all specified performance characteristics, and provided that deviations in dimension, profile, performance, and finish are minor and do not detract from the indicated design intent.

1.9 DELIVERY, STORAGE, AND PROTECTION

A. Provide wrapping to protect pre-finished panel surfaces. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Equipment Screen Framing System Manufacturer:
   1. RoofScreen Manufacturing; SC3 Frame: www.cityscapesinc.com.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Basis of Design Metal Wall Panel Manufacturer:
   1. Morin Corporation; Exposed Y-29, Profile B: www.morincorp.com/.
   2. Substitutions: See Section 016000 - Product Requirements.

2.2 EQUIPMENT SCREEN FRAMING SYSTEM

A. General: Provide factory-formed modular framing system designed to be field assembled and mechanically attached to roof structures to support equipment screen panels.

B. Modular Frame, Cantilevered Three-Member System: Formed with high-strength galvanized steel tubing and stainless steel connectors.
   1. Framing Tubing: 2.5-inch O.D. galvanized steel.
   2. Wall Thickness: As determined by manufacturer's structural engineering calculations.

C. Connector Fittings: Formed ANSI Type 304 Stainless Steel with telescoping design.

D. Base Attachment: Welded steel base support with stainless steel cap and EPDM gaskets for compression seal.

E. Hardware: 18-8 Stainless Steel bolts/nuts; corrosion-resistant coated carbon steel screws.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

B. Box Rib Profile, Exposed-Fastener, Perforated, Metal Wall Panels: Formed with raised, box-shaped ribs, evenly spaced across panel width, and with rib/recess sides angled 60 degrees or more.
   1. Aluminum Thickness: 0.050.
   2. Rib Spacing: 7-3/16 inch, on center.
   3. Panel Coverage: 29 inch, minimum.
   4. Panel Depth: 1-1/2 inch.

2.4 DESIGN REQUIREMENTS

A. General: Design system to resist snow, wind, suction, and uplift loading at any point in the system without damage or permanent set.

B. Regulatory Requirements: Comply with requirements of building authorities having jurisdiction in Project location.

C. Design Criteria:

1. Rooftop Equipment Screens:

a. The manufacturer is responsible for the structural design of all materials, assembly, and attachments to resist snow, wind, suction, and uplift loading at any point without damage or permanent set.

b. Framing shall be designed in accordance with the Aluminum Design Manual to resist the minimum loading criteria according to ASCE 7.

c. Minimum Clear Space Between Equipment and Screen: 36 inch nominal.

d. Screen Heights: As indicated on drawings.

e. Screens Mounted to Steel Posts: Posts must be set no further than 96 inches on center.

2.5 MATERIALS

A. Square Base Supports: Weldments fabricated from cold rolled steel conforming to ASTM A 1008, fabricated with pre-punched holes in base plate for fastening to roof structure. After fabrication, apply minimum 2 to 4 mil baked on powder coat primer.

1. Height: Varies by roof assembly thickness, slope, and required clearance as indicated on drawings.

B. Square Base Support Extensions: Fabricated from same material and finish as base supports.

1. Height: 8 inches.

C. Square Base Cap: Weldments fabricated from AISI Type 304 stainless steel with mill finish, and fabricated to overlap base support and flashing boot a minimum of 2 inches (51 mm). Provide moment resisting adjustable connection to attach framing to base cap.

D. Square Post Support: Weldments fabricated from galvanized steel tube conforming to ASTM A 500 and cold rolled steel plate conforming to ASTM A36, fabricated with pre-punched holes in base plate for fastening to roof structure. After fabrication, apply minimum 2 to 4 mil shop primer to base plate and weld.

E. Square Post Cap: Saddle - AISI Type 304 Stainless Steel, 11ga. Connective tube- AISI Type 304 Stainless Steel, 11 ga. Fabricated to overlap base support and flashing boot a minimum of 2 inches (51 mm).

F. Roof Flashing: As specified in Section 075323 - Ethylene-Propylene-Diene-Monomer Roofing (EPDM).

G. Base Cap Gasket: EPDM with self-adhesive closed cell foam.

H. Framing: Carbon or galvanized steel structural tubing in manufacturer's standard sizes, conforming to ASTM A 500 and/or ASTM A787 with manufacturer's standard galvanized coating conforming to ASTM A 1057; provide with wall thickness as determined by structural calculations.

I. Connector Fittings: Fabricated from AISI Type 304 stainless steel with mill finish.

J. Steel Girts: Steel tube conforming to ASTM A 500 and/or A 787, with a G90 hot-dip galvanized coating.

K. Steel Hat Channel: Steel sheet conforming to ASTM A 653, Class SS, with a G90 hot-dip galvanized coating per ASTM A 1057.

L. Hardware: Bolts, nuts and washers: 18-8 stainless steel.

M. Self-Drilling Screws: Carbon steel with factory applied protective coating conforming to ASTM B 117 salt spray testing.

N. Welding Materials: AWS D1.1; type required for materials being welded.

O. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Finish: Superior performing organic coatings.

a. Factory finish all surfaces that will be exposed in completed assemblies.

b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

d. Color: Custom match to storefront framing.

P. Trim and Closures:

1. Material: Aluminum.
2. Thickness: 0.050.
3. Finish: Superior Performing Organic Coatings System.

2.6 ACCESSORIES

A. Fasteners and Anchors: Stainless steel type; sized and configured to comply with design requirements.

B. Panel Accessories: Provide components required for a complete system including trim, copings, fascia, sills, corner units, clips, flashings, sealants, fillers, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer

C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.7 FINISHES

A. Cladding:

1. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.

2. Color: Custom; match to storefront framing.

2.8 FABRICATION

A. Framing:

1. Fit and shop assemble items in largest practical sections, for delivery to site.

2. Fabricate items with joints tightly fitted and secured.

3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

4. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

5. Fabricate system components so that portions of screen can be dismantled for repairs to equipment being screened and for future roof replacement.

B. Panels:

1. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

2. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate in accordance with equipment manufacturer's written instructions and to comply with details shown.

3. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

4. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that prevent metal-to-metal contact, and that minimize noise from movements.

5. Sheet Metal Flashing and Trim: Fabricate trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

   a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

   b. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

   c. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

   d. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

      1) Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment items and associated curb supports are ready to receive work and unit dimensions are as indicated on shop drawings.

3.2 FRAMING INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide for erection loads, and for sufficient temporary bracing to maintain indicated alignment until completion of erection and installation of permanent attachments.

D. Anchor fabrications to structure as indicated.

E. Separate dissimilar metals and use gasketed fasteners, isolation shim, or isolation tape to eliminate possibility of corrosive or electrolytic action between metals.

F. Exercise care when installing components so as not to damage finish surfaces. Touch up as required to repair damaged finishes.

G. Install flashing boots at base supports as required to provide a watertight connection. Install as recommended by the roof membrane manufacturer.

H. Remove all protective masking from material immediately after installation.

3.3 PANEL INSTALLATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

B. General: Install metal panels in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to support structure unless otherwise indicated. Allow provisions in the assembly for thermal and structural movement.

C. Shim or otherwise plumb substrates receiving metal panels.

D. Install screw fasteners in predrilled holes.

E. Locate and space fasteners in uniform vertical and horizontal alignment.

F. Install flashing and trim as metal panel work proceeds.

G. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

H. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

I. Fasteners: Use stainless steel fasteners.

J. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

K. Lap-Seam Metal Panels: Attach metal panels to supports with fasteners at each lapped joint at location and spacing within the panel profile recommended by manufacturer.

L. Follow manufacturer’s standard Installation Guide.

M. Install components required for a complete metal panel system including trim, copings, corners, seam covers,, sealants, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

N. Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated.

O. Install exposed trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal trim to fit substrates.

P. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 ft. (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.5 CLEANING

A. Clean surfaces and components immediately prior to Substantial Completion.

END OF SECTION

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SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2

1.3 SECTION INCLUDES

A. Kitchen appliances.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate clearance requirements and utility service rough-in locations with casework in which appliances are to be installed.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Installation Instructions: Submit manufacturer's printed installation instructions for each appliance type, including clearance requirements and utility service location requirements.

D. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

D. Basis of Design: Specifications are based on appliance models and types by the specified basis of design manufacturer. Appliances manufactured by other acceptable manufacturers are permitted, subject to compliance with all specified requirements; and provided that deviations in dimensions, sizes, style, function, and finish are minor, and do not detract substantially from the indicated design intent.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

PART 2 PRODUCTS

2.1 KITCHEN APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator: Free-standing, top-mounted freezer, frost-free.
   1. Capacity: Total minimum storage of 20 cubic ft; minimum 25 percent freezer capacity.
   2. Features: Include glass shelves.
   3. Finish: Porcelain enameled steel, color as indicated.
   4. Acceptable Manufacturers:
      a. Frigidaire Home Products; FFHT2045XS: www.frigidaire.com/#sle.

C. Microwave: Countertop.
   1. Capacity: 2.2 cubic ft.
   2. Power: 1,100 watts.
   3. Features: Include turntable.
   4. Exterior Finish: Stainless steel.
   5. Acceptable Manufacturers:
      a. GE Appliances; PCT22U1WSS: www.geappliances.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.2 MEDICAL APPLIANCES

A. Pharmaceutical Refrigerator: Undercounter.
   1. General: Provide a 24-inch wide, built-in undercounter all-refrigerator designed for vaccine and pharmaceutical storage, complying with CDC and VFC guidelines; ADA compliant with a maximum cabinet height of 32 inches for installation under lower counters.

2. Capacity: 5.5 cubic feet.
3. Performance & Controls:
    a. Temperature Range: Fixed operating range of 2 to 8 degrees C (35.6 to 46.4 degrees F).
    b. External Monitoring: Front-mounted digital microprocessor with NIST-calibrated temperature display (Celsius/Fahrenheit switchable) showing current, minimum, and maximum temperatures.
    c. Alarm System: High/low temperature audible alarm with buffered temperature probe encased in a glycol-filled bottle for accurate simulated product temperature.
    d. Cooling: Internal fan-forced cooling for even temperature distribution and automatic defrost for reduced maintenance.
    e. Defrost: Automatic.
4. Features & Construction:
    a. Exterior: White fully finished cabinet with front-breathing design for built-in or freestanding use.
    b. Security: Factory-installed keyed lock located at the top of the solid door.
    c. LED lighting, three adjustable wire shelves, and a flat door liner for deep storage.
    d. Connectivity: Pre-installed 3/8-inch access port for external monitoring probes.
    e. Electrical: Hospital-grade power cord with ‘green dot’ plug.
5. Features:
    a. Door Swing: Standard Right-Hand.
    b. Data Logging: [Option DL2B] NIST-calibrated USB digital data logger with LCD display.
    c. Self-Closing Door: Optional self-closing door mechanism to ensure temperature integrity.
    d. Power Failure Alarm: [Option PF1HG] Supplemental alarm for loss of power.
    e. WiFi Integration: [Option DL11B] WiFi-enabled temperature monitoring kit.
    f. Stainless Steel Finish: [Option SSK] Stainless steel kickplate.
6. Acceptable Manufacturers:
    a. Accucold Division, Felix Storch, Inc.; FF7LWBIMED2ADA: www.accucold.com.
    b. Substitutions: See Section 016000 - Product Requirements.

2.3 ACCESSORIES

A. Provide appliances with light bulbs, power cords, and other standard accessories supplied by the manufacturer or required for complete and functional installation of each appliance unit.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.3 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.4 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 11 40 00
FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division 01 Sections, apply to this Section.

1.2 SCOPE

A. Attention is directed to the detailed Item Specifications, which provide for minimum acceptable products. Item Specifications paragraphs may indicate materials or components that exceed the manufacturer's standards and are required for this project.

B. Cooperate and coordinate with others engaged on the project in order that work will progress on schedule.

C. Work to be performed under this Section is shown on Foodservice Equipment Drawings.

D. Install materials furnished under this Section, other than materials that are expressly noted for installation under other Sections. Installation work shall be performed by workmen compatible with those existent on the project site. Equipment shall be of the latest design; new and unused, unless indicated otherwise in the Item Specifications, complete with all standard parts for normal operations and including such accessories or materials as may be required to comply with these Specifications.

E. This Specification is to further describe and supplement the applicable Drawings. What is called for by either the Drawings and/or these Specifications shall be furnished and installed as part of this work. Any questions relative to discrepancies or omissions shall be submitted to the Architect.

F. Provide neatly punched openings or cutouts required to permit passage of plumbing and electrical services by related trades and to accommodate mounted switches and receptacles in the equipment.

1. Work in this Section shall include but shall not be limited to the following:
2. Catalog items of equipment.
3. Fabricated equipment other than catalog items.
4. Plumbing trim consisting of mechanical system components required for standard operation of equipment items such as faucets and waste outlets. Vacuum breakers shall be furnished for equipment where water is introduced less than 2 in. above flood level.
5. Electrical equipment forming an integral part of equipment items such as electric motors, heating elements, controls, switches, starters, temperature regulators and internal wiring to a control panel or switch, if mounted on the equipment.

G. Sustainable Design Intent: Comply with project requirements intended to achieve a rating, measured and documented according to the LEED Green Building Rating System, of the US Green Building Council.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Finished floor and walls, structural supports for all ceiling supported equipment, acoustical ceilings and related building.

B. Connecting piping, waste lines, traps and vent piping, complete with shut-off valves to all the equipment, and the rough-in for sanitary waste, domestic water, floor drains and plumbing fixtures except those provided under this Section, and related mechanical work.

C. Exhaust ventilating systems complete with blowers, ductwork, hangers, access panels, and insulation between the exhaust collars and the exhaust blowers.

D. External wiring; the mounting and wiring of motor starters, solenoid valves, switches and receptacles not integral with the equipment; mounting and wiring of walk-in refrigerated room ceiling mount light fixtures; wiring of walk-in refrigerated room interior evaporator coils; connecting conduit, and external connections to equipment to the building electrical distribution system.

1.4 SUBMITTALS

A. Submit Shop Drawings for approval in accordance with the General Conditions.

B. Stub-in drawings shall indicate the layout of equipment and dimensioned locations of all services to the equipment.

1. Hand drawn scale: 1/2 inch = 1’-0”.
2. CAD drawn scale: 1/4 inch = 1’-0”.
3. Stubbed services shall include electrical, hot and cold water, floor drains or floor sinks, solid wastes and exhaust collar connections. Point of connection services shall include steam supply, condensate return, gas connection and indirect waste connections. Service dimensions shall include height measured from finish floor.
4. Electrical and plumbing services shall be indicated and coordinated on the same drawing.
5. Call-outs for each stub point indicated at the point, or clearly keyed to a schedule on the same drawing.
6. Special conditions plan shall include all floor recesses, curbs and special wall construction indicated and dimensioned

C. Fabrication drawings shall be furnished for non-catalog items, showing plans, elevations and full construction details with gauges, components, fasteners, erection and connections. Drawings shall be to the minimum scale of 3/4 in. = 1 ft., 0 in.

D. Drawings for custom fabrication, refrigerated rooms, exhaust ventilators, and stub-in drawings shall each be individually submitted in separate drawing packages.

E. Standard items of equipment, not built-in or part of other assemblies shall be submitted for approval in the form of bound catalog cuts. Each cut shall include a

clearly marked item number, a listing of all optional accessories and finishes, and connection data.

F. Mechanical refrigeration system submittal shall include the firm name and address of the installation contractor and name of the qualified installer.

G. Energy Star - Specified Energy Star rated equipment and appliances shall serve as the standard for all types of equipment and appliances whenever possible. Kitchen Equipment Contractor shall clearly indicate that items are Energy Star rated both on the submittal cover sheet and manufacturer cut sheets.

H. Failure to comply with approved shop drawings shall be cause for rejection of an improperly built assembly.

1.5 SAMPLES

A. If the bidder's proposed equipment fabricator is unknown to the Consultant's office, immediately after award of contract, submit the following samples for selection and approval:

1. Section of table showing edge, bullnose, framing, fasteners, gusset, leg, and foot, all assembled.
2. Drawer assembly (will be returned for use on this project).

B. Work delivered to the job shall match approved samples.

1.6 GUARANTEES AND WARRANTIES

A. New equipment furnished for this facility shall be guaranteed for a period of not less than one calendar year beginning on the date of final acceptance of the work of this Section. In the case of a manufacturer whose standard warranty exceeds this period the longer period shall apply. Self-contained refrigeration units for reach-in refrigerators, freezers, ice cream chests and ice machines shall carry a five-year replacement warranty for the sealed unit. The guarantee shall protect against defective material, design and workmanship.

B. In addition to the guarantee called for under the General Conditions, this Contractor shall further agree that in the event of failure of any system or item of equipment or improper functioning of specified work during the guarantee period, he shall have "on call" competent service personnel available to make the necessary repairs or replacements of specified work promptly at no cost to the Owner. In the event that replacement of an entire item is required, the Owner will have the option of full use of the defective equipment until a replacement has been delivered and completely installed.

C. Furnish manufacturer's warranty for each item of standard equipment and a warranty on fabricated equipment. Submit guarantees and warranties to the Architect in accordance with conditions found in "Demonstration and Operating Instructions" paragraphs, contained in Part 3, this Section.

1.7 REGULATORY AGENCIES

A. Work shall be in accordance with the governing health, building and safety, and fire protection codes and regulations.

B. Standards of the National Sanitation Foundation (NSF) shall serve as guidelines for the work of this Section.

C. Electric equipment and accessories shall conform to the standards of the National Electric Manufacturers Association (NEMA), Underwriters Laboratories, Inc. (UL) or Electrical Testing Station (ETS).

D. Steam generating equipment and accessories shall conform to the standards of the American Society of Mechanical Engineers (ASME).

E. Gas fired equipment and accessories shall conform to the standards of the American Gas Association (AGA) and the American National Standards Institute (ANSI) Z83.11.

F. Energy Star - Specified Energy Star rated equipment and appliances shall serve as the standard for all types of equipment and appliances whenever possible.

1.8 EQUALITY OF MATERIALS AND EQUIPMENT

A. The base bid shall contain no substitutions to these drawings or specifications. Bidders may offer substitute equipment in a separate proposal, indicating the proposed model and sum to be added or deducted if the alternate item is accepted by the Owner. Each line item shall include delivery, installation and taxes. Decisions to accept or reject a piece of equipment shall be made by the Owner, and all decisions shall be final.

PART 2 - PRODUCTS

2.1 MATERIALS AND FINISHES

A. General

1. Metals shall be free from defects impairing strength, durability or appearance, made of new materials with structural properties to withstand strains and stresses to which normally subject.
2. Stock materials, patterns, products and methods of fabrication shall be approved provided that they conform to the requirements specified under Item Specifications.

B. Stainless Steel

1. Stainless steel shall be non-magnetic corrosion resistant chromium-nickel steel, Type 302 or 304 (18-8 Alloy), polished to a Number 4 finish where exposed, unless otherwise noted. Minimum gauges shall be as specified under Item Specifications.

C. Galvanized (Galvannealed) Steel

1. Galvannealed steel shall be commercial quality with tight coat of zinc galvanizing metal applied to a soft steel sheet, subsequently passed through a 1200 degree F. oven, resulting in a spangle free paintable surface. Minimum gauges shall be as specified under Item Specifications.

D. Plastic Laminate Materials

1. The laminate facing shall be GP-50, .050 in. thick, general purpose, high pressure, decorative plastic laminate that meets or exceeds the requirements of NEMA Publication LD3-1985, and NSF Standard 35. The plastic laminate

exposed surfaces shall be provided in accordance with the specified manufacturer, finish and color. Balancing sheet shall be backing grade GP-28 in matching color at semi-exposed and BK-20 unfinished where hidden.

2. Plastic laminate covered surfaces shall be factory fabricated with 3/4 in. thick core having plastic laminate facing on both faces and all edges, laminated with waterproof glue under pressure in accordance with the plastic laminate manufacturer's specifications.
3. The core shall be medium density phenolic resin particleboard conforming to ANSI A208.1, Type 2-M-2, 45 pound per cubic foot density minimum.
4. Provide veneer core plywood or solid hardwood edge banding for doors and vertical dividers or panels where hardware is attached to casework.
5. Hinges shall be articulated, spring loaded type equal to Grass CST65-170-F or Stanley, with quantity adequate to support the door without deformation. Do not provide handles on plastic laminate clad doors.

2.2 CONSTRUCTION

A. General

1. Flat metal work items of equipment, such as tables, sinks, or counter tops, and other non-catalog items described under Item Specifications, shall be manufactured by a food service equipment fabricator who has the plant, personnel and engineering facilities to properly design, detail and manufacture high quality food service equipment.
2. The equipment fabricator shall be subject to the approval of the Architect, Owner and Consultant. Refer to Paragraph 1.05, Samples.
3. Fabricated foodservice equipment shall be manufactured by one manufacturer, of uniform design, material and finish.
4. Equipment shall conform to the applicable requirements of current Federal, State, and Local Codes and Regulations.

B. Welding

1. The words "weld", "welded" or "welding" as used in this Section of the Specification shall mean that metal joints shall be continuously welded and the exposed parts ground smooth and polished to match adjoining surfaces. Welding electrodes shall match the material being welded.
2. Where spot welding is specified, the welds shall be a maximum spacing of 3 in. on center.
3. Where tack welding is specified, the pieces welded shall have 1/2 in. minimum lengths of welding material at 4 in. on center maximum spacing.

C. Grinding, Polishing and Finishing

1. Exposed welding joints shall be ground flush with the adjoining material and neatly finished to harmonize therewith. Wherever material has been depressed or sunken by a welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surfaces and, if necessary, again welded and ground to eliminate low spots. Ground surfaces shall be polished or buffed to a degree consistent with good workmanship. Coves shall be ground and polished to match adjoining material.
2. Care shall be exercised in grinding operations to avoid excessive heating of metal and discoloration. Abrasives, wheels, and belts used in grinding

stainless steel shall be iron free and shall have not been used on carbon steel. The texture of the final polishing operation shall be uniform and smooth. Grain direction shall be uniform, uni-directional for a total length of material. Cross grains and random polishing are not acceptable.

3. The general finish of equipment shall be consistent throughout the job. Brake ends shall be free of open texture or orange peel appearance, and where brake work mars the uniform finish of the material, the marks shall be removed by grinding and polishing, and finishing. Sheared edges shall be free of burrs, projections or fins to eliminate all danger of laceration. Mitered or bullnosed corners shall be neatly finished with the underedge of the material neatly ground to a uniform condition and in no case will overlapping material be acceptable. The equipment surfaces, where exposed, shall be finished to a grained Number 4 (satin) finish unless otherwise specified. An exposed surface shall include an inside surface, which is exposed to view when a swinging or sliding door is opened. Underside of shelves need not be satin finish unless otherwise specified.
4. Excessive distortion caused by welding shall be cause for rejection for that item of equipment.

2.3 BUY-OUT COMPONENTS

A. CASTERS: 5 in. diameter polyurethane tired, swivel, plate or stem mount to suit application, 300 pound capacity, brakes only if specified, NSF approved; Component Hardware C-21-3050 (plate/no brake), C21-3051 (plate/brake) C23-3350 (stem/no brake) or C23-3351 (stem/brake), or equal by Kason, or PDI Atlanta.

B. COUNTER LEGS: Stainless steel, 6 in. to 7-3/4 in. height adjustment; Component Hardware A72-0811, or A77-5048, or equal by Kason, or PDI Atlanta.

C. DOOR AND DRAWER PULLS: Stainless steel, full grip type with beveled edge, NSF approved for stud mounting in device, in horizontal attitude to meet NSF requirements; Component Hardware P63-1012, or equal by Kason, or PDI Atlanta.

D. DOOR HINGES: Stainless steel, lift off type, swedged knuckle for minimum clearance, nylon bearings; Component Hardware M75-1002 or equal by Kason, or PDI Atlanta.

E. DRAWER PANS: Molded plastic or fiberglass, 20 in. by 20 in. by 5 in. deep, NSF approved; Component Hardware S80-2020, or equal by Kason, or PDI Atlanta.

F. DRAWER SLIDES: Stainless steel, NSF approved, full extension, 200 pound capacity with stainless steel ball bearing wheels; Component Hardware S-52 series, or equal by Kason, or PDI Atlanta.

G. FAUCET SETS, DECK MOUNTED: Chrome plated cast bronze with 1/2 in. IPS eccentric flanged female inlets on 8 in. centers, removable cartridges, lever handles, and aerator tip on swivel nozzle or swivel gooseneck to suit the application; T&S Brass B-0221 (with B-0425-M connection kit) or B-0321-NPL, or equal by Component Hardware, Chicago, or Fisher.

H. FAUCET SETS, POTWASHING SINK: Chrome plated cast bronze with removable cartridges, 3/4 in. passages, eccentric flanged female inlets on 8 in. centers with LL street EL inlets with locknuts, four prong handles, 12 in. swing spout; T&S Brass B-0290 or equal by Component Hardware, Chicago, or Fisher.

I. FAUCET SETS, SPLASH MOUNTED: Chrome plated cast bronze with 1/2 in. IPS eccentric flanged female inlets on 8 in. centers, removable cartridges, lever handles, and aerator tip on 12 in. swing spout; T&S Brass, B-0231-CC or equal by Component Hardware, Chicago, or Fisher. Provide each with a mounting kit.

J. GUSSETS: Stainless steel, stepped side, fully closed, NSF approved, mild steel interior reinforcement, wide flange for welding to framing, set screw anchor for leg; Component Hardware A20-0206C, or equal by Kason, or PDI Atlanta.

K. LEG AND BULLET FOOT ASSEMBLIES: Stainless steel tubing, 16 gauge, number 4 finish, adjustable bullet foot with minimum of 3 in. vertical travel, 2,000 pound capacity, top designed for mounting in gusset, length to suit application; Component Hardware A46-6272-C, or equal by Kason, or PDI Atlanta.

L. LEG AND FLANGED FOOT ASSEMBLIES: Stainless steel tubing, 16 gauge, number 4 finish, adjustable bullet foot with 3-1/2 in. diameter flange and two holes for securing to floor, minimum of 3 in. vertical travel, 2,000 pound capacity, top designed for mounting in gusset, length to suit application; Component Hardware A46-4272-C, or equal by Kason, or PDI Atlanta.

M. NUTS: Zinc plated "Pal Nuts" with integral cap and lockwasher; Component Hardware Q-34-1024 or equal by Kason, or PDI Atlanta.

N. SEALANT: Sealant for sealing equipment to walls or filling crevices between components. All materials listed below that are used in the building interior must not exceed the following requirements:

1. South Coast Air Quality Management District (SCAQMD) Rule #1168
2. For interior adhesives and sealants applied within the weatherproof barrier, submit a printed statement of VOC content.

O. SOUND DEADENING BASINS: Component Hardware Q75-1366 or equal by Kason, or PDI Atlanta.

P. SOUND DEADENING TOPS AND SHELVES: Component Hardware Q85-5225, or equal by Kason, or PDI Atlanta, "Tacky Tape" installed between all channel or angle reinforced tops, drainboards or undershelves.

Q. WASTE OUTLETS, CRUMB CUP: Stainless steel body, removable crumb cup stopper, gasket, coupling nut and sealing washer, 1-1/2 in. IPS, and optional 4 in. long nickel plated brass tailpiece with gasket; Component Hardware E38-1010, or equal by Kason, or PDI Atlanta.

R. WASTE OUTLETS, LEVER OPERATED: Cast stainless steel rotary type with 1-1/2 in. NPS and 2 in. NPS threads, and removable beehive crumb-cup; Component Hardware DSS-8000 or equal by Component Hardware, Chicago, or Fisher.

S. WELD STUDS: Copper flashed steel with 10-24 threads, length to suit; Component Hardware Q-36, or equal by Kason, or PDI Atlanta.

T. GFCI RECEPTACLES: Pass & Seymour 2095-W, 115 volt, 20 amp GFCI Duplex Receptacle or equal.

2.4 FABRICATED COMPONENTS

A. Box Type Cabinet Construction

1. Sheet metal cabinet bases of box type construction shall be fabricated without general interior framing. Structural strength shall be achieved by the gauge of the metal and the formed angle and channel edges and corners. Vertical sections shall be closed. Cabinet base shall be fabricated of 18 gauge minimum of material specified at Item Specifications. Mount on counter legs or base as specified.
2. Intermediate shelf shall be fabricated of 16 gauge stainless steel with rear and sides turned up 1-1/2 in. tight to the cabinet sides. The front edge of shelf shall be turned down 1-1/2 in. and in 1/2 in. at 45 degrees and shelf spot welded in place. Reinforce underside with longitudinal 14 gauge channel on the centerline.
3. Bottom shelf shall be fabricated of 16 gauge stainless steel similar to the intermediate shelf except that the front edge shall be formed into a full width 1-1/2 in. by 4 in. welded in boxed channel. Rear edge shall be fitted with a full width channel. Underside shall be reinforced.

B. Counters and Drainboards

1. Counters, table tops and drainboards shall be 14 gauge stainless steel, of NSF construction, with edges per Item Specifications. Metal tops shall be made of the largest pieces available and shall appear as one piece with all field and shop joints reinforced and welded, ground and polished. Short pieces of metal will not be acceptable. Counter bends shall be not less than 1/8 in. radius. Wherever a fixture has a waste or drain outlet, the surface shall pitch toward the outlet.
2. Counters, table tops and drainboards shall be reinforced with channel or angle frame as specified in the Item Specifications. Framing shall be secured to the underside with sound deadening material sandwiched between the surfaces, weld studs, and nuts.
3. Wherever bolts or screws are welded to the underside of trim or tops, neatly finish the reverse side of the weld uniform with the adjoining surface of the trim or top. Depressions at these points will not be acceptable. Raise dimples and depressions by peening, or heating and shrinking, and grind and polish to present a flat surface.

C. Crossrails

1. Crossrails shall be not less than 1-1/4 in. outside diameter 16 gauge stainless steel tubing welded, ground and polished to a Number 4 finish. Crossrails shall be welded to legs at a height of 10 in. above finished floor, and shall extend from left to right between front legs, unless otherwise specified, and from front to back between all legs.

D. Drawer Assembly

1. Drawer assemblies shall consist of a removable drawer pan set in a removable 16 gauge stainless steel channel shaped drawer support frame with gusset plate reinforced corners.
2. Support frame shall have double pan front cover consisting of boxed 18 gauge stainless steel outer shell with welded corners, flush mounted recessed stainless steel pull, 20 gauge stainless steel back shell tack welded to outer shell with fiberglass sound deadening between. Drawer shall be provided with

rubber bumpers to quiet closing. Support drawer frame on full extension drawer slides.

3. Drawer shall be suspended from table in a three-sided, 16 gauge stainless steel enclosure with flanged-in bottom edges, banded lower front, flanged-out front side and top edges. All sharp corners shall be broken and any exposed exterior threads of slide mounting bolts shall be provided with solid metal acorn nuts.
4. Component Hardware S91-0020 with thermoplastic pan is considered as equivalent to the above specified construction.

E. Edges

1. Marine: Bumped up 1/2 in. at 45 degrees and turned down 1-1/2 in. and in 1/2 in. at 45 degrees; corners welded and square.
2. Raised roll: Coved up and rolled 180 degrees on a 1-1/2 in. diameter with 3 in. height; corners welded and rounded or coved.
3. Rolled: Rolled 180 degrees on a 1-1/2 in. diameter; corners welded and bullnosed.
4. Short (6 inch) splash on counters and tables: Coved up 6 in., turned back to wall or equipment 1 in. and down 1/2 in.; ends welded closed. Secure tight to face of wall with clips unless specified otherwise and seal joint.
5. Tall (10 inch) splash on preparation sinks, dishtables, counter, and tables: Coved up 8-1/2 in., turned back to wall or equipment 1-1/2 in. at 45 degrees and down 1/2 in.; ends welded closed. Secure 3 in. off face of wall with brackets unless specified otherwise.
6. Turn down: Turn down 2 in. and in 1/2 in. at 45 degrees; corners welded and square.

F. Framing of Tops, Drainboards, Undershelves

1. Channel: Reinforce with 1 in. by 4 in. by 1 in. 14 gauge galvannealed steel channels; stainless steel if exposed to view. Channels shall run front-to-back at all legs and longitudinally on the centerline. Cross and longitudinal members shall be welded into a single assembly at intersections and sharp corners shall be broken. Framing shall be secured to underside of tops with pairs of weld studs. Framing shall be installed maintaining NSF required clearance to adjacent vertical surfaces and edges of top. The following specified angle framing is considered superior to channel framing and may be used in its place.
2. Angle: 1-1/2 in. by 1-1/2 in. by 1/8 in. perimeter angle frame with crossmembers not over 30 in. on center. Framing shall be secured to top with weld studs, 18 in. on center maximum with three minimum studs on any single face of a table. Perimeter angle frame that is exposed to normal view, shall be stainless steel. Crossmembers and framing not unexposed to normal view shall be iron. Corners of angle frame shall be mitered, or notched and brake formed to form a closed corner. Corner gusset plates used for mounting of leg gussets shall be 1/8 in. thick and sealed to underside of the top. Iron framework joints shall be ground smooth, and shall be painted with a minimum of two coats of aluminum lacquer after degreasing. Framing shall be installed maintaining NSF required clearance to adjacent vertical surfaces and edges of top. Channel framing shall not be considered equal to specified angle framing.

3. Sound deaden all horizontal framed surfaces with material sandwiched between the framing and the bottom of the surface.

G. Hinged Doors

1. Hinged doors shall be double pan type stainless steel construction with 18 gauge exterior and 20 gauge interior, welded corners, and 1/2 in. fiberglass insulation for sound deadening. Each door shall be provided with a stainless steel recessed handle, and an adjustable tension door catch equal to Component Hardware M22-2430. Doors shall close against the bottom shelf and flush with body of equipment.
2. Louvered hinged doors for ventilation shall be fabricated of the same components and provided with a full perimeter 3 in. wide channel reinforcing frame on the interior face. Remaining face shall be die punched with drip-proof louvers fully utilizing the remaining flat metal or a stainless steel flattened expanded metal grille per Item Specifications.

H. Sinks and Sink Inserts

1. Unless otherwise specified, sinks including sink inserts built into tops of fixtures, shall be made of 14 gauge stainless steel with all vertical and horizontal corners rounded to a radius of approximately 3/4 in. with the intersections meeting in a spherical section. Sinks shall be integrally welded to fixture tops.
2. Sinks with two or more compartments shall have full height, 1 in. thick double wall partitions consisting of two pieces of stainless steel back-to-back so fabricated that each compartment will be a deep bowl with coved corners. Partitions shall be welded in place to the bottom, front and back of the sink with smooth rounded coved corners. Top edges of the partitions shall be continuously welded. The front of the sinks shall consist of a stainless steel smooth, flush apron, same gauge as the sinks. Bottom and rear of partitions shall be closed. Sink dimensions contained in Item Specifications are inside dimensions.
3. Sinks shall be provided with integral 14 gauge stainless steel drainboards when specified. Drainboards and sink basins shall be pitched toward waste outlets and shall be self draining. The underside of all sink basins shall sound deadened. Sink units shall be provided with an integral splash at walls. Provide the necessary holes for the mounting of faucet sets.

I. Sliding Doors

1. Sliding doors shall be double pan type stainless steel construction with 18 gauge exterior and 20 gauge interior, welded corners, and 1/2 in. fiberglass insulation for sound deadening. Each door shall be provided with a stainless steel recessed handle. Provide sliding doors with nylon roller bearing sheaves and overhead track components equal to Component Hardware B58-5523 and 5513 sheaves, B57 track, B62-1093 nylon door guides and B60-1086 door stops.

J. Undershelves

1. Undershelf in an open type table shall be 16 gauge stainless steel unless otherwise noted. Edges shall be turned down 1-1/2 in. and in 1/2 in. at 45 degrees with corners notched out to fit legs to which shelf shall be welded from underside. Line up all edges of shelf with centerline of legs. Reinforce underside with longitudinal 14 gauge channel on the centerline.

K. Wall Brackets

1. Dish tables, sinks and counters with sinks shall be securely anchored 3 in. off the face of the wall unless specified otherwise. Brackets shall be "Z" shaped and fabricated of 3 in. wide, 14 gauge stainless steel. Brackets shall be secured in a vertical attitude to the rear of equipment backsplash with weld studs, and to the wall with appropriate fasteners.
2. Counters that are specified tight-to-wall shall be secured in a hidden manner with steel clips, and the wall/fixture joint shall be sealed.

L. Wall Shelves

1. Wall shelves shall be fabricated of 16 gauge stainless steel, size per Item Specifications, with back and ends raised 1-1/2 in., front edges of ends angled back, all corners broken, and front turned down 1-1/2 in., and in 1/2 in. at 45 degrees. Shelf corners shall be welded, ground and polished. Mount shelf 1 in. off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48 in. on center maximum. Flag brackets shall have a web angle of 30 degrees, measured from horizontal.

2.5 ELECTRICAL EQUIPMENT AND WIRING

A. Under this Section, items of equipment having mounted electrical motors, electrical heating units, lighting fixtures, controllers, control stations, switches, receptacles and the like shall be internally wired as specified herein, terminating at a junction box mounted on the equipment and left ready for connection to the building electrical distribution system by the Electrical Contractor. Extra ceiling mount light fixtures for refrigerated rooms shall be delivered to Electrical Contractor for field installation and wiring. Connections to evaporator coils mounted inside refrigerated rooms shall be wired by the Electrical Contractor.

B. Provide openings or cutouts required to accommodate the switches and receptacles in the specified work, and the wiring in conduit from terminal blocks in junction boxes.

C. Electrically operated equipment and fabricator wiring shall conform to the requirements of Underwriter's Laboratories, Inc. Motors over one horsepower shall be equipped with overload protection.

D. Furnish wiring diagrams for equipment as requested by the Architect or Contractor.

2.6 ITEM SPECIFICATIONS

Item 1

MOP SINK CABINET

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts CMM-MC-D2 or equal by Julien Inc.

Size - 50" x 22-5/8" x 84" high; 12" deep mop sink basin

Construction - 16 gauge type 304 stainless steel sloped top at 5 degrees with edges turned down, 16 gauge stainless steel cabinet body, vented cabinet walls, 18 gauge double-pan hinged double doors with locks and “T” handles, two full depth adjustable intermediate shelves, one shallow depth adjustable 12” deep adjustable shelf and a fixed stainless steel bottom shelf on left side, adjustable hallow depth intermediate shelf, two mop holders, and mop sink with drain fitting and stainless steel strainer on right side, full stainless steel back panel with neatly punched holes spaced 8" on center for water connections. Sides of cabinet to be notched and extended where it meets to wall for tight installation avoiding conflict with coved flooring base material.

Installation - KEC to provide stainless steel trim as required to close off gaps at walls. Secure and seal to wall.

Accessories - Provide with T&S Brass B-2492 service faucet.

Item 2

MOP BUCKET

No work in this Section. Units provided by Owner.

Item 3

STAFF LOCKER, TWO-TIER

Quantity - 3

No work in this Section. Units provided by General Contractor.

Item 4

OFFICE DESK

No work in this Section. Units provided by General Contractor.

Item 5

WALK-IN COOLER

Make - American Panel or equal by Bally or Thermalrite

Size - 6'-9" x 8'-3" x 7'-10" high minimum inside dimensions; 7'-8" high after finished floor is installed by the General Contractor

Power - 1.1 KW - 120/60/1 to light fixtures, temperature monitor/alarm, and door defrost heater strip

Installation - The walk-in cooler shall be installed on 4" high screeds prior to installation of the finished floor, and shall be floorless type utilizing the finished floor provided by the General Contractor for its interior floor. Screeds shall be secured to the sub floor provided by the General Contractor with no exposed fasteners. Finished floor and setting bed shall be carried into cooler from the adjacent room and level to same, and shall have coved joints at all walls, turned up a minimum of 4".

Construction - All standard construction per the manufacturer, modified to meet the specific following points:

- Walls to be 4" thick with CFC free urethane foam insulation, UL Class 1 rated

- Cam type locking devices
- 34" x 76" minimum door clearance
- Polished hardware (hinges and latch to match)
- Three hinges on doors (to include one Kason 1248 spring assist hinge per door)
- Leveraged pull handle (mechanical advantage type, Kason 1236 or equal)
- Quarter turn inside safety release lever handle mechanism (not screw type)
- Prewired door sections with heater wires and light fixtures and switches
- Kason 1808 LED light fixtures
- Dial type thermometers at doors
- Model IC+ (with dry contacts) or Modularm 75LC temperature and HACCP monitoring system at doors. Cooler and freezer alarms to interconnect with access control system for alert monitoring. This Cintractor to provide each system with a pair of 22 gauge low voltage wires. Wires shall be installed by the Controls Contractor. Wires shall run from the dry contacts to the access control panel. Kitchen Equipment Contractor to verify length prior to purchasing. To avoid false triggering, provide a shielded two-conductor cable with the shield connected to the receiving equipment.
- NSF construction throughout with exception of buried floor panels
- Interior and exterior faces of doors and exposed exterior walls shall be provided with aluminum diamond tread plate protective material to a height of 48" above finished floor. Hold diamond plating up 6" from the finish floor to accommodate the coved base.

Minimum Cooler Insulation R-Values

Wall and Roof Panels (4 in.): R-29

Floors: R-25

Doors: R-32

Minimum materials - Interior wall surfaces shall be clad with white .038" pebble finished aluminum; the exterior surface shall be .038” pebble finish aluminum. The ceiling shall be finished in white polyester over 24 gauge galvanized steel. Interior floor shall be 14 gauge galvanized steel.

Accessories - Each door shall be provided with a heated vision panel, 14-1/2" x 23” constructed of three panels of tempered unbreakable glass, electrically heated, with sealed air spaces between. Provide matching trim strips and closure panels to adjoining surfaces, fabricated per details, made of largest pieces available to minimize number of joints, and installed in accordance with NSF Brochure 770202, Installation Manual for Walk-in Refrigerators and Freezers. Provide one total extra Kason 1808 light fixtures for mounting in the rooms and deliver to Electrical Contractor for field installation.

Guarantee - The walk-in refrigerated room panels shall be guaranteed for a period of ten (10) years from the date of approved installation for defects in materials and workmanship when subjected to normal use and service; remainder of rooms for one year.

Item 6

MECHANICAL REFRIGERATION SYSTEM

Make - Heatcraft, Bohn, Larkin, Climate Control, Chandler

Scope - Furnish and install complete refrigeration systems for the walk-in refrigerated rooms in accordance with the plans. The systems shall include condensing units, evaporator coils, piping, all specified accessories, and those components required to provide complete and satisfactory systems in accordance with accepted refrigeration practice.

Important: The installation work shall be performed by a fully qualified refrigeration contractor employing a certified mechanic fully trained in the installation of commercial refrigeration systems. Submittal shall list the installing company and the qualified system installer.

Piping - Furnish and install the interconnecting piping between the condensing units and their respective unit coolers. Piping shall be installed in a neat and workmanlike manner with adjustable hangers spaced at no more than ten foot intervals on horizontal runs; six foot intervals, vertical runs.

Line sizes shall be in accordance with ASHRAE standards and best refrigeration practice to assure proper feed to evaporator, avoid excessive pressure drop, and prevent excessive amounts of lubricating oil from being trapped in any part of the system. Line sizing shall be such that it will protect the compressor from loss of lubrication at all times, prevent liquid refrigerant from entering the compressor during operating or idle time, and maintain a clean and dry system.

Refrigeration piping shall be Type L, ACR grade, hard drawn seamless copper tubing, wrought type copper fittings, and silver soldered joints. Precharged lines are not acceptable.

Furnish and install sleeves for refrigerant and evaporator drain piping wherever piping passes through a wall or ceiling. Sleeves shall be non-conductive gray plastic tubing, with interior dimension sized at least 1/4" larger than piping, and shall be neatly packed with brine putty after installation.

Furnish and install condensate drain piping from the unit cooler to an open drain. Piping shall consist of not less than 7/8" Type L copper tubing, supported 36" on center maximum, in such a way that there will be 1" clearance between the wall and the tubing. Provide a union or slip fitting at the connection to the evaporator drain pan to allow easy disassembly for service and cleaning. Drain piping shall be pitched 1/4" to the foot and carried through the wall of the refrigerated area. It shall be trapped to prevent entry of warm air and insects to the refrigerated rooms and discharged to a floor drain with the code required air gap. The exposed drain piping shall be spray painted.

Provide an electric drainline heater tape in the freezer, with a length equal to five wraps per foot of length of the drainline located within the freezer compartment. Wrap and secure in accordance with manufacturer's recommendations.

Provide chrome plated escutcheon plates at all exposed points where piping penetrates the wall or ceilings.

Insulation - Suction lines for refrigerated rooms having a temperature above freezing shall be covered with 3/4" wall thickness closed cell HT Armaflex insulation with ultra violet radiation protection.

Suction lines for refrigerated rooms having a temperature below freezing shall be covered with 1" wall thickness closed cell HT Armaflex insulation with ultra violet radiation protection.

The insulation shall be applied to these lines in accordance with manufacturer's recommendations, and as they are being installed so that insulation will not be split. All joints shall be completely sealed with overlapping, cemented material to prevent the formation of frost on the lines.

Controls - Each evaporator shall be provided with an iNtelliGen electronic control as manufactured by Heatcraft Refrigeration. Provide each system with a pair of twisted 24 gauge low voltage wires, Belden 9841 or equal. Wires shall be installed by the Controls Contractor. Wires shall run from the dry contacts at the evaporators to the access control panel. Kitchen Equipment Contractor to verify length prior to purchasing. To avoid false triggering, provide a shielded two-conductor cable with the shield connected to the receiving equipment. The time clock and heater contactor shall be removed from the condensing unit. No control wiring will be required from evaporator to the condensing unit.

Refrigerant Testing - The entire system shall be pressure and leak tested at no less than 100 PSIG, cleaned and dehydrated by maintaining a vacuum of 500 microns or lower for a period of twelve hours. The required operating charge of refrigerant and oil, if necessary, shall be added and the entire system tested for performance. Each system shall be clearly marked as to the type refrigerant required.

Guarantee - The equipment shall be guaranteed to maintain the specified temperatures. All mechanical refrigeration equipment shall be mechanically guaranteed for a period of one year after date of acceptance by the Owner. The emergency service shall be provided free of charge, whenever necessary on a 24 hour, seven day-per-week basis during the guarantee period.

Any leaks that occur during the first year of operation after acceptance by the Owner, shall be repaired and the necessary refrigerant added at no expense to the Owner.

The year's service shall be provided by the installing company, and under no circumstances will the service policy be sublet to another refrigeration contractor. The name of the installer/service agency for the guarantee period shall be located at a prominent place on the condensing units.

The condensing units shall be provided with an additional four year parts warranty to commence upon the completion of the aforementioned guarantee, bringing the total parts warranty to five years.

Condensing Units - The condensing units shall consist of an EC energy saving motor with variable speed controller, compressor, refrigerant condenser, liquid receiver, compressor service valves, and a dual high-low pressure control. The units shall be as manufactured by Heatcraft Refrigeration.

The condensing units shall be outdoor type, wall mountable, and quiet type with an approximate 51 to 63 decibel rating at 100 percent fan speed. The compressor shall be Microchannel Coil Technology scroll type per schedule, and fitted with coated aluminum fin condenser, suction service valve, discharge service valve, compressor contactor, high and low pressure controls, receiver with fusible plug, liquid shut-off valve and charging port, mounted non-fused disconnect switch, waterproof electrical control box, discharge line vibration eliminator, weather resistant UL painted steel cabinet, access guard, liquid

line assembly, suction line filter and vibration eliminator, crankcase heater, and 1-1/2" high raised steel base.

Provide condensing units with 18" high support stands and mount on roof per Architectural drawings with all structural supports, roof penetrations and weatherproofing provided by the General Contractor.

Evaporator Coils - Each evaporator shall be provided with iNtelliGen electronic control as manufactured by Heatcraft Refrigeration, thermostatic expansion valve, and solenoid valve. The time clock and heater contactor shall be removed from the condensing unit. No control wiring will be required from evaporator to the condensing unit. iNtelliGen Controls to include iIC integration card for BMS connection direct to evaporator controls. iNtelliGen Controls to include iWC Webserver card for router connection direct to evaporator controls. Each evaporator coil shall be provided with a refrigerant leak detection system.

The freezer shall be provided with an automatic electric defrost system consisting of one evaporator coil as indicated in the schedule. Evaporator shall be low profile type six fins per inch complete with variable speed EC energy saving fan motors with controller. Coil shall be NSF and UL Listed.

The cooler shall be provided with one evaporator coil as indicated in the schedule. Evaporator shall be low profile type six fins per inch complete with EC energy saving fan motors. Coil shall be NSF and UL Listed.

Furnish and install 1/4" minimum diameter stainless steel threaded mounting rods for the hanging of the evaporator coils, with stainless steel washers and nuts on the interior ends, and reinforcing angle at the exterior top of the room. Plated steel running thread is not acceptable.

Item 7
COOLER EVAPORATOR COIL
Make - Bohn BEL0095AS6AMA
Power - 1.8 amps - 120/60/1
Specified as part of item 3 Mechanical Refrigeration systems.

Item 8
COOLER CONDENSING UNIT
Make - Bohn BCH0010MCACZ0017
Power - 7.2 amps - 208/60/3
Specified as part of item 3 Mechanical Refrigeration systems.

Item 9

MOBILE SHELVING UNIT, FOUR-TIER

Quantity - 6

Make - MetroMax Q or equal by Eagle

Size - (2) 48" x 21", (2) 42" x 21", (1) 36” x 21” and (1) 30" x 21", all 69" high on casters; four tier

Description - Shelving unit shall be all standard construction and shall consist of four shelves with removable injection molded polypropylene mats with antimicrobial product protection, supported on epoxy coated steel shelf frames and similar uprights with capped tops, and mounted on 5" diameter polyurethane tired swivel casters with donut bumpers.

Accessories - Provide with polymer posts in lieu of standard.

Item 10

EXISTING BUN PAN RACK

No work in this Section. Owner to relocate this equipment following completion of the project.

Item 11

STORAGE SHELVING, FIVE-TIER

Quantity - 4

Make - Metro Super Adjustable Super Erecta or equal by Eagle

Size - per plan x 74-5/8" high; five tier with bottom shelf up 14" clear above floor

Description - Unit shall be all standard construction with Super Adjustable Chrome plated wire shelves and tubular steel uprights with capped tops, adjustable feet, and 1" shelf height adjustment capability with Corner Release System. Each unit shall include four legs.

Item 12

DUNNAGE RACK

Quantity - 2

Make - Channel HD2048 or equal by New Age

Size - 48" x 20" x 12" high

Description - Dunnage platforms shall be all standard construction with extruded high tensile aluminum tubing with four horizontal tubes and four legs welded together, and each unit capable of supporting 2,500 pounds.

Item 14

EXISTING REACH-IN FREEZER

No work in this Section. Owner to relocate this equipment following completion of the project.

Item 15

UTILITY CART

Make - Lakeside 521 or equal by Kelmax or Channel

Size - 32-5/8" x 19-3/8" x 34-1/2"

Description - Cart shall be all standard NSF construction, fully welded stainless steel throughout, with top and bottom shelves supported by an angle frame, and mounted on two 8" fixed and two 5" swivel casters. Capacity of cart to be 650 pounds.

Item 16

HAND SINK

Quantity - 2

Make - Glastender WHS-14-S or equal by Advance Tabco

Size 14" x 15" x 14" high plus 7" rear splash

Plumbing - 3/8” hot and cold water; 1-1/2” direct waste

Description - 20 gauge type 304 stainless steel body with 6" deep bowl, heavy duty deck mounted faucet set, with 18 gauge wall hanging bracket. Hand sink included integral left and right side splashes with radius worksurface corners for cleaning and front lip to contain splash.

Accessories - Provide with a deck mounted gooseneck faucet set, 3" flat strainer type (non-basket, non-lever) open type waste, chrome plated tailpiece, "P" trap and clean-out cap, B-0199-02-F10 aerator tip in lieu of the standard. Provided end splashes welded to each side.

set, wall hanging bracket and built-in soap and towel dispensers.

Item 17

WASTE BIN

Quantity - 2

No work in this Section. Units provided by Owner.

Item 18

REACH-IN FREEZER

Make - Traulsen G12001 or equal by Continental

Power - 9.7 amps - 1/2 HP - 115/60/1 - cord and plug

Capacity - 23.4 cubic feet

Doors - Half height solid doors, left hinged

Description - Freezer shall be constructed with stainless steel exterior front and doors, anodized aluminum sides and interior, and galvanized steel top, back and bottom. Provide heavy duty all-metal construction with foamed-in-place polyurethane insulation. Unit shall include self-closing cam lift hinges with stay-open feature, cylinder door locks, lifetime guaranteed handles, and magnetic door gaskets. Interior shall include three (3) epoxy coated wire shelves with adjustable supports and automatic LED lighting. Provide anti-condensate door heaters.

Refrigeration system shall be top-mounted, self-contained using R-448A refrigerant with thermostatic expansion valve, air-cooled hermetic compressor, and evaporator located outside the food zone. Provide microprocessor controls with LED display maintaining 0°F to -5°F operating range. Include front-facing condenser coil and non-electric condensate evaporator.

Mount unit on 6" high locking casters.

Accessories - Provide tray slides as required and additional shelves as needed. Include standard 3-year parts and labor warranty with additional 2-year compressor warranty.

Item 19

PREP TABLE WITH SINKS

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 90" x 27" x 36" high to work surface plus 10" high splash at rear; two 18" x 20" x 10" deep integral sink basins

Construction - 14 gauge stainless steel top, basins and splash, channel reinforced, six legs with gussets and adjustable feet, partial undershelf, two crossrails, tall splash rear, and marine front and ends, secured 3" off face of wall.

Accessories - Drawer assembly, splash mounted faucet set and two 2" lever waste outlets. Provide a flat spot for mounting the manual can opener, fully weld the flat spot to the table spot leaving no gaps.

Item 20

WALL SHELF

Quantity - 2

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 72" x 12" mounted 54" and 60” above floor

Construction - Wall shelf shall be fabricated of 16 gauge stainless steel with back and ends raised 1-1/2", front edges of ends angled back, all corners broken, and front turned down 1-1/2", and in 1/2" at 45°. Shelf corners shall be welded, ground and polished. Mount shelf 1" off face of wall with suitable fasteners on 14 gauge stainless steel flag brackets, 48" on center maximum. Flag brackets shall have a web angle of 30° measured from horizontal.

Item 21

WASTE BARREL

Quantity - 3

No work in this Section. Units provided by Owner.

Item 22

CAN OPENER

Make - Edlund S-11 or equal by Vollrath or Nemco

Description - Opener shall be all standard construction with cast stainless steel body, base and blade. Install on table per plan.

Item 25

CEILING MOUNTED UTENSIL RACK

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 4'-6" x 24" mounted up 6'-6" and 7'-6" above floor

Construction - Rack shall be fabricated of 1/4" x 2" stainless steel bar stock throughout, fully welded construction, consisting of a two bar upper rail with full radiused ends, a single lower rail, reinforcing straps, and suspended from the overhead structure on four hangers. Provide unit with forty Component Hardware J77-4401 stainless steel double pot hooks.

Item 26

COUNTERTOP SIX PAN STEAMER

Make - Cleveland 22CGT6.1 or Groen

Size - 21-1/2" x 32-1/8" x 30" high on 4" high legs

Power - 35 watts - 120/60/1

Rating - 1/2" gas inlet at 32,000 BTU/hour

Capacity - Six 12" x 20" x 2-1/2" deep pans

Description - Atmospheric gas boilerless unit shall consist of a six pan compartment with 60 minute electro-mechanical timer with audible signal and switch for manual operation. Cooking compartment shall be coved corner stainless steel construction with insulation and equipped with a two piece door with floating inner piece and reversible gasket. Base cabinet to have stainless steel top, sides, and front and include a flue back.

Accessories - Provide unit with 34" high stainless steel equipment stand (UNISTAND34).

Item 27

WATER FILTER ASSEMBLY

Make - 3M ScaleGard HT SF165 Modified or equal by Pentair

Description - Unit shall be all standard construction designed for wall mounting behind the Cleveland steamer and consisting of a mounting bracket, quarter-turn cartridge release mechanism, manifold with integral pressure gauge, integral quarter turn shut-off valve, outlet check valve, filter cartridge with internal prefilter membrane and external scale feeder cartridge. Provide with HF95-CLX chloramine reduction filter cartridge in lieu of standard HF65 cartridge.

Accessories - Provide four spare HF95-CLX filter cartridges and four spare HF8-S cartridges.

Item 28

EXISTING SIX-BURNER RANGE

No work in this Section. Owner to relocate this equipment following completion of the project.

Item 29

DOUBLE CONVECTION OVEN

Make - Blodgett ZEPHAIRE-200-G-ES Double or equal by Vulcan or Montague

Size - 38-1/4” x 46” to include fan motor by 70-5/8” high

Power - (2) 8 amps - 3/4 HP - 120/60/1 - cords and plugs

Rating - 3/4" gas inlet at 100,000 BTU/Hour

Description - Units shall be all standard construction with stainless steel front, sides and top, porcelain enameled steel interior with 29" x 28-1/4" x 20" high inside dimensions, 1” solid block insulation and 1" thick mineral fibre sheet insulation for 2” on insulation on top, back and sides, simultaneously operating doors with stainless steel framed dual pane thermal glass windows, removable rack supports capable of holding eleven racks and five chrome plated steel wire racks, electronic ignition with fail-safe controls, solid state manual controls with separate dials for temperature and time settings, timer with buzzer, removable dual tube burners, pressure regulators, two-speed blowers with thermal overload protection and door interlock, and interior lighting with two halogen bake oven lamps. Provide standard one year parts and labor warranty on the total oven and additional three year warranty on the door assembly, parts only.

Accessories - Mount on heavy duty swivel casters. Manifold the two ovens for a single gas connection. Provide assembly with a 48" long x 3/4" line size Dormont 1675 KIT2S plastic covered hose assembly with full port gas ball valve, two Supr-Swivels, brass

disconnect, 90° street elbow and restraining cable. Mount the nipple on the rear of the oven, and the hose assembly with disconnect device connected to the building supply line.

Item 30

EXHAUST HOOD

Make - Captive Aire or equal by Gaylord

Size - 10'-3" x 60" x 24" high plus 4" high collars, mounted up 6'-8" above finished floor; flat bottom

Power - 0.8 KW - 120/60/1 to lights; remote controller provided and installed by Electrical Contractor.

Exhaust - 2,200 CFM exhaust through a 14" dia. collar at -0.969" static pressure. Blower, control switch, and ductwork provided and installed by Ventilation Contractor.

Description - Ventilator shall be of all standard construction, built of not less than 18 gauge 304 stainless steel throughout with welded joints and seams in accordance with NFPA-96, with reinforced front bottom edges with integral front baffle, double wall insulated fronts, and NSF Listed. Units shall have grease collection troughs, storage containers, and hanger brackets. Provide with 430 stainless steel Captrate Grease-Stop Solo Filter UL classified S-baffle extractors that shall remove at least 75% of grease particles five microns in size, and 85% of grease particles seven microns in size and larger, with a corresponding pressure drop not to exceed 1.0 inches of water gauge. Provide all materials necessary for the hanging of the ventilator.

Accessories - Provide unit with five LED UL Listed light fixtures, factory prewired and left ready for final connection by the Electrical Contractor. Provide closure trim per detail to a point 3" above finished ceiling to close to adjacent surfaces on three sides. Provide one filter removal tool, quarter end panels. And a full System Design Verification to be performed by a Factory Certified Technician once system start-up and inspections are completed.

Item 31

STAINLESS STEEL WALL FLASHING

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 12'-10" extending from bottom of ventilator to floor or top of coved material

Construction - Wall shall be clad with 20 gauge type 304 stainless steel cut in largest sheets to minimize joints and secured to wall with adhesive and no exposed fasteners. Provide Component Hardware J64-1450 “T” dividers at joints and J63-1451 cap strips at ends. Provide carefully punched holes at all service locations.

Item 32

FIRE SUPPRESSION SYSTEM

Make - Ansul R-102 or equal by Kidde or Pyro-Chem

Protection for hoods: Item 30

Design - Provide an automatic liquid fire suppressant system sized to meet all local codes, UL 300 and NFPA Codes. System shall provide surface protection for cooking equipment, hood and the exhaust duct work, if required. Tanks shall be mounted in the hood manufacturer provided utility cabinet and piping shall run hidden wherever possible. All pipes and fittings used to convey the chemical shall be scale free steel, 40 weight. Exposed piping located within the ventilator shall be stainless steel or chrome and limited to vertical drops only. Horizontal piping shall be run over the ventilator's top. Nozzles shall be swivel type with metal caps. Detection shall be fusible links rated per codes, and system shall rely on no outside source of power. The system shall be provided with a control box with indicator to indicate system status. Control head shall also include

integral micro switch offering "normally open" and "normally closed" terminals for use by the Electrical Contractor for the shut-down of equipment and the sounding of alarms, etc. Suppressant tanks shall be stainless steel. Provide a properly sized mechanically operated gas shut-off valve (up to 3" diameter) for mounting by the Plumber at a point in the gas supply that will shut off fuel to all gas fired equipment. Provide and install a remote pull station per codes, complete with cables, conduit and pulleys. Coordinate installation of remote pull station with General Contractor to provide a recessed junction box mounted for installing the pull box with cable conduit concealed within walls. Provide system with class-K extinguisher as required.

Workmanship - Exposed stainless steel fittings and piping shall be assembled with special care to avoid marring or damaging the surfaces. Any pieces showing marks shall be removed and replaced with new materials. ***Chrome sleeves are not acceptable.***

Test - Perform a puff test on the completed system and obtain the written approval of the local Fire Inspector.

Accessories - Provide metal blow-off caps on all nozzles.

Item 33

HOOD AUTO-START CONTROL SYSTEM

Make - Captive Aire SC-310110MA (DWG# 8517245) or equal by Gaylord or Halton

Power - 15 amps circuit - 120/60/1 to logic controller

Scope - Furnish and install complete exhaust control system for the exhaust canopy in accordance with the plans and Manufacturers shop drawings. The system shall include programmable logic controller (PLC), stainless steel control enclosure, exhaust duct temperature sensors, room temperature sensor, LCD screen interface with cable, all specified accessories, and those components required to provide complete and satisfactory systems in accordance with accepted HVAC practice. System shall control Item 30.

Mount system processor in a stainless steel cabinet, wall mounted per plan at 80" high minimum above the floor. Mount the room air temperature sensor on the wall 66" above the finished floor.

Important: The installation work shall be performed by a fully qualified contractor employing a certified mechanic fully trained in the installation of the hood control system. Submittal shall list the installing company and the qualified system installer. Provide wiring diagrams and guidance to related trades to achieve correct operation of the system.

Accessories - Provide BacNet monitoring system. Service Design Verification: Factory Services and on site coordination to be performed by the Manufacturers service technician (not a sales representative). On site supervision shall include two site visits: One visit to coordinate preparations for installation, and a second visit at startup and calibration.

Item 34

AUTO-START CONTROL INTERFACE CABLE

Specified as part of Item 33

Item 35

ROOM TEMPERATURE SENSOR

Specified as part of Item 33

Item 36

EXISTING INSULATED FOOD CARRIER

Quantity - 14

No work in this Section. Owner to relocate this equipment following completion of the project.

Item 37

COOK'S TABLE WITH SINK

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 8'-0" x 30" x 36" high; overshelf 3'-6" long with shelf at 54" above floor; 10" deep shelf; 18" x 20" x 10" deep integral sink basin

Construction - 14 gauge stainless steel top and sink basin over angle frame, edges formed in turndown, six legs with gussets, adjustable feet, flanged feet at the corners for securing to floor, two crossrails and partial undershelf. Overshelf shall be 16 gauge stainless steel, constructed similar to a wall shelf, channel reinforced, and welded to three extended rear table legs with support webs, and supported in integrally welded inverted gussets with sleeved joints for rigidity.

Accessories - Drawer assembly, deck mounted faucet set and a 2" lever waste outlet. Provide 4 rigid stainless steel brackets for mounting of electric outlets in setback positions complete with work boxes, GFI receptacles and stainless steel cover plates. Prewire receptacles through table legs to a mounted junction box below the undershelf.

Item 38

EXISTING HOT HOLDING CABINET

No work in this Section. Owner to relocate this equipment following completion of the project.

Item 39

WATER FILTER ASSEMBLY, WAREWASHER

Make - WaterSpec WS-SSEXT or equal by 3M or Everpure

Description - Unit shall be all standard construction designed for vertical wall mounting per plan and consisting of a mounting bracket, manifold, and filter cartridge with housing. Assembly shall have an operating inlet water temperature range of 35 to 160 degrees Fahrenheit.

Accessories - Provide four spare SS-EXT filter cartridges.

Item 40

MILK COOLER

Make - Beverage-Air STF58HC-1-S or equal by Continental

Size - 58" x 34" x 47-3/4" high; sixteen 13" x 13" x 11" milk crate capacity

Power - 3.3 amps - 1/3 HP - 120/60/1 - cord and plug

Description - Dual access milk cooler shall be all standard construction with stainless steel interior and exterior fronts and ends, self-contained refrigeration system with thermostatic controls and blower, urethane foam insulation, exterior dial thermometer, and hinged and lockable drop-front covers. Interior shall be fitted with a vinyl coated wire rack. Mount on 4" diameter swivel casters and provide with R-290 refrigerant.

Accessories - Provide unit with optional five year compressor warranty.

Item 41

EXISTING HEATED SERVING COUNTER

No work in this Section. Owner to relocate this equipment following completion of the project.

Item 42

MOBILE WORK TABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 66" x 30" x 36" high

Construction - 14 gauge stainless steel top over angle frame with edges formed in turndown and mounted on four legs with gussets, 5" diameter swivel casters, two with brakes, and full undershelf.

Item 43

INSULATED FOOD CARRIER

Quantity - 5

Size - 21-1/2" W x 33-1/4" D x 63-3/4" H

Description - Insulated transport cart shall be double cavity Camcart design constructed of durable molded polyethylene with foam insulation for temperature retention. Unit shall be configured for sheet pan storage with (24) tray support rails on 1-15/16" centers. Provide full height doors with heavy duty hinges and positive latching. Unit shall include molded-in handles for transport and reinforced doors to prevent warping and improve insulation.

Accessories - Provide (4) 6" diameter casters, (2) rigid and (2) swivel (one with brake). Provide in charcoal gray color (615).

Item 44

THREE COMPARTMENT SINK

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 1'-2" x 30" x 34" high plus 10" high splash at wall; 3" high raised open roll at front and end; three 21" x 27" x 12" deep integral sink basins

Construction - 14 gauge stainless steel top, basins and splash, stainless steel channel reinforced, six legs with gussets, adjustable feet, and five lengths of crossrail. Secure 3" off face of wall. Turn end down into dishwasher and secure with stainless steel machine screws and nuts. Provide left and center basin with a lift out, 16 gauge stainless steel cover with all edges flanged down 1", corners rounded and welded, provided with two neatly punched thumb holes, and designed to rest on 1/4" rod stock supports welded across the basin corners at proper height to provide a flush surface. Provide a hook under the drainboard for hanging the lids when not in use. Provide right basin with two 16 gauge perforated stainless steel scrapping baskets, 20-1/2" x 12" x 4" deep, with top of short ends flanged out 1" to hang on top of the basin sides, and integral tubular rack-slide/handles flush with counter top. Round off corners of flanged edges.

Accessories - Provide unit with one splash mounted faucet set and three 2" lever waste outlets.

Item 45

WALL SHELF

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 54" x 12" mounted 54" above floor

Construction - See item 20

Item 46

PRE-RINSE ASSEMBLY WITH ADD-ON FAUCET

Make - T&S Brass B-0133-BC or equal by Fisher

Description - Pre-rinse sprayer shall be all standard construction with splash mounted mixing body, tubing riser, spring action gooseneck, wall bracket, and a B-107-J water saver pre-rinse spray.

Accessories - Provide with T&S B-0156 add-on faucet assembly

Item 47

VENTLESS WAREWASHER

Make - Hobart AM16VLT-BAS (Hot Water Sanitizing) or equal by Champion

Power - 53.7 amps - 208/60/3

Maximum Water Use - 0.64 Gallons per Rack

Certification - Unit shall be Energy Star compliant

Description - Dishwasher shall be door type with extended hood of all standard construction with 40 rack per hour capacity, 16 gauge stainless steel drawn tank, 18 gauge stainless steel chamber, and 12 gauge stainless steel frame and stainless steel feet, ventless energy recovery, touchscreen controls, WiFi connectivity, two stage filtration, pillarless opening, three-sided hood, pumped drain, door lock, timed wash cycles for 1, 2, 4 or 6 minutes, NSF pot and pan rating for 2, 4, and 6 minute cycles, 70°F rise integral electric booster heater, 27" door opening for 18" x 26" sheet pans or 60-quart, spring counterbalanced chamber, X-shaped revolving, interchangeable upper and lower anti-clogging wash arms, revolving, interchangeable upper and lower rinse arms, slanted, self-locating, one-piece scrap screen and, basket system, automatic fill, door actuated start. Pump shall be stainless steel with stainless steel impeller and shaft, fitted with a stainless steel and carbon ceramic seal, capable of 160 gallon per minute flow and self draining. Motor shall be 2 HP, three phase, squirrel cage, induction-run type with inherent thermal protection, grease packed ball bearings, splashproof design, and ventilated.

Accessories - Single point electrical connection, and four plastic racks; two peg, two flat, sheet pan rack. Provide drain water tempering kit.

Item 48

CLEAN DISTABLE

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 48" x 30" x 34" high plus 10" splash at rear; 3" high raised roll at front and end

Construction - 14 gauge stainless steel top and splash over channel frame with raised roll front and end, tall splash at rear, turned down into dishwasher and secured with stainless steel machine screws, and mounted on four legs with gussets, adjustable feet and undershelf. Secure table 3" off face of wall.

Item 49

WALL SHELF

Make - Fabricate per General Construction this Section by Custom Metals of Massachusetts or equal by Julien

Size - 36" x 12" mounted 54" above floor

Construction - See item 20

PART 3 - EXECUTION

3.1 SANITATION REQUIREMENTS

A. Equipment specified herein shall be fabricated to conform to the "Food Service Equipment Standards" of the National Sanitation Foundation prepared by the Committee on Food Service Standards, and published by the National Sanitation Foundation, Ann Arbor, Michigan. Any differences of opinion on sanitation will be referred to the State Department of Health for a ruling.

B. Equipment shall be installed in accordance with the manufacturer's instructions and the best practices of the food service industry, with careful attention to eliminating all cracks, crevices and concealed spaces in wet areas that would be difficult to clean or keep free of vermin and soil.

3.2 EXAMINATION AND ACCEPTANCE

A. Determine whether the General Contractor will furnish and provide temporary power and light, openings and storage space to permit scheduled delivery of equipment. Verify water pressure and provide necessary reducing valves.

B. Examine space in which specified work is to be installed to assure that conditions are satisfactory for the installation of specified work. Report in writing to the Architect, any deficiency in the work of other contractors affecting specified work. Commencement of specified work will be construed as acceptance of space conditions.

C. Obtain and verify all measurements and conditions on the job, and assume responsibility in respect to same.

D. Inspect flooring and raised concrete bases, wall finishes, painting, ceiling installation and all related work for readiness to commence installation of foodservice equipment. Verify the existence of required mechanical and electrical rough-ins.

3.3 CLEANING UP

A. Debris and surplus materials resulting from installation work shall be removed promptly as work progresses, to a location indicated by the General Contractor.

B. Following completion, and before final acceptance by the Owner, clean finished surfaces in accordance with the manufacturer's instructions, and leave specified work free of imperfections.

3.4 DEMONSTRATION AND OPERATING INSTRUCTIONS

A. Before final acceptance, and by appointment with the Owner and his representatives, completely demonstrate with power, the correct operation of each new item of operating equipment.

B. Prior to the demonstration, turn on all mechanical and electrical foodservice equipment. Test for leaks, poor connections, and inadequate or faulty performance and correct if necessary. Adjust for proper operation. Thermostatically controlled equipment and equipment with automatic features shall be operated for a sufficient length of time with proper testing equipment to prove controls are functioning as intended. Recalibrate thermostats if necessary.

C. Provide Architect or Consultant with a loose leaf bound manual of operating data and maintenance instructions containing complete description, wiring diagrams, operating data, maintenance requirements and other information pertaining to the proper operation and upkeep of the various items of electrical or mechanical equipment. Include names, addresses and telephone numbers of authorized service agencies for all items. Arrange all material in alphabetical order by Manufacturer. Provide with a list of equipment to include make, model, and serial number where applicable. Book shall be turned over to Owner after review and approval.

D. Submit guarantees and warranties to the Architect in the above specified manual with all warranty cards completed and becoming effective at the time the equipment was satisfactorily demonstrated.

3.5 PROTECTION OF WORK

A. Protect specified work from damage during transportation to the project site, storage at the site, during installation, and after completion until acceptance by the Owner.

B. Protect adjacent work under other contracts during installation until completion of specified work. After completion, the contractor for other work shall be responsible for the protection of his work until acceptance by the Owner.

C. Damaged work as determined by the Architect, shall be repaired or replaced as determined by the Architect.

3.6 EXISTING EQUIPMENT

A. Foodservice equipment that is scheduled for reuse shall be removed and stored in a location provided by the General Contractor on site. This Contractor shall provide transportation of equipment.

B. Verify and document the operating condition of all relocated equipment prior to its being disconnected. Document the condition of the equipment to note any dents, scratches, broken components or other damage prior to placing it in storage. Protect equipment during transport and storage, and assume responsibility for its re-installation in the condition viewed prior to removal. Transport and install the equipment in accordance with Item Specifications.

C. This Contractor is not responsible for refurbishing equipment noted as "Existing" on plans or specifications unless work is specifically called for in the Item Specifications.

D. Disconnecting and reconnecting of services to "Existing" equipment shall be performed by related trades.

E. This Contractor shall restart all existing equipment following its reconnection to building services and verify its correct operation as viewed prior to removal.

F. This Contractor shall not provide a warranty or guarantee on "Existing" equipment. In the case of a new component being provided by this Contractor for an "Existing" piece of equipment, the component shall be warranteed or guaranteed as specified hereinbefore.

G. Foodservice equipment that is scheduled for reuse must be verified for NSF certification.

END OF SECTION

SECTION 122300 - VINYL SHUTTERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Security-type vinyl shutters used for classroom lockdown shades.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

1.4 REFERENCE STANDARDS

A. NFPA 701

B. ASTM E84

C. UL 723

1.5 SUBMITTALS

A. PRODUCT DATA: Submit manufacturer’s descriptive literature indicating sizes, quantities and installation instructions and verifying that product meets requirements specified, including manufacturer's recommendations for maintenance and cleaning.

B. DRAWINGS AND DIAGRAMS: Submit diagrams of any components or units, working and assembly drawings.

C. SAMPLE: Submit one sample shutter of each type specified; furnish complete units with all required components, mounting and associated hardware, instructions, and warranty.

1.6 QUALITY ASSURANCE

A. SUPPLIER: Manufacturer, subsidiary or licensed agent shall be approved to supply the products specified, and to honor any claims against product presented in accordance with warranty.

B. INSTALLER: Installer or agent shall be qualified to install specified products by prior experience, demonstrated performance and acceptance of requirements of manufacturer, Installer shall be responsible for an acceptable installation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver product to site in manufacturer's original packaging.

B. Handle and store product to prevent damage to materials.

1.8 JOB CONDITIONS

A. Enclose building prior to Shutter installation.

1.9 WARRANTY

A. Five Year Warranty. Product warranties available from manufacturer or its authorized agent.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.

B. Substitutions: See Section 016000 - Product Requirements.

2.2 MATERIALS

A. Shutters: Flame retardant corrugated vinyl, in compliance with NFPA 701; through-body color; scratch-resistant finish; constructed to prevent accidental movement.

1. Thickness: 4 milimeter, minimum.
2. Color: As scheduled.
3. Tolerances: Within +/- 1/4 inch, or as recommended in writing by manufacturer.

B. Accessories and Hardware: As scheduled.

PART 3 EXECUTION

3.1 INSPECTION

A. Installer shall be responsible for inspection on site, approval of mounting surfaces, installation conditions and field measurement for this work.

B. Other interacting trades shall receive drawings of shutters, dimensions, assembly and installation methods from manufacturer upon request.

3.2 INSTALLATION

A. Comply with manufacturer’s specifications, standards and procedures as detailed in manufacturer's installation instructions.

B. Provide adequate spacers to permit unencumbered operation of shutter.

C. Clean finish installation of dirt and finger marks.

D. Leave work area clean and free of debris.

3.3 DEMONSTRATION

A. Demonstrate operation method and instruct responsible personnel in the proper operation and maintenance of the shutters.

END OF SECTION

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SECTION 122400 - WINDOW SHADES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2

1.3 SECTION INCLUDES

A. Interior manual roller shades.

1.4 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

B. Section 090000 - Finish Schedule: Schedule of manufacturers

1.5 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

C. WCMA A100.1 - Standard for Safety of Window Covering Products.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with window installation and placement of concealed blocking to support shades.

B. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

C. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
2. Do not install shades until final surface finishes and painting are complete.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

E. Selection Samples: Where shade fabric is not scheduled, include fabric samples in full range of available colors and patterns.

F. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

I. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.10 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:

1. Shade Hardware: One year.
2. Fabric: One year.
3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.
2. Substitutions: See Section 016000 - Product Requirements.

B. Other Acceptable Manufacturers - Interior Manually Operated Roller Shades:

C. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 ROLLER SHADES

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades - for manual operation:

1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.

a. Drop Position: Regular roll.

b. Roll Direction: Roll down, closed position is at window sill.

c. Mounting: Window jamb mounted - inside, between jambs.

d. Size: As indicated on drawings.

e. Fabric: As indicated under Shade Fabric article.

f. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.

g. Drive Chain: Continuous loop, beaded ball chain with restraining device, 95 lb minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.

C. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.

1. Material: Stamped steel.

D. Roller Tubes: As required for type of shade operation.

1. Material: Extruded aluminum, baked enamel; color from manufacturer's standards.
2. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
3. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
4. Take-Up Roller: Manufacturer's standard roller tube pretensioned for winding lift cable in bottom-up type shades.

E. Hembars: Designed to maintain bottom of shade straight and flat.

1. Style: Manufacturer's standard concealed hembar, flat profile with closed ends.

2.3 SHADE FABRIC

A. Fabric: Micro-perforated, nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

1. Material: Vinyl coated polyester.
2. Performance Requirements:

a. Flammability: Pass NFPA 701 large and small tests.

b. Fungal Resistance: No growth when tested in accordance with ASTM G21.

3. Openness Factor: 1%.
4. Color: As scheduled.

2.4 ACCESSORIES

A. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners.

1. Color and Style: As selected by Architect from shade manufacturer’s full selection.
2. Profile: Square.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. End Caps: Provide manufacturer's standard end caps to cover exposed ends of brackets.

D. Fasteners: Noncorrosive, and as recommended by shade manufacturer.

2.5 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.

1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.

2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:

1. Inside Mounting: Maximum space between shade and jamb when closed of 1/16 inch.

2. Maximum Offset From Level: 1/16 inch.

C. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

D. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate manualoperation and maintenance of window shade system to Owner's personnel.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 123600 - COUNTERTOPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2

SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters and vanity tops.

C. Solid surface window stools.

1.3 RELATED REQUIREMENTS

A. Section 064000 - Architectural Woodwork.

1.4 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. AWI (QCP) - Quality Certification Program.

C. IAPMO Z124 - Plastic Plumbing Fixtures.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.

E. ISFA 3-01 - Classification and Standards for Quartz Surfacing Material.

F. NEMA LD 3 - High-Pressure Decorative Laminates.

G. NSI (DSDM) - Dimensional Stone Design Manual, Version VIII.

H. PS 1 - Structural Plywood.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizing and configuration of countertops with associated casework and adjacent construction.
2. Coordinate sizing and locations of cutouts for plumbing fixtures with base cabinet configurations for proper alignments as indicated on Drawings.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other Sections.
1. Indicate plans, sections, dimensions, seam locations, component sizes, edge details, fabrication details, attachment provisions, sizes of furring, blocking, and coordination requirements with adjacent work. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacles and other items installed in countertops.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Installation Instructions: Manufacturer's installation instructions and recommendations.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this Section, with not less than three years of documented experience.

C. Quality Certification:
1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Solid Surface Material Manufacturer Warranty: Provide manufacturer’s standard warranty for solid surface material for period of 10 years against material defects.

PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Basis of Design: As indicated in finish schedule on drawings.
         1) Substitutions: See Section 016000 - Product Requirements.
      b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      c. Finish: Matte or suede, gloss rating of 5 to 20.
      d. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: Molded PVC edge with T-spline, sized to completely cover edge of panel.
      a. Color: As selected by Architect from the manufacturer's full line.
   3. Back and End Splashes: Same material, same construction.
   4. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Custom Grade.

C. Solid Surfacing Countertops and Window Stools: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness: 1/2 inch, minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    a. Basis of Design: As indicated in finish schedule on drawings.
        1) Substitutions: See Section 016000 - Product Requirements.
    b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    c. Sinks: Separate units for undercounter mounting; comply with IAPMO Z124.
    d. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
    e. Color and Pattern: As indicated on drawings.
3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; bevel eased edge profile.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on Drawings.
7. Fabricate in accordance with manufacturer's standard requirements.

D. Natural Quartz and Resin Composite Countertops: Sheet or slab of natural quartz and plastic resin over continuous substrate.
1. Flat Sheet Thickness: 1-1/4 inch, minimum.
2. Natural Quartz and Resin Composite Sheets, Slabs and Castings: Complying with ISFA 3-01 and NEMA LD 3; orthophthalic polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard stone fabrication tools; no surface coating; color and pattern consistent throughout thickness.
    a. Basis of Design: As indicated in finsh schedule on drawings.
        1) Substitutions: See Section 016000 - Product Requirements.
    b. Factory fabricate components to the greatest extent practical in sizes and shapes indicated; comply with NSI (DSDM).
    c. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
    d. Sinks: Separate units for undercounter mounting; comply with IAPMO Z124.
    e. Finish on Exposed Surfaces: Polished.
    f. Color and Pattern: As scheduled on Drawings.
3. Other Components Thickness: 3/4 inch, minimum.

4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Skirts: As indicated on Drawings.
7. Fabricate in accordance with manufacturer's standard requirements.

2.2 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 ACCESSORIES

A. Countertop and Workstation Brackets:
1. Material: Steel or aluminum.
2. Load Capacity Per Bracket: 450 pounds minimum.
3. Finish: Manufacturer's standard, factory-applied powder coat.
4. Color: Selected by Architect from manufacturer's standard range.
5. Products: See drawings for types and locations.
a. A&M Hardware, Inc ; Concealed Brackets: http://www.aandmhardware.com.
b. Rangine Corporation; Rakks EH-Inside Wall Mount - Counter Support Brackets; www.rakks.com.
c. Substitutions: See Section 016000 - Product Requirements.

B. Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets: ADA Compliant bracket with option to install surface-mounted skirt.
1. Material: Steel or aluminum.
2. Load Capacity Per Bracket: 450 pounds minimum.
3. Finish: Manufacturer's standard, factory-applied powder coat.
4. Color: Selected by Architect from manufacturer's standard range.
5. Products:
a. A&M Hardware, Inc ; ADA Vanity Brackets: http://www.aandmhardware.com/#sle.
b. Hafele; ADA Vanity Bracket: www.hafele.com.
c. Rangine Corporation; Rakks ADA Vanity Brackets; www.rakks.com.
d. Substitutions: See Section 016000 - Product Requirements.

2.4 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to walls with contact surfaces set in waterproof adhesive.
2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

1. Arrange seams symmetrically or in orderly locations, minimum 12 inches from edges of sink and similar cutouts.

D. Cutouts and Holes:

1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
2. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
3. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
4. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

E. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on Drawings, finished to match.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that blocking/backing has been installed prior to installation of countertop brackets and prefabricated vanities.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

E. Verify actual site dimensions and location of adjacent materials prior to commencing work.

F. Examine cabinets upon which counter tops are to be installed. Verify cabinets are level to within 1/8" in 10' - 0"

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Attach wood substrates using screws with minimum penetration into substrate board of 5/8 inch.

D. Attach countertops using compatible adhesive.

E. Stone and Quartz:

1. Do not cut stone or quartz and resin composite countertops in field unless otherwise indicated. If countertops or splashes require additional fabrication not specified to be performed at Project site, return to fabrication shop for adjustment.

F. Set countertops to comply with requirements indicated. Shim and adjust, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure countertops in place.

G. Bond joints with countertop manufacturer's recommended adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

H. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

I. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Extruded aluminum entrance floor grilles.

B. Walk-off matting.

1.3 RELATED REQUIREMENTS

A. Section 090000 - Finish Schedule: Schedule of manufacturers and products.

B. Section 096813 - Tile Carpeting : Walk-off mats used in combination with aluminum entrance floor mats.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.

1. For recessed frames located within a dimensionally restricted area, show dimensions of space within which the frame will be installed.

D. Samples: Submit two samples, 6 by 6 inch in size illustrating pattern, color, finish, and edging.

E. Maintenance Data: Include cleaning instructions, and stain removal procedures.

1.5 QUALITY ASSURANCE

A. Installer: Installer should be highly experienced in performing work of this section, having previously done work similar to that required for this project.

1.6 FIELD CONDITIONS

A. Temperature: Maintain temperature where products will be installed before, during and after installation as recommended by Manufacturer.

B. Field Measurements: Where possible, verify actual measurements by field measuring before fabrication and include measurements in shop drawings. To avoid construction delays, coordinate field measurements and fabrication schedule based upon construction progress.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Basis of Design: As indicated in Section 090000 - Finish Schedule for all product types listed in this section.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ENTRANCE FLOOR GRILLES AND GRATINGS

A. Entrance Floor Grilles: Recessed all-aluminum foot grilles with drain pan.

1. Locations: As indicated on drawings.
2. Construction:
   a. Bolt-thru design with individual aluminum spacers.
   b. Swedge, welded, and key lock fastening of rails are not permitted.
3. Material:
   a. Heavy gauge aluminum alloy type 6061-T6.
   b. Soft aluminum alloys (such as 6063-T52) are not permitted.
4. Recycled Content: Aluminum to be 64% pre-consumer and 16% post-consumer recycled content.
5. System Depth: 2-1/8 inch total, with grille, frame, and drain pan.
6. Grilles:
   a. Panels: Foot grille to be supplied in panels not to exceed 48 inch x 42 inch. One Piece design not allowed. All grille panels to be supplied with individual, pre-fabricated, factory-assembled frames.
   b. Depth: 1 inch without frame, and 1-1/8 inch with frame.
   c. Blades:
      1) Shape: Tee.

2) Size: 3/16 inch wide at primary body, 1/8 inch wide at top walking surface x 1 inch deep.

3) Spacing: Not to exceed 3/16 inch between blades.

7. Frame:

a. Type: Recessed.

b. Construction: Aluminum, inverted "T" shape, pre-assembled at factory incorporating welded construction for all joints. For each grille section, provide an invisible section divider integrated and welded within the frame.

8. Drain Pan: 20 gauge aluminum.

2.3 ENTRANCE MATS

A. Walk-Off Matting: Extruded post-industrial recycled polyvinyl chloride (PVC) welded in a non-hinged grid with polyamide nylon 6.6 fiber insert grille design with an embossed non-skid surface.

1. Size: As scheduled.
2. Color: As scheduled.
3. Application Style: Surface mounted.
4. Locations: As indicated on drawings.
5. Performance:

a. ASTM C1028 Static Coefficient of Friction: Wet 1.01; Dry 0.97.

b. ASTM E648 Critical Radiant Flux: Class 1.

2.4 FABRICATION

A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.2 PREPARATION

A. Mats: Verify size of floor recess before fabricating mats.

B. Vacuum clean floor recess.

3.3 INSTALLATION

A. Install frames to achieve flush plane with finished floor surface.

B. Install walk-off surface in floor recess flush with finish floor after cleaning of finish flooring.

3.4 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

END OF SECTION

SECTION 129313 - BICYCLE RACKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled "Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Procurement and installation of bicycle racks of the style and configuration indicated.

a. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.
b. Contractor is responsible for all heath and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR)

C. 29 CFR 1926, Safety and Health Regulations for Construction.

1.4 ASTM INTERNATIONAL (ASTM)

A. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.

B. ASTM C94 - Standard Specification for Ready-Mixed Concrete.

C. ASTM D2967 - Standard Test Method for Corner Coverage of Powder Coating.

D. ASTM D3451 - Standard Guide for Testing Coating Powders and Powder Coatings.

E. ASTM D4217 - Standard Test Method for Gel Time of Thermosetting Coating Powder.

F. ASTM A123 - Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

G. ASTM A428 - Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles.

1.5 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.

2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.6 SUBMITTALS

A. Shop drawings for all equipment furnished under this Section. Shop drawings shall indicate the configuration, dimensions, layout, and spacing of major and minor equipment components such as posts, supports, rails, brackets, fasteners, foundations, anchorage, and a schedule of such equipment components. Show in large-scale details any unique fabrication, assembly, and/or installation requirements.

B. Material certificates or other data indicating compliance with these Specifications for finish type, color, size, style, posts, fittings, hardware, and accessories.

C. Copies of manufacturer-provided installation instructions, operation instructions, and maintenance material for all equipment furnished under this Section.

D. Manufacturer’s warranties and associated warranty registration data in Owner’s name. Submit two (2) copies of each warranty to Engineer in the manufacture’s/supplier's standard form or if there is no standard form available, in a form specified by Engineer.

1.7 QUALITY ASSURANCE

Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage

1. Transportation carrier shall use appropriate methods to ensure materials are properly packaged, stacked, and restrained during transport. Utilize protective packaging as required.
2. Protect materials during storage against moisture, soiling, staining, and physical damage.
3. Any product or associated component showing manufacturing flaws upon receipt at the Project Site shall be referred to Engineer for determination as to whether it shall be repaired, rejected, or used.
4. Protect railing materials during storage to avoid damage from moisture, abrasion, and other construction activities.

B. Handling

1. Handle railing materials to prevent abrasion, chipping, marring, soiling and other damage.

C. Damaged equipment shall not be installed. Contractor shall bear responsibility for damage to equipment until final acceptance by Owner. Any installed equipment exhibiting damage shall be replaced or repaired to the satisfaction of Engineer, and Contractor shall assume all costs related thereto.

1.9 WARRANTY

A. Provide manufacturer’s standard warranty, as applicable, for all products furnished under this Section. Warranty shall be registered in Owner’s name.

B. Bind warranties in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

C. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.

D. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of Contractor.

E. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS

A. BICYCLE RACK

B. Basis-of-Design Product: Subject to compliance with requirements, provide “Loop Bicycle Rack” as manufactured by Landscape Forms (800) 521-2546 or a comparable product by the following, as approved by the Landscape Architect:

1. www.landscapeforms.com.

C. Bicycle Rack Construction:

1. Frame: : Aluminum Casting – A356 ASTM B108 or A360 ASTM B108 & LFI 7.4.2-A1.

2. Style: Double-side parking with hoop form mounted at end of each section.

a. Overall Height: 31 inches.
b. Overall Length: 36 inches.
c. Capacity: Designed to accommodate two bicycles per unit.

3. Installation Method: In ground mount embedded into concrete base.

4. Aluminum Finish: Powder-coated.

5. Color: Matte Black.

2.2 CYLINDRICAL FORMS/FORM TUBES

A. Pre-formed, single use cylindrical heavy-duty cardboard or plastic forms.

2.3 CONCRETE FOOTINGS

A. Ready-Mix, ASTM C94; or pre-packaged concrete mix, ASTM C 387. Minimum 28-day compressive strength of 4,000 psi.

PART 3 - EXECUTION

3.1 FOOTINGS

A. Where concrete footings are called-for, verify rack location(s) before proceeding. For multiple racks, verify spacing.

B. Install concrete footings as indicated on the Drawings using cylindrical forms. Verify top of footing elevation relative to finished grades and adjust as required prior to forming.

3.2 INSTALLATION

A. Verify mounting location before proceeding. For multiple racks, verify spacing.

B. Examine conditions at the installation area for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Use manufacturer’s templates or similar guides prior to drilling for anchorage. Control dust and protect adjacent areas.

E. Comply with manufacturer's written installation instructions for installation, unless more stringent requirements are indicated. Complete field assembly where required.

3.3 PROTECTION AND CLEAN UP

A. After completing installation, inspect components. Remove spots, dirt, and debris.

B. Protect until acceptance of project. Repair any damaged finishes to match original finish or replace component.

END OF SECTION

SECTION 210500 - FIRE PROTECTION BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SECTION INCLUDES

A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

1.3 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.

1.4 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX – Welding and Brazing Qualifications; 2023.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

D. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

E. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2018.

F. ASSE 1015 - Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies; American Society of Sanitary Engineering; 2021.

G. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2022).

H. ASTM A197/A197M - Standard Specification for Cupola Malleable Iron; 2000 (Reapproved 2019).

I. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021

J. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings; 2022.

K. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

L. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

M. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, witgh Errata (2018).

N. AWWA C153 - Ductile-Iron Compact Fittings; 2019.

O. FM (AG) - FM Approval Guide current edition.

P. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2019.

Q. UL (DIR) - Online Certifications Directory Current Edition.

R. UL 262 - Gate Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

S. UL 312 - Check Valves for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. See Section 013300 - Submittal Procedures, for project requirements.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Conform to UL (DIR) requirements.

C. Valves: Bear UL and FM product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

1.7 CONTRACTOR'S RESPONSIBILITIES

A. All permits and fees.

B. Hoisting, rigging, transportation costs and installation of necessary appurtenances.

C. The Contractor shall visit the premises and note all pertinent facts and details including conditions under which the work must be carried out. No allowance will be made for failure to have done so.

D. Holes - Cutting and Patching: Cutting will be by core boring, patch will require both waterproofing and fireproofing.

E. Expenses for Fire Watches are the responsibility of the Fire Protection Contractor.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

PART 2 PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Comply with NFPA 13.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.2 BURIED PIPING

A. Ductile Iron Pipe: AWWA C151/A21.51, 125 pound WSP, Class 52, exterior bituminous coating, AWWA C104 cement-mortar lined.

1. Fittings: AWWA C110 or C153 mechanical joint, Class 350, exterior bituminous coating, AWWA C104 cement mortar lined.

2. Joints: AWWA C111, SRB rubber gasket.

3. Mechanical joint: Shaped composition sealing gasket, T-bolts, and nuts, low alloy corrosion resistant high strength steel.

2.3 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 795 Schedule 10 or ASTM A795 Schedule 40, black.

1. Standard weight Schedule 40 with grooved coupling in sizes 1-1/2" and 2". Standard square cut grooves to coupling manufacturer's specifications.

2. Standard weight Schedule 40 with threaded coupling and fittings in sizes 2" and smaller.

3. Light wall Schedule 10 with grooved couplings in sizes 2-1/2" and larger. Rolled grooves; no cut grooves or threading will be allowed on Schedule 10.

B. Fittings

1. Steel Fittings: ASME B16.9 wrought steel, buttwelded.

2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4 threaded fittings.

3. Malleable Iron Fittings: ASME B16.3, threaded fittings, ASTM A47 and ASTM A197.

4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.4 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 3/8 to 3 inch: Malleable iron, split ring extension hanger.

B. Hangers for Pipe Sizes 1 inch and Over: Carbon steel, adjustable ring, with knurled swivel. NFPA threaded rod sizes.

C. Hanger attachment to structural steel beam: Universal or wide mouth malleable iron C-type beam clamp with locknut, U.L. Listed. Secure with retaining strap hammered tight to beam flange.

D. Hanger attachment to concrete: Set-in expansion anchors to rated capacity or self drilling anchors where weight of piping does not exceed half of rated capacity.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle with U-bolt, threaded pipe adjuster, cast iron floor flange, and steel pipe support.

2.5 GATE VALVES

A. Up to and including 2 inches:

1. Bronze body with union bonnet, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.

B. Over 4 inches:

1. Class 125 flanged cast iron body, rising stem with bolted bonnet, resilient wedge, OS&Y gate valve, 200 PSI non-shock water pressure. UL listed and FM approved.

2.6 BALL VALVES

A. Up to and including 2 inches:

1. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.

2.7 BUTTERFLY VALVES

A. Bronze Body:

1. Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC. UL listed and FM approved

B. Ductile Iron Body

1. Epoxy coated ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck, handwheel and gear drive, 175 PSI non-shock water pressure. Integral indicating device, and internal tamper switch rated 10 amp at 115 volt AC. UL listed and FM approved

2.8 CHECK VALVES

A. Up to and including 2 inch:

1. Bronze body and swing disc, rubber seat, threaded ends.

B. 4 inch and Over:

1. Iron body, bronze mounted, swing check with rubber disc, renewable disc and seat, flanged maintenance port, grooved or flanged ends with automatic ball check. 175 PSI non-shock water pressure. UL listed and FM approved.

2.9 DRAIN VALVES

A. Ball Valve:

1. Brass with cap and chain, 3/4 inch hose thread.

2.10 DOUBLE CHECK VALVE ASSEMBLIES

A. Double Check Valve Assemblies:

1. ASSE 1015; Ductile or cast iron body with corrosion resistant internal parts and stainless steel springs; two independently operating, spring loaded check valves. All bodies epoxy coated, check valves with removable bronze seat, tight sealing rubber faced disc, test cocks bronze body ball valves, 175 PSI working pressure. UL listed and FM approved.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3.3 HANGERS AND SUPPORTS

A. Pipe Hangers and Supports:

1. Place hangers within 12 inches of each horizontal elbow. Any sprinkler pipe over 1'-6" in length requires a hanger and the maximum overhang beyond the last hanger shall not exceed 1'-6". Hangers are to be installed on both sides of grooved pipe couplings.

2. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe. End of line hangers for pendent sprinklers shall prevent upward movement of pipe.

3. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.4 PIPING SYSTEM

A. The piping system shall be arranged so that the entire system can be flushed and drained through accessible low points. Slope piping towards main drain or provide auxiliary drains for water in trapped sections of pipe.

B. Pipe and fittings for drain lines shall be galvanized.

C. Do not penetrate building structural members unless indicated.

D. Provide sleeves when penetrating floors, walls, and foundations. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required. Firestop floor penetrations in un-rated floors to a minimum of 1 hour UL fire rating.

E. Escutcheons:

1. Install and firmly attach escutcheons at piping penetrations into finished spaces.

2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.

3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

G. Grooved fittings and couplings shall be installed in accordance with the manufacturer's recommendations. Piping shall be cut and prepared per the coupling manufacturer's standards.

H. Threaded joints shall be made with teflon liquid joints compound applied to male threads only.

I. Chrome-plated escutcheon shall be used on all exposed piping with penetrates either walls or ceilings.

3.5 VALVES

A. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

B. Provide drain valves at main shut-off valves, low points of piping and apparatus. All drain piping shall be galvanized.

C. Backflow Preventer: Install per manufacturer's instructions and requirements of the Public Health Code.

1. Installation shall provide adequate space for testing, repair and maintenance.

2. Ensure valve assembly trim is provided in right hand or left hand configuration as appropriate for access in installed location.

3. Thoroughly flush piping prior to installing backflow prevention assembly.

4. Perform certification test of backflow preventer in accordance with the New England Water Works Association guidelines for field test procedure; and furnish report.

END OF SECTION 210500

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SECTION 211300 - FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SECTION INCLUDES

A. Wet-pipe sprinkler systems.

B. System design, installation, and certification.

C. Fire department connections.

1.3 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 210500 - Fire Protection Basic Materials and Methods: Pipe, fittings, and valves.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

D. Section 284600 - Fire Detection and Alarm.

1.4 SYSTEM DESCRIPTION

A. Systems to provide coverage for the existing school building.

B. Provide hydraulically designed automatic wet pipe sprinkler system. Water supply from new 6" water service connected to municipal water main in Willow Brook Road.

C. Furnish all necessary labor, materials, tool, equipment, appurtenances, instruments, etc. necessary to fully complete the Fire Protection System in accordance with the plans and specifications and both local and state fire codes and NFPA 13.

1.5 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide current edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2019.

C. UL (DIR) - Online Certifications Directory current edition.

1.6 SUBMITTALS

A. See Section 013300 - Submittal Procedures, for project requirements.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:

1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.

2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

3. Sealed plans with detailed pipe layout indicating, hangers and supports, sprinklers, components and accessories. Indicate sprinkler locations fully coordinated with final ceiling layouts.

4. Submit shop drawings and hydraulic calculations to authority having jurisdiction, Rating Bureau and RZ Design Associates, Inc. for approval.

D. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, Test Certificates, replacement part numbers and availability, and location and numbers of service depot.

1.7 QUALITY ASSURANCE

A. Comply with UL (DIR) requirements.

B. Design by a NICET Level IV Certified Sprinkler Technician or under direct supervision of a Professional Fire Protection Engineer experienced in design of this type of work and licensed in Connecticut.

C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience and approved by manufacturer.

E. Equipment and Components: Provide products that bear UL label or FM marking.

1.8 CONTRACTOR'S RESPONSIBILITIES

A. Drawings are diagrammatic; do not rely on scaling of drawings. Make such deviations and offsets as necessary to meet the space requirements.

B. The contractor shall be responsible for water damage to the property of the owner, the work of other trades, and existing building systems during all phases of the work.

C. Coordination Drawings: The Fire Protection Contactor shall incorporate the shop drawing sprinkler design into the master coordination drawings and work with the other trade contractors to resolve conflicts.

1.9 EXTRA MATERIALS

A. Provide extra sprinklers of type and size matching those installed, in quantity required by referenced NFPA design and installation standard.

B. Provide suitable wrenches for each sprinkler type.

C. Provide red enamel finished steel sheet metal storage cabinet in location designated.

PART 2 PRODUCTS

2.1 SPRINKLERS

A. Suspended Ceiling Type: Recessed pendent type with matching push on escutcheon plate.

1. Finish: Chrome plated.

2. Escutcheon Plate Finish: Chrome plated.

3. Fusible Link: Glass bulb type, quick response, temperature rated for specific area hazard.

B. Suspended Ceiling Type: Concealed pendent with white cover plate for gypsum board ceilings.

1. Fusible Link: Glass bulb type or fusible link type, quick response, temperature rated for specific area hazard.

C. Exposed Area Type: Standard upright type.

1. Finish: Brass.

2. Fusible Link: Glass bulb type, quick response, temperature rated for specific area hazard.

D. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate.

1. Escutcheon Plate Finish: Chrome plated.

2. Fusible Link: Glass bulb type, quick response, temperature rated for specific area hazard.

E. Dry Sprinklers: Standard dry pendent type with matching push on escutcheon plate.

1. Finish: Chrome plated.

2. Fusible Link: Glass bulb type, quick response, temperature rated for specific area hazard.

2.2 FLEXIBLE SPRINKLER DROPS

A. Description: Flexible Sprinkler Hose Fittings for use in commercial suspended ceilings.

1. Product Performance Criteria: UL Listed pursuant to UL 2443 Standard for Flexible Sprinkler Hose with Fittings for Fire Protection Service. FM Approved pursuant to FM Class Number 1637 Approval Standard for Flexible Sprinkler Hose with Threaded End Fittings.

2. Materials and Fabrication: Flexible Sprinkler Hose Assemblies and End Fittings.

   a. Hose: AISI 304 Stainless Steel corrugated flexible hose with AISI 304 Stainless Steel braided jacket. Welded stainless steel collars and brass slip nuts with EPDM seals. Hose bore 28 mm internal corrugated hose diameter, minimum rated pressure 175 psi, and maximum length 1800 mm (6 Ft).

   b. Inlet nipple and outlet reducer of Zinc-Plated Carbon Steel.1" NPT inlet and straight outlet with 1/2" or 3/4 NPT sprinkler reducer with clamp bar flats.

   c. Ceiling Brackets and Support Bar: Zinc-Plated Carbon Steel assemblies intended for installation into commercial suspended ceilings having medium to heavy support tee bars meeting ATSM C-635 and installed in accordance with ASTM C-636. Assemblies shall be adjustable with set-screws and clamps that anchor the sprinkler securely to the ceiling grid and are suitable for both pendent and concealed type heads.

2.3 SPRINKLER SPECIALTIES

A. Riser Check Valve: Swing check type valve with drain and gauge ports. Ductile iron body featuring covered access port for maintenance of internal components without removing valve from installed position; spring loaded, stainless steel clapper with EPDM rubber face and bronze seat ring. Trim to include angle drain valve, supply and system pressure gauges. UL listed and FM approved.

B. Inspector's Test Connection: Section drain valve with integral test port, single bronze body ball valve with minimum 1" NPT inlet and outlet, chromium plated bronze ball, glass impregnated teflon valve seat, two fused tempered sight glasses and 1/2" test orifice. UL listed and FM approved. Provide AGF Manufacturing Inc. Model 3011SG or approved equal.

C. Air Venting Valves: Equip wet-pipe sprinkler systems with automatic float type air vent. Provide AGF Model M7900AAV; forged brass body assembly with integrated ball valve, stainless steel strainer and purge valve with hose fitting. Install at high point in each sprinkler zone.

2.4 ACCESSORIES

A. Water Flow Switch: Vane type switch, aluminum pipe saddle mount, polyethylene paddle, adjustable retard and tamper-proof housing, with two SPDT contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC. As manufactured by Potter Electric, Model VSR-F or equal by System Sensor or Notifier.

B. Alarm Bell: Vibrating bell, 8 inch red powder coat finish, 120 volts AC. Bell shall conform to UL 464; furnish with weatherproof back box. As manufactured by Potter Electric, Model PB1208 or equal by System Sensor or Notifier. Minimum 75 dB at 10 feet.

C. Supervisory Switches: For monitoring open position of OS&Y gate valve, integral mounting bracket with adjustable clamp bar. Tamper-proof switch housing with two SPDT contacts rated at 15 amp at 125 volt AC and 2.5 amp at 30 volt DC. As manufactured by Potter, Model OSYSU-2 or equal by System Sensor or Notifier.

2.5 FIRE DEPARTMENT CONNECTIONS

A. Type: Large Diameter Hose.

B. 5" Storz x 4" NPT female, with Storz blind cap, non-threaded, genderless, 1/3 turn quick connect coupling, with lever type lock per NFPA 1963. Connector and cap manufactured of forge T6160 aluminum alloy with hardcoat anodized finish, face gasket resilient nitrile rubber. Cap attached to connector by chain or cable.

C. Escutcheon: Round red enamel finished aluminum plate, lettering "AUTO. SPKR.".

1. Product: Croker Fig. 6362 or equal by Potter-Roemer, Fire Protection Products Inc. or Kochek.

2.6 HOSE VALVE TEST HEADER

A. Type: Flush backflow preventer test header.

B. Cast brass body with end inlet and two outlets, chrome plated non-rising stem hose gate valves with loose bonnets, 3" female NPT inlet and 2-1/2" male hose thread outlet, and caps and chains. Threads to local fire department specifications.

C. Escutcheon: Rectangular chrome plated, lettering "BACKFLOW PREVENTER TEST CONNECTION".

1. Product: Potter Roemer Fig. 5862-C with Fig. 4335 valve or equal by Elkhart Brass or Croker.

PART 3 EXECUTION

3.1 GENERAL

A. The complete system shall be installed in accordance with Rules and Regulations pertaining to Light Hazard (not to exceed 168 sq. ft. per head - system hydraulically calculated; not sized per pipe schedule) and Ordinary Hazard Group 1 occupancies and comply with the full requirements of the regulatory agencies.

B. The Fire Protection Contractor shall have hydrant flow tests conducted on the fire hydrants hydraulically closest to the new water service entrance. Conduct test and record test data in accordance with NFPA 291.

1. Obtain flow test data, attested to by Clerk of the Works, which is adequate to base the design on. Data will be judged adequate if the actual flow values measured during flow test equal or exceed total demand. Flow values extrapolated from measured flow values may not be used as a basis for design.

C. The Fire Protection Contractor shall have prepared by a NICET Level IV Certified Sprinkler Technician or under a P.E. work installation drawings (Shop Drawings) and shall submit them to the engineer and Rating Bureau for approval.

D. Shop Drawings shall include all hydraulic calculations prepared on forms similar to those in NFPA 13 Appendix A.

E. Design Criteria:

Light Hazard - 0.10 GPM/Sf density over the most remote 1500 sq.ft. for offices and classrooms. Protection area limitation 168 sq.ft. with standard coverage sprinklers.

Ordinary Hazard Group 1 - 0.15 GPM/SF density over the most remote 1500 sq.ft. for Storage and Mechanical Areas. Protection area limitation 130 sq.ft.

Calculations shall allow a 10 percent safety factor for future deterioration of the water supply.

F. Water Supply: (Verify the following.)

Willow Brook Road, March 31, 2026

1. Static: 138 psig
2. Residual: 30 psig
3. Flow: 535 GPM

G. Before commencing work, the Fire Protection Contractor shall coordinate with other trades, so that no possible interferences will occur. If due to inadequate coordination, extra work is entailed, the Fire Protection Contractor shall be held fully responsible.

3.2 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Locate outside alarm bell on exterior of building wall adjacent to fire protection riser.

D. Place pipe runs to minimize obstruction to other work. Special care must be taken to insure that piping above hung ceilings is run to maintain maximum headroom and clearance for access to equipment of other trades and to avoid conflict with electrical conduits, light fixtures, other piping, ductwork etc.

E. Pipe shall be run concealed throughout finished spaces. Place above finished ceilings or in chases, shafts, wall cavities or soffits. Exposed piping shall be run with care for aesthetics, minimizing fittings and offsets and creating symmetry in the in the installation.

F. In gridded sprinkler systems, the water velocity shall not exceed 20 ft./sec. in branch lines 2" and smaller.

G. Pipe size for drops to sprinkler heads located below suspended ceilings shall be 1 inch minimum.

3.3 SPRINKLER HEADS

A. Sprinkler heads of the proper configuration and numbers are to be installed as required in accordance with regulations pertaining to Light and Ordinary Hazard Occupancies and meet the full requirements of the NFPA, Local Fire Department, State Fire Marshal, Fire Insurance Company, Rating Bureau and other agencies having jurisdiction.

B. Center sprinklers in ceiling tiles except where indicated otherwise. Provide and adjust arm over assemblies as necessary.

C. Where flexible sprinkler drop are used the minimum bend radius shall be 7 inches. Use FM equivalent length in hydraulic calculations. The ceiling support brackets shall be attached to the main tee bar runner in the grid, not the cross support rails. Follow all manufacturer's instructions.

D. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

E. Install heads with Teflon liquid joint compound applied to male threads only.

F. Install guards on sprinklers in locations subject to mechanical damage.

G. Mount sprinkler head cabinet in the location directed by the Owner Representative. Stock with spare sprinkler heads of each type and or temperature rating and a sprinkler head wrench per NFPA 13.

3.4 FIRE DEPARTMENT CONNECTION

A. The fire department connection shall be made down stream of riser check valve in the system piping. There shall not be a shut-off valve in the fire department line.

B. The pipeline between the check valve and the outside hose coupling shall be equipped with an approved automatic drip.

C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

D. Installation shall conform with the requirements of the local Fire Department, and the Rating Bureau in accordance with NFPA.

3.5 INSPECTOR'S TEST CONNECTIONS

A. Install at end of most remote branch line, valve shall not be over 7'-0" above floor. Terminate connection outside building with 1 inch 45 degree elbow. Flow shall be equivalent to one sprinkler head.

B. Inspector's test connections shall be mounted so as to be easily reached for test purposes without need for the use of a ladder.

3.6 TESTING

A. Hydrostatically test entire system. Test system at no less than 200 psi for two (2) hours after completion, in accordance with NFPA 13.

B. Flush entire piping system of foreign matter. Furnish to the insurance carrier, Contractor's Material and Test Certificate. Fill in and sign form as outlined in NFPA 13.

C. During and after completion, the entire installation shall be subject to inspection and testing by the insurance carrier.

D. Notify authority having jurisdiction of testing.

3.7 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION 211300

SECTION 220500 - PLUMBING GENERAL CONDITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and the general provisions of the Contract, including The General Conditions of the Contract, the Supplementary General Conditions, and Division 1 Specification Sections are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.

B. Complete installation, startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the start up procedure.

D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

1.3 DESCRIPTION

A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.

B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein.

C. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division.

D. The following information contains specifications of Work in connection with, and in addition to, this Division:

1. All drawings associated with the project.

2. All specifications associated with the project.

E. Division of work responsibilities shall be as defined and directed by the Bidding Agent and/or the Bidding General Contractor.

1.4 INTENT

A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.

B. Furnish, deliver and install any apparatus, appliance, material or Work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the Work complete and perfect in all respects and ready for operation, even if not particularly specified, under their respective Section without additional expense to the Owner.

C. Include in the work minor details not usually shown or specified but necessary for proper installation and operation, as though they were hereinafter shown or specified.

D. Provide Engineer written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of Work omitted. In the absence of such written notice, it is mutually agreed that Work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

E. The Work indicated is diagrammatic. The Architect and/or Engineer may require as part of this Contract, the relocation of devices to reasonable distances from the general locations shown.

F. Verbal clarifications of the Drawings or Specifications during the bid period are not to be relied upon. Refer any questions or clarifications to the Engineer at least five Working days prior to bidding to allow for issuance of an addendum. After the five-day deadline, Bidder must make a decision and qualify the Bid, if the Bidder feels it necessary.

1.5 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings.) Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

B. Closely follow Drawings in layout of Work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom. Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.

C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.

D. Where variances occur between the Drawings and Specifications or within either of the Documents, include the item or arrangement of better quality, greater quantity or higher cost in the Contract price. The Engineer shall decide on the item and the manner in which the work shall be installed.

1.6 SURVEYS AND MEASUREMENTS

A. Before submitting a Bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which the work will be installed. Contractor will be held responsible for any assumptions, omissions or errors made as a result of failure to become familiar with the site and the Contract Documents.

B. Base all measurements, both horizontal and vertical, from established bench marks. All Work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the Work.

C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer do not proceed with that Work until instructions have been received from the Engineer.

1.7 CODES AND STANDARDS

A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.

B. The current adopted editions of the following State or local Codes apply:

1. Connecticut State Building Code with Amendments to the following:

a. International Building Code

b. International Mechanical Code

c. International Plumbing Code

d. Connecticut Gas Equipment and Piping Code

e. National Electrical Code (NFPA 70)

f. International Energy Conservation Code

g. ICC/ANSI A117.1-2017 Accessible and Usable Buildings and Facilities

C. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.

D. Include in the Work, without extra cost to the Owner, any labor, materials, testing, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings and/or specified.

1.8 PERMITS AND FEES

A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.9 SEISMIC RESTRAINT

A. General: Verify current seismic requirements based on project location and with Code requirements. If This project is in a seismic zone per State and/or Local Codes and Ordinances and all materials and equipment shall be installed, supported, and seismically restrained accordingly.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those required for this Project in material, design, and extent.

C. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, design of seismic supports and selection of seismic restraints for all equipment and materials.

2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.

3. Seismic Restraint Details: Detail fabrication and attachment of restraints, supports and snubbers.

4. Seismic Separation Assemblies: Refer to the Architectural and/or Structural drawings for locations of seismic joints.

D. Installation: Installation shall be carried out in strict accordance with the Seismic Engineer's submittal, current Code, accepted standards and the equipment and material manufacturers' recommendations.

1.10 COORDINATION

A. Carry out all work in conjunction with other trades and give full cooperation in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades, and to allow for serviceable access to equipment.

B. Mechanical contractors' shall initiate coordination drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner. The Contractors' shall prepare coordination drawings at a scale no less than 1/4"=1'-0", showing the work of all trades, including but not limited to, the following: proposed ductwork installation in detail, including ceiling heights, approved structural steel shop drawings, duct heights, access doors, light fixtures, registers and diffusers, sprinkler piping, electrical distribution conduits, wires, panels and any other electrical work which may conflict with the sheet metal ducts or piping, waste and vent piping, water piping, storm piping, and rain leaders. Provide elevation details showing connections and equipment layout and configuration based on approved submittals. Each shall use a different color code. A coordination meeting of all Contractors involved is then to be held and all possible conflicts are to be resolved. All trades shall sign acceptance of the drawings and then shall submit two (2) prints of each drawing to the Engineer for record.

C. Contractors are required to examine all of the Project Drawings and mutually arrange Work so as to avoid interference. In general, ductwork, heating piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer regarding the arrangement of Work, which cannot be agreed upon by the Contractors, will make final decisions. Service of equipment will take precedence.

D. Where the Work of the Contractor will be installed in close proximity to or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment.

E. If Work is installed before coordinating with other Divisions or so as to cause interference with Work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.

F. Initial contact and coordination has been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.11 ACCEPTANCES

A. The equipment, materials, Workmanship, design and arrangement of all Work installed are subject to the review of the Engineer.

B. Within 30 days after the awarding of a Contract, submit to the Engineer for review a list of manufacturers of equipment proposed for the Work. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, notify the Engineer, in writing, within 30 days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.

D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog or model number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

E. If material or equipment is installed before shop drawing review, liability for its removal and replacement is assumed by the Contractor, at no extra charge to the Owner, if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.

F. Failure on the part of the Engineer to reject shop drawings or to reject Work in progress shall not be interpreted as acceptance of Work not in conformance with the Drawings and/or Specifications. Correct Work not in conformance with the Drawings and/or Specifications whenever non-conformance is discovered.

1.12 EQUIPMENT DEVIATIONS

A. Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing within 60 days from the Award of Contract. The Contractor shall state in his request whether it is a substitution or an equivalent to that specified, and the amount of credit involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts.

1. The Base Product Specification shall be based on using the materials and equipment as specified and scheduled with no exceptions. Equipment Manufacturers Scheduled on Drawings are considered Base Product Specification and any other acceptable manufacturers listed in the specifications is considered an equivalent manufacturer to the Base Product Specification. Unlisted manufacturers are considered a substitution and equipment deviation and subject to the requirements for equipment substitution and deviation. When any alternate manufacturer does not qualify acceptable, as determined by the Engineer, provide the Base Bid manufacturer at no additional cost to Owner.

2. Where an equivalent manufacturer is listed in the specifications, it may or may not indicate that there is an equal product available. Any products must meet all criteria of the Base Product Specification as determined by the Engineer.

B. Substitutions and Equipment Deviations will not be considered if they have a direct bearing on the changing or revising of Contract Documents or if it involves other Contractor's scope of work or thier equipment. Coordination with all trades is required and must be acceptable to all other involved Contractors.

C. Substitutions may be considered for one of the following:

1. Substitution for Cause: Changes proposed by the Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of warranty terms.

2. Substitutions for Convenience: Changes proposed by the Contractor or Owner that are not required in order to meet other Project requirements, but may offer advantage to either the Owner or Contractor.

D. In these Specifications and on the accompanying Drawings, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation. In the event that only one (1) manufacturer of a product is specified and it is found that the manufacturer has discontinued the product, the Contractor shall use an acceptable equivalent product that meets the requirements of an equivalent product, as noted below, and has all the features of the originally specified product. The details of workmanship, finish and design, and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.

E. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineer's review.

F. Where two or more names are given as equivalents, the Contractor must use the specified item or one of the named equivalents. Where one name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with this Specification.

G. Equipment, material or devices submitted for review as an "accepted equivalent" shall meet the following requirements:

1. The equivalent shall have the same construction features such as, but not limited to:

2. Material thickness, gauge, weight, density, etc.

3. Welded, riveted, bolted, etc., construction

4. Finish, undercoatings, corrosion protection

5. The equivalent shall perform with the same or better operating efficiency.

6. The equivalent shall have equal or greater reserve capacity.

7. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.

8. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.

H. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.

I. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

J. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.

1.13 SHOP DRAWINGS

A. Refer to individual specification sections for additional submittal information.

B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed.

C. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (9) copies for review.

D. Provide shop drawings for all devices specified under equipment specifications for all systems, materials, equipment and/or devices. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal. Partial submissions shall be rejected.

E. Equipment shop drawings shall contain full range performance curves, graphs, tables or other pertinent data which clearly indicates operational range of a given unit size. Computer generated/plotted curves, based solely on design performance, will not be accepted.

F. All specific options and/or alternatives shall be clearly indicated. Failure to do so shall be grounds for rejection.

G. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. and the specific associated specification section.

H. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.

I. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. Contractor must allow for a one week review at the Engineer's office plus normal delivery time to the G.C., Architect, Engineer, and return to the Architect, and G.C. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer. The Contractor shall incur all costs associated with delay of construction due to equipment and/or materials arriving late due to late or improper shop drawing submittal.

J. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.

K. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not indicate that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

L. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

M. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.

N. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.

O. Contractor shall make any corrections required by Engineer and shall resubmit required number of corrected copies of shop drawings or new samples until accepted. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than corrections requested by Engineer on previous submissions. Engineer shall review no more than one resubmittal of any shop drawing or sample at Owner's expense. The fees for review of additional resubmittals shall be paid by the Contractor at the Engineer's standard rates.

1.14 CHANGES IN WORK

A. A Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.

B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 12.

1.15 MANUFACTURER'S IDENTIFICATION

A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. Nameplate data shall not be obstructed. The nameplate of a Contractor or distributor will not be acceptable.

B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.16 RECORD DRAWINGS

A. Maintain at the job site a record set of Project Drawings on which any changes in location or routing of all equipment, materials and access panels shall be recorded.

B. At the end of construction, the Contractor shall provide the Owner with a complete set of As-Built Drawings, including all updated coordination drawings, ductwork and piping plans. As-Builts shall be drawn on the latest version of Autocad or compatible software, approved in writing, prior to submittal. The Owner shall be provided with a "CD Rom" disk and one set of reproducible mylar sepias.

1.17 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.

B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.

C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.18 PROTECTION OF MATERIALS AND EQUIPMENT

A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.

B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.19 BASES AND SUPPORTS

A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, rails, framing, bases and piers required for all equipment furnished under this Division.

B. Unless otherwise indicated in individual trade Sections, pumps, fans, air handlers, boilers, chillers, tanks, compressors and other rotating machinery shall be mounted on a minimum of six (6") inch high concrete pads which shall be furnished and installed per Division 3. All pads shall be extended six (6") inches beyond machine base in all directions with top edge chamfered. Shop drawings of all foundations and pads shall be submitted to the Engineer for review before they are constructed. The Mechanical Contractor shall field coordinate all required dimensional and necessary loading information.

C. Construction of foundations, supports, pads, bases and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.

D. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without extra cost to the Owner.

E. All equipment supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement. The equipment shall be positively anchored to the bases or supports to resist vertical movement. The equipment and its supports shall be provided with suitable restraints to resist horizontal movement from any direction as dictated by applicable seismic Codes.

1.20 SLEEVES, INSERTS AND ANCHOR BOLTS

A. The Contractor shall provide, set in place and be held responsible for the location of all sleeves, inserts and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.

B. It is the responsibility of the Contractor to furnish cast-in-place steel sleeves, inserts and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Structural Engineer for alternate installation methods.

C. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves having an inside diameter one (1") inch larger than the outside diameter of the pipe, conduit or insulation enclosing the pipe.

D. Piping insulation shall run continuous through sleeve.

E. Penetrations through fire-rated walls, ceilings and all floors (except slab on grade) in which piping or ducts pass shall be filled solidly with acceptable fire-stopping material. Sleeves shall be steel or a UL / FM listed and approved assembly.

F. When ducts, piping or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.21 FIRE-STOPS AND SEALS

A. Refer to Division 07 Specification for additional and more specific information.

B. Fire-stopping systems shall be submitted as shop drawing.

C. Penetrations through fire-rated walls, ceiling or floors shall be sealed with a UL approved fire-stop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling or floor.

D. Thruwall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.

1.22 CUTTING AND PATCHING

A. All cutting and patching shall be done per Division 1 requirements. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.

B. Work under this Division shall include furnishing, locating and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.

C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs in order to avoid cutting or damaging structural members. No structural members or structural slabs/floors shall be cut without the written acceptance of the Structural Engineer and all such cutting shall be done in a manner directed by him.

D. SCAFFOLDING, RIGGING, HOISTING

1. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.23 EXCAVATION AND BACKFILLING

A. Excavation and backfilling shall be done per Division 2 of the Specifications.

B. It is the responsibility of the Contractor to coordinate sizes, depths, fill and bedding requirements and any other excavation work required under this Division per code and local utility requirements.

1.24 WATERPROOFING

A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

1.25 ACCESSIBILITY AND ACCESS PANELS

A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.

B. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to: motors, controllers, coil, valves, switchgear, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the Engineer.

C. Access doors in walls, ceilings, floors, etc., shall be field coordinated. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc.

D. On a clean set of prints, the Contractor shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.

E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner. All access panel or door locations shall be indicated on Owner's final as-built record drawings.

F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed. Coordinate exact requirements in field.

1.26 TEMPORARY OPENINGS

A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall coordinate the requirements accordingly. In the event of failure of the Contractor to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

B. SHUTDOWNS

1. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner's representative.

2. The Architect and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

3. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.27 TAGS AND CHARTS

A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags securely fastened with brass chains, screws or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters two (2") inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location and use of each item. Directories shall be prepared under each Section and shall be glass framed.

B. Directory shall indicate valve tag number and the unit number, floor/area branch line, main line, service or other pertinent data to quickly and easily identify the valve's purpose.

1.28 ESCUTCHEONS

A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls or partitions in finished visible locations.

1.29 PAINTING

A. All finish painting in completed areas shall be performed per other divisions of the Specifications.

B. All materials shipped to the job site under this Division, such as piping, fittings, plumbing fixtures, valves,etc., shall have standard manufacturer's finish, unless otherwise specified by Architect.

C. All outdoor piping, fittings and hangers shall be properly primed with zinc-rich primer and finished with a minimum of two (2) coats of high grade exterior enamel.

1.30 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Provide engineered design, layout, details and fabrication, submitted with registered professional engineer sign and seal, of swing joints, expansion loops and expansion joints with proper anchors and guides. Pay particular attention to plastic piping with high coefficients of expansion.

B. Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.31 ELECTRICAL CONNECTIONS

A. Unless otherwise specified, all wiring shall be furnished and installed per Division 26 Specifications.

B. All motor controllers not factory mounted on mechanical equipment shall be furnished, mounted, and installed by the Division 26 contractor, and shall be coordinated with this contractor. Provide properly sized overload heaters and all required accessories with all motor controllers. See Division 26 Motor Controllers for motor controller requirements.

C. All power wiring shall be furnished and installed per Division 26 complete from power source to motor or equipment junction box including power wiring through the motor controller and proper means of disconnect per NEC and Division 26. The Division 26 Contractor shall provide all disconnects, unless noted otherwise.

1.32 QUIET OPERATION

A. Equipment and material used in the various systems described herein shall not produce a sound level greater than 55 decibels in the area served. If noise level is deemed objectionable by the Owner/Engineer, the Contractor shall test and record sound levels in the presence of the Owner/Engineer. The sound level shall be observed on the "A" weighting network of a sound level or sound survey meter. The ASHRAE "Guide and Data Book" provides a means to determine sound level of mechanical equipment when the total of background plus equipment sound levels exceeds the minimum acceptable equipment sound level.

B. If objectionable noises or vibrations of any magnitude are produced and transmitted to occupied portions of the building by apparatus, piping, ducts or other parts of the mechanical work, the Contractor shall make such changes or additions as necessary without extra cost to the Owner.

1.33 MAINTENANCE

A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.

B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.

C. The Contractor shall provide a check list and shall put a copy of it in the boiler or main mechanical room. The check list shall itemize each piece of equipment furnished under his Section.

D. The Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, it has been properly lubricated, and that all necessary current and preventative maintenance has been performed as recommended by the manufacturer and by good and accepted practice.

E. The Contractor shall check all controls in the building to ascertain that they are functioning as designed. This shall apply to all thermostats, aquastats, humidistats, freezestats and firestats, etc. This portion of the work shall be performed by the Contractor who installed the controls.

F. During construction, the Contractor shall ensure that all filters are in place on all equipment. If the equipment is operated during construction (see restrictions section of this specification), strict attention shall be paid to maintaining clean and effective filters and cleaning ductwork and equipment. Filters shall be new and/or clean when the system testing and balancing takes place. The Contractor shall bear the cost of all filters and media during construction until final acceptance by the Owner. This requirement shall apply equally to fluid filters and strainers.

G. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., special filter removal hooks, valve wrenches, etc.).

1.34 DEMOLITION

A. All required demolition work shall be performed by the Contractor. All demolition work shall be performed in a neat and orderly fashion.

B. Demolition work, if indicated on the drawings, is intended for general information only and is not intended to describe the full extent of demolition work required under this Contract. All existing plumbing work and systems, including but not limited to piping, equipment, wiring, controls, hangers, and supports, made obsolete by this project, shall be removed in their entirety under this Contract, unless noted otherwise.

1. Existing plumbing fixtures, water piping, sanitary/waste piping, storm piping as indicated on the plans, decribed in notes or implied by nature of the work.

a. All plumbing water piping removed from active lines to remain shall be capped watertight.

1) Remove abandoned piping to source of supply, provide isolation valve and cap at mains.

b. All sanitary branch piping removed from active systems to remain shall either have a new cleanout provided at termination or the branch line shall be removed to within 24" of the active main and capped.

c. Removal shall be complete to behind finished surfaces.

d. Contractor shall make safe all work associated with this division.

C. After piping, equipment, etc., has been removed, neatly cap remaining piping, and insulate caps to match the existing adjacent piping. In finished areas, all piping shall be cut back to a concealed location, i.e., within walls, above ceilings, etc., before capping.

D. Before submitting his Bid, the Contractor shall visit the site with the Contract Documents in hand, and shall inspect all existing systems to determine the extent of demolition work involved. Particular attention is drawn to the removal of existing walls or portions of existing walls. In those areas, all exposed and concealed piping, equipment, etc., running across or through affected areas shall be removed as required. Piping shall then be either capped, or, if required for the proper continuing operation of an existing system or portions to remain, piping shall be rerouted around the affected areas and reconnected as required.

E. In general, it shall be the responsibility of the Contractor to remove demolished equipment, piping, etc., from the site and properly dispose of it. If the Owner shall so request, however, the Contractor shall turn over demolished equipment, etc., to the Owner for the Owner's use. Unless otherwise noted, demolished work shall not be abandoned in place. Contractor shall make safe all utilities pertaining to this section.

F. Demolition shall include the removal of all hangers and supports, anchors and other items not required for the new work.

G. EXAMINATION

1. Verify existing conditions in the field. Note which items are to remain and which items are to be removed as indicated on drawings.

2. Verify that abandoned wiring and equipment serve only abandoned facilities.

3. Demolition drawings are based on casual field observation and existing record documents.

4. Report discrepancies to Engineer before disturbing existing installation, i.e. asbestos. Where asbestos materials are deemed to be part of the equipment, the abatement contractor shall be responsible for demolition and proper removal and disposal of equipment.

5. Beginning of demolition means installer accepts existing conditions.

H. PREPARATION

1. Disconnect electrical systems in walls, floors, and ceilings to be removed. Coordinate with Electrical Contractor for extent of work to be performed.

2. Provide temporary piping and connections if required to maintain existing systems in service during construction. When work must be performed on energized equipment or piping, coordinate shut-down time with owner.

3. Existing Domestic Cold Water System: Maintain existing systems in service. Disable systems only to make switchovers and/or connections. Minimize outage duration.

   a. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

4. Existing Sanitary System: Maintain existing system in service. Disable system only to make switchovers and/or connections. Minimize outage duration.

5. Contractor shall coordinate demolition work in any occupied areas so as to cause the least interuption or disruption to normal routines.

   a. All demolition work shall be scheduled and coordinated in order to accommodate construction phasing schedule.

I. DEMOLITION AND EXTENSION OF EXISTING WORK

1. Remove, relocate, and extend existing installations to accommodate new construction.

2. Contractor shall make safe all work associated with this division.

3. Disconnect and remove piping and fittings serving equipment that has been removed .

4. Disconnect and remove existing equipment, piping and fittings as indicated on the drawings.

1.35 LUBRICATION

A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner.

B. The Contractor shall furnish and install, as appropriate on all equipment requiring lubrication, Zerk pressure gun grease fittings or sight gravity-feed oilers equipped with shutoff and needle valve adjustment.

1. Units furnished with sealed bearings and lifetime lubrication are exempted.

2. All fittings and oilers are to be fully accessible for lubrication with equipment which does not require special adapters.

3. Where fittings would be otherwise inaccessible, furnish and install extended grease lines.

1.36 CLEANING

A. The Contractor shall be responsible for keeping the jobsite clean, safe and neat throughout the duration of construction. The Contractor shall clean up his own debris daily and shall coordinate removal of rubbish and debris with the General Contractor/Construction Manager.

B. No debris, construction materials, cigarette butts, coffee cups, etc., shall be left above suspended ceilings.

C. Terminal equipment and plumbing fixtures shall cleaned at substantial completion.

D. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

E. During the course of construction, all pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.

F. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.37 OPERATING INSTRUCTIONS

A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least 72 hours notice to the Owner, Engineer, and Commissioning Agent in advance of this period.

1. Prior to the instruction period, the contractor shall have approved Owner's Manuals on site for aiding in the instructions.

B. The Contractor shall formally submit for delivery to the Engineer a minimum of three (3) Owner's Manuals, to be complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction.

C. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.

D. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.

E. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. These letters will be bound into the operating and maintenance books.

F. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.38 ADJUSTING AND TESTING

A. Prior to factory star-up procedures, the Contractor shall perform prefunctional checks and procedures to ensure that the equipment is installed properly and are operational.

1. The prefunctional checklists and procedures are to be provided by the Commisioning Agent. These forms must be filled out and approved before final start-up and adjustments are made by the factory representative.

B. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer and the Commissioning Agent that they are in proper adjustment, the controls operate as described in the sequence of operation and all systems are in satisfactory, permanent operating condition.

C. A factory service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment.

1. The following equipment will require this inspection: pumps, equipment, water temperature controls and valves, water heaters, specialized plumbing fixtures, and electric/electronic faucets and flush vlaves.

2. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.

a. The written notification shall include a complete start-up report on manufacturer's letterhead with all information including date and signature.

b. The report shall be made available to the Engineer and Commisioning Agent for review before acceptance is granted.

1.39 GUARANTEES

A. The Contractor shall guarantee all equipment, material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner, unless otherwise noted.

B. All refrigeration compressors shall have five (5) year guarantee from the date of final acceptance by the Owner unless otherwise noted.

C. All water heaters shall have an optional minimum five (5) year guarantee from the date of final acceptance by the Owner unless otherwise noted.

D. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by the Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.

1.40 RESTRICTIONS

A. Water heaters provided under this Division may not be used for temporary hot water requirements due to premature wear and dirt/dust infiltration. Written approval may be obtained from the Owner only after submission of a written cleaning plan and guarantee/warranty extension.

B. Piping shall not be run in any concrete floor slab. Written approval from the Structural Engineer may be obtained only after submission and approval of a layout shop drawing.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION - NOT USED.

END OF SECTION 22 05 00 220500

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SECTION 220505 - PLUMBING DEMOLITION

PART 1 GENERAL.

1.1 RELATED DOCUMENTS

A. Drawings and the general provisions of the Contract, including The General Conditions of the Contract, the Supplementary General Conditions, and Division 1 Specification Sections are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

C. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SECTION INCLUDES

A. Plumbing demolition.

1. Plumbing Contractor shall make all work safe, including all coordination between all other trades such as Mechanical, Electrical, Fire Projection, ect.

2. Existing plumbing fixtures, water piping, sanitary/waste piping, vent piping and storm piping as indicated on the plans, decribed in notes or implied by nature of the work.

a. All plumbing water piping removed from active lines to remain shall be valved with use of a proper isolation valve. I

b. All sanitary branch piping removed from active systems to remain shall be removed to within 24" of the active main and capped.

c. Removal shall be complete to behind finished surfaces.

B. Demolition shall include the removal of all hangers and supports, anchors and other items not required for the new work.

PART 3 EXECUTION

2.1 EXAMINATION

A. Verify existing conditions in the field. Note which items are to remain and which items are to be removed as indicated on drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Engineer before disturbing existing installation.

E. Report discrepancies to Engineer before disturbing existing installation, i.e. asbestos. Where asbestos materials are deemed to be part of the equipment, the abatement contractor shall be responsible for demolition and proper removal and disposal of equipment.

F. Beginning of demolition means installer accepts existing conditions.

2.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Provide temporary piping, ductwork, control wiring, and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or piping, coordinate shut-down time with owner.

C. Existing Domestic Cold Water System: Maintain existing systems in service. Disable systems only to make switchovers and/or connections. Minimize outage duration.

1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.

D. Existing Sanitary System: Maintain existing system in service. Disable system only to make switchovers and/or connections. Minimize outage duration.

2.3 DEMOLITION AND EXTENSION OF EXISTING PLUMBING WORK

A. All demolition work shall be scheduled and coordinated in order to accommodate construction phasing schedule.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned piping to source of supply, provide isolation valve and cap at mains.

D. Contractor shall make safe all work associated with this division.

E. Disconnect and remove plumbing piping and fittings serving equipment that has been removed .

F. Disconnect and remove existing equipment, piping and fittings as indicated on the drawings.

2.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused in accordance with manufacturer's reccommended maintenance procedures.

END OF SECTION 220505

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Single phase electric motors.

D. Three phase electric motors.

E. Electronically Commutated Motors (ECM).

1.2 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

B. Section 262913 - Enclosed Controllers.

1.3 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators.

B. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for _____ use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Comply with NFPA 70.

C. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.1 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.

B. Electrical Service:

C. Construction:

1. Open drip-proof type except where specifically noted otherwise.

2. Design for continuous operation in 104 degrees F environment.

3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

E. Wiring Terminations:

1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.

2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.2 APPLICATIONS

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 220513

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SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

C. Pipe loops, offsets, and swing joints.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

A. EJMA (STDS) - EJMA Standards.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

END OF SECTION 220516

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 220523 - General-Duty Valves for Plumbing Piping.

C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.

D. Section 220716 - Plumbing Equipment Insulation.

E. Section 220719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Manufacturers:

B. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.

2. Provide sealant for watertight joint.

3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.

4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.

2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:

1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.

E. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Engineer.

F. Clearances:

1. Provide allowance for insulated piping.

2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

A. Manufacturers:

B. Pipe Sleeve Material:

1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.

2. Masonry Structures: Sheet metal or fiber.

C. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

PART 3 EXECUTION

3.1 INSTALLERS

3.2 PREPARATION

3.3 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

E. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a water-tight seal.

6. Install in accordance with manufacturer's recommendations.

F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION 220517

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SECTION 220519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water meters.

B. Gas meters.

C. Pressure gauges.

D. Thermometers.

1.2 RELATED REQUIREMENTS

A. Section 221006 - Plumbing Piping

1.3 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

D. AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case.

E. AWWA C701 - Cold-Water Meters -- Turbine Type, for Customer Service.

F. AWWA C702 - Cold-Water Meters -- Compound Type.

G. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance.

H. NSF 61 - Drinking Water System Components - Health Effects.

I. NSF 372 - Drinking Water System Components - Lead Content.

J. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Utility Service Metering: Coordinate and apply Utility Service Provider requirements in terms of meter type, size, physical location, pipe size, upstream/downstream pipe lengths required, and other installation details.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

C. Project Record Documents: Record actual locations of components and instrumentation.

PART 2 PRODUCTS

2.1 WATER METERS

A. Compound Water Meters:

1. Manufacturers:
2. Utility Connection Size: 3 inch flanged.
3. Maximum Unidirectional Water Flow Capacity: As indicated on drawings.
4. Lead-free bronze alloy case, polymer-based cap, and hermetically sealed register.
5. Pressure and Temperature: Up to 150 psi and 100 degrees F.
6. AWWA C702, with lead content below 0.25 percent when using non-lead-free materials on wetted surfaces according to NSF 61 and NSF 372.

B. Turbine Water Meters:

1. Flow Capacity Range: As indicated on drawings.
2. Coated ductile iron case, polymer-based cap, test port, and hermetically sealed register with low flow indicator.
3. Pressure and Temperature: Up to 175 psi and 120 degrees F.
4. AWWA C701 Class II, with lead content below 0.25 percent when using non-lead-free materials on wetted surfaces according to NSF 61 and NSF 372.

2.2 PRESSURE GAUGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Moeller Instrument Company, Inc: www.moellerinstrument.com.
3. Omega Engineering, Inc: www.omega.com.

B. Bourdon Tube for Liquids and Gases:

1. Dial Size and Cover: 4-1/2 inch diameter scale with polycarbonate window.
2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
4. Scale: Psi.

2.3 THERMOMETERS

A. General:

1. Product Compliance: ASTM E1.
2. Lens: Clear glass, except where stated.
3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

B. Thermometers - Dial Type:

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify Utility Service Provider piping readiness to receive meter.

B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

3.2 INSTALLATION

A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.

B. Install water meters with inlet and outlet isolation valves in compliance with AWWA M6.

C. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Extend nipples to allow clearance from insulation.

D. Locate PT (pressure-temperature) test plugs adjacent to control device sockets.

3.3 SCHEDULES

A. Pressure Gages, Location:

1. Pumps
2. Expansion Tanks
3. Pressure reducing valves
4. Backflow preventers
5. Scale range shall be consistant with the service
6. Backflow preventers, 0 to ____ psi.

B. Stem Type Thermometers, Location and Scale Range:

1. Domestic hot water supply and recirculation, 0 to 150 degrees F.

END OF SECTION 220519

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SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Applications.

B. General requirements.

C. Ball valves.

D. Butterfly valves.

E. Check valves.

F. Gate valves.

G. Globe valves.

H. Plug valves.

1.2 RELATED REQUIREMENTS

A. Section 220553 - Identification for Plumbing Piping and Equipment.

B. Section 220719 - Plumbing Piping Insulation.

C. Section 221005 - Plumbing Piping.

1.3 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. SWP: Steam working pressure.

I. TFE: Tetrafluoroethylene.

1.4 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

E. ASME B16.34 - Valves - Flanged, Threaded and Welding End.

F. ASME B31.9 - Building Services Piping.

G. ASTM A48/A48M - Standard Specification for Gray Iron Castings.

H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

I. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

J. AWWA C606 - Grooved and Shouldered Joints.

K. MSS SP-45 - Bypass and Drain Connections.

L. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends.

M. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves.

N. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.6 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.

2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.

2. Protect valve parts exposed to piped medium against rust and corrosion.

3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.
5. Secure check valves in either the closed position or open position.
6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.
   a. Provide temporary inlet and outlet caps.
   b. Maintain caps in place until installation.
2. Store valves in shipping containers and maintain in place until installation.
   a. Store valves indoors in dry environment.
   b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

1.8 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:

A. Handle large valves with sling, modified to avoid damage to exposed parts.

B. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. See Drawings for specific valve locations in addition to those locations listed below.

B. Provide the following valves for the applications if not indicated on drawings:

1. Shutoff: Ball, butterfly, gate or plug.
2. Dead-End: Single-flange butterfly (lug) type.
3. Throttling: Provide globe, angle, ball, or butterfly.
4. Swing Check (Pump Outlet):
   a. 2 NPS and Smaller: Bronze swing check valves with bronze disc.
   b. 2-1/2 NPS and Larger for Domestic Water: Iron swing check valves with closure control, metal or resilient seat check valves.
   c. 2-1/2 NPS and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

D. Required Valve End Connections for Non-Wafer Types:

1. Steel Pipe:

a. 2 NPS and Smaller: Threaded ends.

b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.

c. 5 NPS and Larger: Grooved or flanged ends.

2. Copper Tube:

a. 2 NPS and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

b. 2-1/2 NPS to 4 NPS: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.

c. 5 NPS and Larger: Grooved or flanged ends.

E. Domestic, Hot and Cold Water Valves:

1. 2 NPS and Smaller:

a. Bronze and Brass: Provide with solder-joint or _____ ends.

b. Bronze Angle: Class 125, bronze disc.

c. Ball: One piece, full port, brass or _____ with brass trim.

d. Bronze Swing Check: Class 125, bronze disc.

2. 2-1/2 NPS and Larger:

a. Iron, 2-1/2 NPS to 4 NPS: Provide with threaded or _____ ends.

b. Iron Ball: Class 150.

c. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.

d. Iron Grooved-End Butterfly: 175 CWP.

e. Iron Swing Check: Class 125, metal seats.

f. Iron Swing Check with Closure Control: Class 125, lever and spring.

g. Iron Grooved-End Swing Check: 300 CWP.

h. Iron Center-Guided Check: Class 125, compact-wafer, metal seat.

i. Iron Plate-Type Check: Class 125; single plate; metal seat.

j. Iron Gate: Class 125, NRS.

k. Iron Globe: Class 125.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Gear Actuator: Quarter-turn valves 8 NPS and larger.

2. Handwheel: Valves other than quarter-turn types.

3. Hand Lever: Quarter-turn valves 6 NPS and smaller except plug valves.

4. Wrench: Plug valves with square heads.

5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

D. Valves in Insulated Piping: With 2 NPS stem extensions and the following features:

1. Gate Valves: Rising stem.

2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

3. Butterfly Valves: Extended neck.

4. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.

2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

3. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.

4. Solder Joint Connections: ASME B16.18.

5. Grooved End Connections: AWWA C606.

F. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.

2. Solder-joint Connections: ASME B16.18.

3. Building Services Piping Valves: ASME B31.9.

G. Valve Materials for Potable Water: NSF 61 and NSF 372.

H. Bronze Valves:

1. Fabricate from dezincification resistant material.

2. Copper alloys containing more than 15 percent zinc are not permitted.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRONZE ANGLE VALVES

A. Class 125: CWP Rating: 200 psig:.

1. Comply with MSS SP-80, Type 1.

2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.

3. Ends: Threaded.

4. Stem: Bronze.

5. Disc: Bronze.

6. Packing: Asbestos free.

7. Handwheel: Bronze or aluminum.

2.4 BRASS BALL VALVES

A. Three Piece, Full Port with Stainless Steel Trim:

1. Comply with MSS SP-110.

2. SWP Rating: 150 psig.

3. CWP Rating: 600 psig.

4. Body: Forged brass.

5. Ends: Threaded.

6. Seats: PTFE.

7. Stem: Stainless steel.

8. Ball: Stainless steel, vented.

2.5 BRONZE BALL VALVES

2.6 IRON, SINGLE FLANGE BUTTERFLY VALVES

2.7 IRON, GROOVED-END BUTTERFLY VALVES

2.8 BRONZE SWING CHECK VALVES

2.9 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

2.10 BRONZE GATE VALVES

A. Non-Rising Stem (NRS):

1. Comply with MSS SP-80, Type I.
2. Class 125: CWP Rating: 200 psig:.
3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
4. Ends: Threaded or solder joint joint.
5. Stem: Bronze.
6. Disc: Solid wedge; bronze.
7. Packing: Asbestos free.
8. Handwheel: Malleable iron, bronze, or aluminum.

2.11 LUBRICATED PLUG VALVES

A. Regular Gland with Flanged Ends:

1. Comply with MSS SP-78, Type II.
2. Class 125: CWP Rating: 200 psig.
3. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
4. Pattern: Regular or short.
5. Plug: Cast iron or bronze with sealant groove.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

D. Install check valves where necessary to maintain direction of flow as follows:

1. Lift Check: Install with stem plumb and vertical.

2. Swing Check: Install horizontal maintaining hinge pin level.

E. Provide chainwheels on operators for valves 4 NPS and larger where located 96 NPS or more above finished floor, terminating 60 NPS above finished floor.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Strut systems for pipe or equipment support.

B. Beam clamps.

C. Pipe hangers.

D. Pipe rollers and roller supports.

E. Pipe supports, guides, shields, and saddles.

F. Seismic bracing hardware.

G. Nonpenetrating rooftop supports for low-slope roofs.

H. Anchors and fasteners.

1.2 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

B. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1. Fiberglass Strut Channel Framing Systems: Include requirements for strength derating according to ambient temperature.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.4 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.

D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

E. Fire Resistance: Provide hardware rated for 60 minutes resistance unless specifically indicated by the authority having jurisdiction.

F. Vibration Isolation and Seismic Restraint Requirements: See Section 220548.

G. Materials for Metal Fabricated Supports: Comply with Section 055000.

1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.

2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

H. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.2 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

2.3 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

B. Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

C. Cable Hanging System Kits:

1. Manufacturers:

a. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.

b. Ductmate Industries, Inc; _____: ductmate.com/#sle.

2. Provide cable-wire in bulk or pre-cut lengths with respective cable hangers as required to hold minimum weight of 120 lb.

2.4 BEAM CLAMPS

A. Manufacturers:

2.5 PIPE CLAMPS

A. Riser Clamps:

1. Manufacturers:

2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

3. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.

4. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

B. Strut Clamps:

1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

2.6 PIPE ROLLERS AND ROLLER SUPPORTS

A. Manufacturers:

2.7 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Pipe Shields for Insulated Piping:

1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

2. General Construction and Requirements:

a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.

b. Shields Material: UV-resistant polypropylene with glass fill.

c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.

d. Service Temperature: Minus 40 to 178 degrees F.

e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

C. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2. Liquid Temperatures Up to 122 degrees F:

a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.

b. Support From Below: MSS SP-58 types 35 through 38.

D. Pipe Supports, Thermal Insulated:

1. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.

c. Provide pipe supports for 1/2 to 30 inch iron pipes.

d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:

a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.

b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.

c. Minimum Thickness: 60 mil, 0.06 inch.

E. Copper Pipe Supports:

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mounting surfaces are ready to receive support and attachment components.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

END OF SECTION 220529

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SECTION 220533 - HEAT TRACING FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Self-regulating temperature maintenance electric heating cable.

B. Accessories.

C. Controls.

1.2 RELATED REQUIREMENTS

A. Section 220719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. UL515 - Electric Resistance Heat Tracing for Comercial Applications

B. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications.

C. NFPA 70 - National Electrical Code.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

C. Coordinate the work with other trades to provide circuit breaker ratings suitable for installed circuit lengths.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for electric heat tracing.

C. Shop Drawings: Indicate electric heat tracing layout, including power connections, tees, end seal, cable length and circuit cable length..

D. Manufacturer's Installation Instructions: Indicate installation instructions and recommendations.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.

1.6 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers

    a. Manufacturer to show minimum of thirty (30) year experience in manufacturing electric self-regulating heating cables.

    b. Manufacturer will be ISO-9001 registered.

    c. Manufacturer to provide products consistent with IEEE 515.1 and CSA 22.2 No 130-03 requirements.

    d. The self-regulating temperature maintenance cable shall be qualified and tested to demonstrate a useful lifetime in excess of 40 years.

    e. The manufacturer shall provide an extensive global reference list for this application, including installations that have been in operation for over 15 years.

2. Installers

    a. System installer shall have complete understanding of product and product literature from manufacturer or authorized representative prior to installation. Electrical connections shall be performed by a licensed electrician.

3. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, Article 100, by a Nationally Recognized Testing Laboratory (NRTL), and marked for intended use.

B. Certifications

1. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified, or FM Approved for hot water temperature maintenance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements

1. Deliver, store and handle products to prevent their deterioration or damage due to moisture, temperature changes, contaminates or other causes.

2. Deliver products to site in original, unopened containers or packages with intact and legible manufacturers' labels identifying the following:

    a. Product and Manufacturer

    b. Length/Quantity

    c. Lot Number

    d. Installation and Operation Manual

    e. MSDS (if applicable)

B. Storage And Handling Requirements

1. Store the heating cable in a clean, dry location with a temperature range 0°F (-18°C) to 140°F (60°C).

2. Protect the heating cable from mechanical damage.

1.8 WARRANTY

A. Manufacturer Warranty

1. Manufacturer shall warrant all goods listed below for two (2) years from date of purchase against faulty workmanship and use of defective materials when such goods are properly installed, operated, and maintained according to product documentation:

a. Heating cables, connection kits & accessories

b. Thermostats, controllers, panels contactors, sensors and accessories

B. Special Warranty -

1. Contractor shall provide the owner an extended product warranty for the heat tracing products listed below. The contractor must complete and forward to owner the Installation, Inspection or Commissioning Record(s) located in the back of installation manual for the heat trace system being installed, and complete the online warranty registration form within thirty (30) days from the date of installation, otherwise only standard limited warranty applies.

a. Heating Cable & Components = Ten (10) Years from Date of Purchase

2. Products not automatically offered with a 10 year manufacturer’s warranty, as a standard matter of course, will not be allowed. Warranty information must be published on the manufacturer's website

PART 2 PRODUCTS

2.1 HEAT TRACING SYSTEM

A. Manufacturers:

1. Basis of Design Manufacturer: Subject to the compliance with requirements, provide Raychem heat tracing products of Pentair Thermal Building Solutions. www.pentairthermal.com

a. Substitutions: See Section 016000 - Product Requirements.

B. Materials

1. Heating cables shall be Raychem HWAT-R2, self-regulating temperature maintenance heating cables specifically designed for this application, tested and approved to IEEE 515.1 and CSA 22.2 No 130-03.

a. The construction of the self-regulating temperature maintenance heating cable shall consist of a continuous core of conductive polymer that is radiation crosslinked, extruded between two (2) 16 AWG nickel?plated copper bus wires that varies its power output in response to pipe temperature changes.

b. The heating cable shall have a modified polyolefin inner jacket for dielectric integrity long life expectancy.

c. The heating cable shall have a laminated aluminum foil layer (Mylar wrap) for additional mechanical protection and shall act as a plasticizer diffusion shield.

d. The heating cable shall have a thicker gauge (5/24) tinned copper braid with minimum 70% coverage for ground path and mechanical ruggedness.

e. The heating cable shall have a polyolefin outer jacket printed with cable model #, agency listings, batch number and meter marks (for ease of installation within maximum circuit length.

f. The heating cable shall have a self-regulating factor of at least 70 percent for HWAT-R2. The self-regulating factor is defined as the percent reduction of the heating cable power output going from a 40°F pipe temperature to 150°F pipe temperature

g. The heating cable shall operate on line voltages of 208 volts without the use of transformers

h. The heating cable shall be included in a UL Listed, CSA Certified, or FM Approved system.

i. Constant wattage cables are not acceptable.

2. Heating Cable Connection Kits

a. Heating cable connection kits shall be Raychem RayClic.

b. Contractor shall provide power connections, splices/tees, and end seal kits to properly connect & terminate the heating cable.

c. All splices, tees and crosses shall be installed underneath the pipe insulation with service loops installed to allow for future service of the piping.

d. Connection kits shall be rated Type 4X to prevent water ingress and corrosion. All components shall be UV stabilized and shall not require the installing contractor to cut into the heating-cable core to expose the bus wires.

e. Connection kits shall be UL Listed, CSA Certified, and FM approved.

3. Attachment of Heating Cable

a. Attachment method of heating cable to the piping shall be Raychem model

1) GT-66 - general purpose, high temperature, glass filament tape for installation @ 40°F and above. Contractor to fix the heating cable to the pipe every 12” by wrapping the GT-66 tape around the pipe & over the heating cable.

2) AT-180 - aluminum tape, high temperature for all plastic piping for installations @ 32°F and above. Tape is installed lengthwise over the heating cable.

b. Metal cable ties are not permitted

4. Identification of Heating Cable System

a. Contractor shall provide & install Raychem model ETL “Electric Heat Traced” labels on exterior of pipe insulation every ten (10) feet on opposite sides of the pipe for the entire length of heat traced piping.

b. In addition, all splices, tees, crosses and power connections shall be labeled on the exterior of the pipe insulation indicating that presence of a connection kit.

5. Energy Efficient Control System

a. Single Circuit Local Digital Controller

1) All self-regulating temperature maintenance cable shall be controlled via an energy saving, programmable single circuit controller to provide adjustable maintained temperatures in the range of 105?F (40?C) to 140?F (60?C), known as Raychem HWAT-ECO, manufactured by Pentair.

2) Digital controller shall operate on 208 - 240 V.

3) Pre-programmed duty cycles based on ambient temperature ranging from

4) 60 - 80°F.

5) The pre-programmed duty cycles shall be based on Raychem HWAT heating cables only. No other heating cables may be used with the HWAT-ECO controller.

6) Flexible temperature control from 105 - 140°F.

7) Three programmable temperature set points for maximum energy efficiency: Maintain, Economy, Off

8) Controller shall have heat cycle setting.

9) Heating cable manufacturer shall provide a local digital controller with 24/7 pre-programmed time based profiles specific to the selected heating cable application such as schools, hospitals and prisons.

10) Controller shall have remote temperature setting through 0 - 10 Vdc BMS interface.

11) Controller shall have a pipe temperature sensor, low/high pipe temperatures alarms and high temperature cut-out to maximize the energy efficiency of the HWAT system by verifying that the hot pipe temperature is at the correct temperature (low temperature alarm); and to monitor and alarm if the pipe temperature is hotter than intended (high temperature alarm and cut-out).

12) Multiple HWAT-ECO controllers can be networked together (master/slave association) to allow BMS to interface with a master HWAT-ECO to control cloned circuits, and to minimize the number of HWAT-ECO controllers that must be individually programmed.

13) Controller shall have 24 A switching capacity rating.

14) Enclosure type shall be NEMA 12 (ABS).

15) Controller shall have NO/NC alarm contacts. Controller shall alarm on:

(a) Loss of power

(b) Controller reinitialized

(c) Internal controller temperature too high

(d) Pipe temperature too high

(e) Pipe temperature too low

(f) Master/slave error

16) Digital controller shall have c-UL-us approvals specifically for use with the HWAT-R2 heating cable.

6. Thermal Pipe Insulation

a. Pipes must be thermally insulated in accordance with the HWAT Design Guide requirements. No deviation from the insulation schedule will be allowed.

b. Thermal insulation must be a type that is flame retardant (closed?cell or fiberglass) with waterproof covering.

7. Approval

a. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified, or FM Approved for hot water temperature maintenance.

b. The temperature maintenance system shall have a design, installation and operating manual specific to domestic hot water piping.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions

1. Prior to installation of heating cable system, verify that all piping which will be heat trace has passed all hydrostatic/pressure test and is signed off by plumbing inspector.

B. Preinstalling Testing

1. Prior to installing heating cable on the piping an insulation resistance test shall be performed by the installing contractor to ensure integrity of heating cable as describe in the installation & maintenance manual.

3.2 PREPARATION

A. Protection Of In-Place Conditions

1. All heating cable ends shall be protected from moisture ingress until cable is terminated.

2. Acceptable methods are installing RayClic-E end seals.

3.3 INSTALLATION

A. Comply with manufacturer’s recommendations in the HWAT System Installation and Operation Manual - H57548.

B. Apply the heating cable linearly on the pipe after piping has successfully completed any pressure tests. Secure the heating cable to piping with fiberglass tape.

C. Install electric heating cable according to the drawings and the manufacturer’s instructions. The installer shall be responsible for providing a complete functional system, installed in accordance with applicable national and local requirements.

D. Any deviation in circuitry, insulation, or piping material must be approved by engineer prior to execution.

E. Distribution pipes & express risers must be isolated electrically. Each shall have their own circuit(s).

F. Branch lines shall be grouped electrically based on location.

G. All power connections must be located in accessible areas. Access panels for power connection shall be a minimum of 12” x 12” and within reach of power connection kit.

H. Refer to Electrical Specification for power connection locations.

I. All power, tee, and splice connection points shall be shown on the plumbing as-built.

J. Installation training, provided by an authorized manufacturer's representative must be completed prior to work mobilization.

K. Interface With Other Work

1. Grounding of controller shall be equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

2. Connection of all electrical wiring shall be according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3. Pipe Insulation shall be thermally insulated in accordance with the HWAT design guide requirements.

3.4 FIELD QUALITY CONTROL

A. Initial start-up and field testing (commissioning) of the system shall be performed by factory technician or factory representative per the owner's requirements.

B. Field Tests And Inspections

1. The system shall be commissioned in accordance to the HWAT Installation and Operation manual.

2. The heating cable circuit integrity shall be tested using a 2500 Vdc megohmmeter at the following intervals:

a. Before installing the heating cable

b. After heating cable has been installed onto the pipe

c. After installing connection kits

d. After the thermal insulation is installed onto the pipe

e. Prior to initial start?up (commissioning)

f. As part of the regular system maintenance

g. Minimum acceptable insulation resistance shall be 1000 megohms or greater

3. The technician shall verify the insulation schedule is in compliance with the HWAT Installation and Operation manual.

4. The technician shall verify that the HWAT-ECO control parameters are set to the application requirements.

5. The technician shall verify that the HWAT-ECO alarm contacts are corrected connected to the BMS.

C. Non-Conforming Work

1. Any heat tracing circuit which fails the any of the above test must be corrected prior to commissioning or startup of the system.

3.5 SYSTEM STARTUP

A. Provide a factory-certified technician or manufacturer's representative for startup & commissioning of the heat tracing system and controller.

B. Coordinate all controller settings with plumbing engineer prior to programming the controller.

C. Provide commissioning report in submittals package to owner.

3.6 EXAMINATION

A. Verify that piping and equipment are ready to receive work.

B. Verify field measurements are as indicated on shop drawings.

C. Verify required power is available, in proper location, and ready for use.

3.7 PREPARATION

A. Clean exposed surfaces prior to installation.

B. Prepare surfaces using approved methods as recommended by manufacturer.

3.8 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.

C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.

D. Comply with applicable local building codes and requirements of authorities having jurisdiction.

E. Identification:

1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft including cladding over each valve or other equipment that may require maintenance.

3.9 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform start-up by factory technician or factory representative as per Owner's requirements.

C. Field Testing and Inspections:

1. Commission system in accordance with installation and operation manual.

2. Inspect for sources of water entry and proper sealing.

3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.

4. Insulation Resistance: Greater than 20 megohms at a test voltage of 2500 VDC for polymer insulated trace heaters.

5. Test heating cable integrity with megohmmeter at the following intervals:

6. Measure voltage and current at each unit.

7. Controls:

3.10 CLOSEOUT ACTIVITIES

END OF SECTION 220533

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

1.2 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping

B. Section 220719 - Plumbing Piping Insulationa

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Heat Transfer Equipment: Nameplates.

B. Piping: Pipe markers.

C. Pumps: Nameplates.

D. Small-sized Equipment: Tags.

E. Tanks: Nameplates.

F. Valves: Tags.

G. Water Treatment Devices: Nameplates.

2.2 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc.: www.pipemarker.com/#sle.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. Seton Identification Products: www.seton.com.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Brimar Industries, Inc.: www.pipemarker.com/#sle.
4. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
5. Seton Identification Products: www.seton.com.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Brimar Industries, Inc: www.pipemarker.com/#sle.
3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
4. MIFAB, Inc: www.mifab.com.

5. Seton Identification Products: www.seton.com.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

E. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

F. Color code as follows:

1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.

2. Fire Quenching Fluids: Red with white letters.

3. Toxic and Corrosive Fluids: Orange with black letters.

4. Flammable Fluids: Yellow with black letters.

5. Combustible Fluids: Brown with white letters.

6. Compressed Air: Blue with white letters.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment. Locate nameplates where accessible and visible. Equipment nomenclature to directly correspond with drawings. Include nameplates for the following general categories of equipment:

1. Water heaters.

2. Pumps.

3. Balancing valves.

4. Grease Traps

5. Expansion tanks

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment.

1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on all piping system. Install with flow indication arrows showing direction of flow.

1. Self-adhesive pipe markers with flow arrows. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts and plenums; and exterior non concealed locations as follows:

1. Near each valve and balance device.

2. Near each branch connection, excluding short takeoffs for fixtures. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and no accessible enclosures.

4. At access doors and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 20 feet along each run. Reduce intervals to 20 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 EXPANSION TANK

A. Provide self-adhesive tag attached to tank indicating system fill pressure

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold water: 1-1/2 inches, round.

b. Hot Water: 1-1/2 inches, round

2. Valve-Tag Color:

a. Cold Water Natural.

b. Hot Water: Natural.

3. Letter Color:

a. Cold Water: Black.

b. Hot Water: Black.

3.6 ADJUSTING

A. relocate plumbing identification materials and devices that have become visually blocked by other work.

B. Do not begin installation until substrates have been properly prepared.

END OF SECTION 220553

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SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glass fiber insulation.

B. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

C. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER INSULATION

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com.

2. Johns Manville Corporation: www.jm.com.

3. Knauf Insulation: www.knaufusa.com.

4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.

5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com/#sle.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. K Value: ASTM C177, 0.24 at 75 degrees F.

2. Maximum Service Temperature: 850 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil, 0.010 inch.

e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert Location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

L. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 SCHEDULES

A. Plumbing Systems:

1. Domestic Cold Water Supply:

a. Glass Fiber Insulation:

1) less than 1" pipe size: 1/2" thickness

2) 1" pipe size and larger: 1" thickness

2. Domestic Hot Water Supply:

a. Glass Fiber Insulation:

1) 1" pipe size and less: 1" thickness

2) 1-1/4" pipe size: 1-1/2" thickness (1.5" thickness if heat traced)

3) 1-1/2" pipe size: 1.5" thickness (1.5" thickness if heat traced)

4) 2" pipe size: 1.5" thickness (2" thickness if heat traced)

5) 2.5" pipe size: 1.5" thickness (2.5" thickness if heat traced)

6) 3" pipe size: 1.5" thickness (3" thickness if heat traced)

3. Domestic Hot Water Recirculation:

a. Glass Fiber Insulation:

1) All sizes: 1" thickness

2)

4. Roof Drain Bodies:

a. All Service Jacket

1) All sizes: 1-1/2" thickness

5. Roof Drainage Above Grade:

a. Glass Fiber Insulation:

1) All sizes: 1" thickness

B. Other Systems:

1. Kitchen Evaporator Coil Condensate:

a. Glass Fiber Insulation:

1) All sizes: 1/2" thickness

2. Kitchen Grease Waste with Heat Trace

a. Elastomeric

1) All sizes: 1" thickness

END OF SECTION 220719

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SECTION 221005 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.

B. Sanitary waste piping, above grade.

C. Domestic water piping, buried within 5 feet of building.

D. Domestic water piping, above grade.

E. Storm drainage piping, buried within 5 feet of building.

1. Storm drainage piping, above grade.

2. Natural gas piping, buried beyond 5 feet of building.

3. Natural gas piping, buried within 5 feet of building.

4. Natural gas piping, above grade.

5. Pipe flanges, unions, and couplings.

6. Pipe hangers and supports.

7. Pipe sleeve-seal systems.

8. Ball valves.

9. Butterfly valves.

10. Balancing valves.

11. Pressure reducing valves.

12. Pressure relief valves.

13. Pressure-temperature valves.

14. Strainers.

1.2 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels.

B. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.

C. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

D. Section 220553 - Identification for Plumbing Piping and Equipment.

E. Section 220719 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ANSI LC 1/CSA 6.26 - Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing.

B. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

E. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

F. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

G. ASME B31.1 - Power Piping.

H. ASME B31.9 - Building Services Piping.

I. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

J. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Potable Water Distribution Systems.

K. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.

L. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

M. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

N. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

O. ASTM B32 - Standard Specification for Solder Metal.

P. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.

Q. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.

R. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.

T. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.

U. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

V. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

W. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

X. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

Y. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

Z. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

AA. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast.

BB. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.

CC. AWWA C606 - Grooved and Shouldered Joints.

DD. AWWA C651 - Disinfecting Water Mains.

EE. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

FF. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

GG. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.

HH. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

II. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

JJ. MSS SP-67 - Butterfly Valves.

KK. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

LL. NSF 61 - Drinking Water System Components - Health Effects.

MM. NSF 372 - Drinking Water System Components - Lead Content.

NN. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

B. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

D. Sustainable Design Documentation: For soldered copper joints, submit installer's certification that the specified installation method and materials were used.

E. Project Record Documents: Record actual locations of valves.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.7 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.2 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.

2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 SANITARY WASTE PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2729.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

B. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.4 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, annealed.

1. Fittings: ASME B16.26, cast bronze.

2. Joints: Flared.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or gray iron, standard thickness.

2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.

2.5 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, alloy Sn95 solder.

3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.6 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2665 or ASTM D3034.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.7 STORM DRAINAGE PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.

2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D2665.

1. Fittings: PVC.

2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.8 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2. Joints: ASME B31.1, welded.

2.9 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASTM A234/A234M, wrought steel welding type.

2. Joints: ASME B31.1, welded.

3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

B. Flexible Gas Piping:

1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.

2. Fittings: Provided by piping system manufacturer.

2.10 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Joints: Threaded or welded to ASME B31.1.

B. Flexible Gas Piping:

1. Corrugated Stainless Steel Tubing: Comply with ANSI LC 1/CSA 6.26.

2. Comply with ASTM E84.

3. Fittings: Provided by piping system manufacturer.

2.11 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.

2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 1 inch:

1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.

2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron.

3. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.

4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.

5. When pipe is field grooved, provide coupling manufacturer's grooving tools.

6. Manufacturers:

a. Grinnell Products, a Tyco Business: www.grinnell.com.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.12 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
    a. Cold and Hot Pipe Sizes 6 inch and Larger: Double hangers.
3. Trapeze Hangers: Welded steel channel frames attached to structure.
4. Vertical Pipe Support: Steel riser clamp.
5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
    a. Bases: High-density polypropylene.
    b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
    d. Attachment and Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
    e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
    f. Manufacturers:
        1) PHP Systems/Design: www.phpsd.com.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
3. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
4. Wall Support for Pipe Sizes 4 inch and Over: Welded steel bracket and wrought steel clamp.
5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.

3. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 6 inch and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.

5. Wall Support for Pipe Sizes Up to 3 inch: Cast iron hook.

6. Wall Support for Pipe Sizes 4 inch and Larger: Welded steel bracket and wrought steel clamp.

7. Wall Support for Hot Pipe Sizes 6 inch and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Floor Support for Hot Pipe Sizes to 4 inch: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

10. Floor Support for Hot Pipe Sizes 6 inch and Larger: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.

11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.

3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.

4. Masonry Screw Type Anchors: Comply with ICC-ES AC106.

5. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.

6. Other Types: As required.

2.13 PIPE SLEEVE-SEAL SYSTEMS

A. Manufacturers:

1. The Metraflex Company; MetraSeal: www.metraflex.com/#sle.

B. Modular Mechanical Seals:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.

2. Watertight seal between pipe and wall-sleeve, wall or casing opening.

3. Size and select seal component materials in accordance to service requirements.

4. Glass reinforced plastic pressure end plates.

2.14 BALL VALVES

A. Manufacturers:

1. Grinnell Products, a Tyco Business: www.grinnell.com.

2. Nibco, Inc: www.nibco.com.

3. Uponor, Inc: www.uponorengineering.com/sle.

B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

2.15 BUTTERFLY VALVES

A. Manufacturers:

1. Crane Company: www.cranecpe.com.

2. Grinnell Products; B302: www.grinnell.com/#sle.

B. Construction 1-1/2 inch and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.16 BALANCING VALVES

A. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.17 PIPING SPECIALTIES

A. Flow Controls:

1. Manufacturers:

a. ITT Bell & Gossett: www.bellgossett.com.

b. Griswold Controls: www.griswoldcontrols.com.

c. Taco, Inc: www.taco-hvac.com.

2. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

3. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

2.18 PRESSURE REDUCING VALVES

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com.
2. Cla-Val Company: www.cla-val.com.
3. Flomatic Valves: www.flomatic.com/#sle.
4. Watts Regulator Company: www.wattsregulator.com.

B. 2 inch and Smaller:

1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
2. Pressure Reducing Pilot-Operator:
   a. Operating Range: 5 to 50 psi.
   b. Connected into brass or bronze pilot piping and fittings.
   c. Fixed flow restrictor, pressure gauges, and isolation valves.

C. 2 inch and Larger:

1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.
2. Pressure Reducing Pilot-Operator:
   a. Operating Range: 5 to 50 psi.
   b. Connected into brass or bronze pilot piping and fittings.
   c. Fixed flow restrictor, strainer, pressure gauges, and isolation valves.

2.19 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.20 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.
2. Green Country Filter Manufacturing: www.greencountryfilter.com.
3. WEAMCO: www.weamco.com.

B. Size 2 inch and Smaller:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

D. Size 5 inch and Larger:

1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 220516.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

1. See Section 220719.

H. Provide access where valves and fittings are not exposed.

1. Coordinate size and location of access doors with Section 083100.

I. Establish elevations of buried piping outside the building to ensure not less than 4 ft of cover.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Excavate in accordance with Division 31.

N. Backfill in accordance with Division 31.

O. Install valves with stems upright or horizontal, not inverted. See Section 220523.

P. Install water piping to ASME B31.9.

Q. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

R. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

S. Sleeve pipes passing through partitions, walls, and floors.

T. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

U. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

8. Provide copper plated hangers and supports for copper piping.

9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

   a. Painting of interior and exterior plumbing systems and components is specified in Division 09.

10. Provide hangers adjacent to motor-driven equipment with vibration isolation; see Section 220548.

11. Support cast iron drainage piping at every joint.

V. Pipe Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a watertight seal.

6. Install in accordance with manufacturer's recommendations.

W. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.4 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

G. Provide spring-loaded check valves on discharge of water pumps.

H. Provide flow controls in water recirculating systems where indicated.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed, and clean.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SERVICE CONNECTIONS

A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.

1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe Size: 1/2 inch to 1-1/4 inch:

1) Maximum Hanger Spacing: 6.5 ft.

2) Hanger Rod Diameter: 3/8 inches.

b. Pipe Size: 1-1/2 inch to 2 inch:

1) Maximum Hanger Spacing: 10 ft.

2) Hanger Rod Diameter: 3/8 inch.

c. Pipe Size: 2-1/2 inch to 3 inch:

1) Maximum Hanger Spacing: 10 ft.

2) Hanger Rod Diameter: 1/2 inch.

d. Pipe Size: 4 inch to 6 inch:

1) Maximum Hanger Spacing: 10 ft.

2) Hanger Rod Diameter: 5/8 inch.

e. Pipe Size: 8 inch to 12 inch:

1) Maximum hanger spacing: 14 ft.

2) Hanger Rod Diameter: 7/8 inch.

2. Plastic Piping:

a. All Sizes:

1) Maximum Hanger Spacing: 6 ft.

2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION 221005

SECTION 221006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Backflow preventers.

F. Double check valve assemblies.

G. Water hammer arrestors.

H. Sumps.

I. Mixing valves.

J. Exterior penetration accessories.

1.2 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

B. Section 223000 - Plumbing Equipment.

C. Section 224000 - Plumbing Fixtures.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains.

B. ASME A112.6.4 - Roof, Deck, and Balcony Drains.

C. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent.

D. NSF 61 - Drinking Water System Components - Health Effects.

E. NSF 372 - Drinking Water System Components - Lead Content.

F. PDI-WH 201 - Water Hammer Arresters.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Certificates: Certify that grease interceptors meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

F. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

G. Operation Data: Indicate frequency of treatment required for interceptors.

H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

I. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Watts Regulator Company

B. Roof Drains:

1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable cast iron dome with vandal proof screws.

4. Accessories: Coordinate with roofing type, refer to schedule on drawings:
    a. Membrane flange and membrane clamp with integral gravel stop.
    b. Adjustable under deck clamp.
    c. Roof sump receiver.
    d. Adjustable extension sleeve for roof insulation.

C. Floor Drain:

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer. Refer to schedule on drawings for options and accessories.

D. Floor Drain (FD-2):

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.

E. Floor Sink:

1. Lacquered cast iron body with dome strainer and seepage flange.

F. Floor Sink:

1. Round lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, nickel bronze frame, full grate.

2.3 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. Zurn Industries, LLC: www.zurn.com.
4. Watts Regulator Company

B. Cleanouts at Exterior Surfaced Areas:

1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Exterior Unsurfaced Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

D. Cleanouts at Interior Finished Floor Areas:

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.4 HOSE BIBBS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

2. Watts Regulator Company: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.

4. Substitutions: See Section 016000 - Product Requirements.

2.5 BACKFLOW PREVENTERS

A. Manufacturers:

1. Conbraco Industries, Inc: www.apollovalves.com.

2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.

2.6 DOUBLE CHECK VALVE ASSEMBLIES

A. Manufacturers:

1. Conbraco Industries, Inc: www.apollovalves.com.

2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.

B. Double Check Valve Assemblies:

1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

2.7 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

2. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.

3. Zurn Industries, LLC: www.zurn.com.

4. Substitutions: See Section 016000 - Product Requirements.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.8 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:

a. ESBE: www.esbe.se/en.

b. Honeywell International Inc: yourhome.honeywell.com.

c. Leonard Valve Company: www.leonardvalve.com.

d. Powers

2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

3. Accessories:

a. Volume control shut-off valve on outlet.

b. Stem thermometer on outlet.

c. Strainer stop checks on inlets.

4. Cabinet: 16 gage, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

2.9 FLOOR DRAIN TRAP SEALS

A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

2.10 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

1. Manufacturers:

a. Quickflash Weatherproofing Products, Inc; _____: www.quickflashproducts.com/#sle.

B. Plumbing Ventilation Thru Roof Accessories - Retrofit:

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets.

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

END OF SECTION 221006

SECTION 221250 - NATURAL GAS PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The Contractor and each Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section "Summary", Paragraph 1.1A, entitled "Related Documents."

1.2 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for gas piping systems.

1. Natural Gas.

2. Regulators and safety devices for Natural and L.P. gas systems

1.3 RELATED SECTIONS

A. Section 07 84 13 - Firestopping

B. Section 220510 - PLUMBING GENERAL CONDITIONS

C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Ststems

D. Section 22 05 53 - Identification for Plumbing Piping and Equipment

E. Section 22 05 19 - Meters and Gages for Plumbing Piping

F. Section 22 10 05 - Plumbing Piping

G. Section 22 30 00 - Plumbing Equipment

1.4 REFERENCES

A. Connecticut Fuel Gas Code

B. NFPA 54

C. ANSI Z223.1

D. CSA / AGA Standards

E. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

F. ANSI/ASME B36.10 Welded and Seamless Wrought-Steel pipe

G. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

H. ANSI/ASME B1.20.1 - Pipe Threads, General Purpose, Inch

1.5 SYSTEM DESCRIPTION

A. Provide piping from the gas meter as shown on the plans.

B. Provide gas piping, including fittings and valves to form a complete system.

1. Piping includes connections to equipment shown on the plans or provided by others.

2. Provide any required gas regulators at equipment connections for reductions in pressure. Coordinate with all other trades for requirements of equipment.

1.6 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures.

B. Piping and fittings

1. Product Data: Provide Manufacturers literature.

2. Shop Drawings: Indicate all catlog data.

C. Equipment and Valving

1. Product Data: Provide Manufacturers literature.

2. Shop Drawings: Indicate all catlog data.

D. Test Reports: Indicate final testing, inspection and approval reports by the AHJ and/or the service utility.

E. Certificates: Certify that products of this section meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Perform in accordance with Connecticut Fuel Gas Code standard, State of Connecticut Building Code.

B. Requirements of the service Utility

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.

E. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

F. All valves, regulators, etc. shall be tested and rated for respective natural gas applications by UL and CSA.

1.8 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

PART 2 PRODUCTS

2.1 MATERIALS

A. Metallic pipe: Steel and wrought-iron pipe, minimum schedule 40, ANSI/ASME B36.10, ASTM A53

B. Metallic pipe fittings: Steel or malleable iron.

C. Piping shall be threaded up to 2" in diameter, over 2" piping shall be welded.

2.2 MANUFACTURED ITEMS

A. Line Gas Pressure Regulators

B. Gas Appliance Regulators

C. Overpressure Protection Device

1. For systems over 60 psi

2.3 ACCESSORIES

A. Shutoff Valves

1. Plug type - Heavy duty, iron body construction, flat head type with brass plug and washer, CSA / UL tested and approved

2. Ball type - Bronze body, chrome plated ball, brass stem, PTFE seat, stem packing and bearing CSA/UL tested and approved.

3. Strainer - Bronze body, CSA/UL tested and approved

4. Roof Supports

PART 3 EXECUTION

3.1 PIPING - GENERAL

A. The service entrance of the gas pipe to the building shall be provided with a line size, CSA/UL tested and approved shut-off plug valve. The valve shall be lockable open or shut with a standard padlock.

B. Ream ends of pipe free from burrs. Keep free of scale, dirt and oil. Piping shall be blown out with compressed air.

C. Pipe threads shall be tapered in compliance with ANSI/ASME B1.20.1. Apply pipe joint compound to male threads only.

1. Threaded pipe shall be used for piping of 2" or less. All piping larger than 2" shall have welded fittings and joints.

D. Provide couplings for pipe size transitions and for joining lengths of pipe. Bushings shall not be used.

3.2 PIPING INSIDE BUILDINGS

A. Do not cut, notch or drill through beams or joists to install piping.

B. Slope piping upwards towards risers or equipment at not less than 1/4" in 15 feet.

C. Piping shall not be installed in concealed locations except with the use of elbows, tees and couplings.

1. Where fittings are inserted in the piping, the pipe shall be reconnected by welding, flanges or a ground joint union.

2. Valves shall not be installed in concealed locations.

D. Where piping is installed in partition walls, a steel striker plate is to be provided the full length of the concealed pipe run

E. Changes in direction shall be made by the use of fittings, factory or field bends.

1. Bends shall be made only with bending equipment and shall be free from buckling, cracks or other damage.

2. Pipe shall not be bent more than 90° with the inside radius not less than 6 times the outside diameter of the pipe.

F. Provide drips at all risers or low points in the system. Drips are to be readily accessible for cleaning or emptying and are not to be used for supporting the piping.

G. Provide plug type gas cocks in pipe branch lines and connections to equipment and cap until ready for connection to equipment.

1. Ball type shutoffs will be acceptable in branch lines off mains

H. All gas piping inside and outside the building shall be painted yellow and pipe markers provided.

I. Branch piping is to be connected from top or side of horizontal piping.

J. Maximum hanger spacing:

1. 1/2" pipe -6 feet

2. 3/4" to 1" pipe -8 feet

3. 1¼" and larger pipe -10 feet

3.3 PIPING OUTSIDE THE BUILDINGS (EXPOSED, NOT BURIED)

A. Slope piping upwards towards risers or equipment at not less than 1/4" in 15 feet.

B. Piping shall not be installed in concealed locations except with the use of elbows, tees and couplings.

1. Where fittings are inserted in the piping, the pipe shall be reconnected by welding, flanges or a ground joint union.

2. Valves shall not be installed in concealed locations.

C. Changes in direction shall be made by the use of fittings, factory or field bends.

1. Bends shall be made only with bending equipment and shall be free from buckling, cracks or other damage.

2. Pipe shall not be bent more than 90° with the inside radius not less than 6 times the outside diameter of the pipe.

D. Provide drips at all risers or low points in the system. Drips are to be readily accessible for cleaning or emptying and are not to be used for supporting the piping.

1. Where drips could be subject to freezing, the AHJ may authorize the drips to be deleted.

E. Provide plug type gas cocks in pipe branch lines and connections to equipment and cap until ready for connection to equipment.

1. Ball type shutoffs will be acceptable in branch lines off mains

F. All gas piping outside the building shall be painted yellow with primer, two coats of paint and pipe markers provided.

G. Branch piping is to be connected from top or side of horizontal piping.

H. Maximum roof support spacing:

1. 1/2" pipe -4 feet

2. 3/4" to 1" pipe -6 feet

3. 1¼" and larger pipe -8 feet

4. Within 12" either side of bends, valves and regulators.

3.4 TESTING

A. All piping, new and existing, shall be tested and shall be in compliance with NFPA-54 with records of inspection and tests performed.

B. Test medium shall be compressed air or other inert gas.

C. Test pressure shall be 1-1/2 times the maximum working pressure but not less than 3 PSIG. Duration shall be ½ hour for each 500 cubic feet of pipe or fraction thereof.

1. Piping shall be tested without valves installed.

2. Valves are not to be used as a bulkhead between gas in one section of pipe and test medium in another.

D. Provide gauges or a manometer of increments not greater than 1/10 pound. Soap solution shall be used at joints or fittings.

1. Pressure gauges shall be permanently installed downstream from each line pressure regulator.

E. After turning on the gas the piping shall be purged of all test medium and the system shall again be checked for leakage.

F. The gas utility shall be the governing authority and shall be presented with copies of tests results and records. All rules and regulations must be complied with and coordinated to insure a safe installation.

G. If any part of the gas system is defective or not in compliance with this specification the contractor shall repair or replace the items at no cost to the Owner.

3.5 REGULATORS

A. Set primary regulator at incoming servivce to pressure as specified on drawings. Coordinate additional requirements with local Gas Co.

B. Set secondary regulators as necessary for appliances and equipment.

C. Vent regulators and other equipment to exterior of building and terminate with suppressor.

1. Vents shall be run independently of each other and shall be field located.

D. Provide strainers on the inlet of each line pressure regulator or electrically operated valve.

E. Provide a shut-off valve upstream of each gas pressure regulator

3.6 EQUIPMENT CONNECTORS

A. Connectors shall have a plug type shut-off gas cock installed in rigid tubing in an accessible location upstream of the connector.

1. Flexible connectors of semi-rigid stainless steel with polyethylene jacket may be used for connecting appliances to the shut-off valve.

2. All connectors shall be provided with a drip leg, full line size.

B. Connectors shall be made from the top or side of horizontal lines.

C. Provide unions for connectors at gas-cocks and equipment.

D. Connectors to kitchen equipment are to be the "quick disconnect" type.

END OF SECTION 22 12 50 221250

SECTION 221329 - SANITARY SEWERAGE PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submersible sewage pumps.

1.2 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings.

C. ICC (IPC) - International Plumbing Code.

D. NEMA MG 00001 - Motors and Generators.

E. UL (DIR) - Online Certifications Directory.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Certificate: Certify that products of this section meet or exceed specified requirements.

C. Executed warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing each product specified in this section, with minimum three years of documented experience.

B. Certifications: UL (DIR) listed, classified, and suitable for purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.6 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for _____. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 SUBMERSIBLE SEWAGE PUMPS

A. Manufacturers:

1. Zoeller Company; _____: www.zoeller.com/#sle.

B. Description: Submersible centrifugal pump made of rugged stainless steel and cast-iron housing and base with oil-filled motor chamber, ball bearings, and mechanical seal.

C. Casing:

1. Capable of withstanding pressures 50 percent greater than maximum operating pressure.

2. Volute: Consisting of smooth passages providing unobstructed flow through pump.

3. Exposed Nuts and Bolts: Stainless steel construction.

4. Finish: Protect casing exterior surfaces in contact with sewage using sewage-resistant coal tar epoxy coating.

D. Pump Shaft: Fabricate of high-grade alloy steel of adequate strength and size, with application-appropriate safety factor to transmit full driver horsepower. Include shaft key so that impeller cannot be loosened by either reverse or forward torque.

E. Wear Rings: Renewable; provided on casing and impeller with wearing surfaces normal to axis of rotation. Material suitable for ease of maintenance and secured to prevent rotation.

F. Bearings:

1. Provide roller type capable to handle multi-directional thrust loads.

2. Do not use pumps dependent on thrust and hydraulic balance.

3. Bearing Life: L-10, 50,000 hours minimum, complying with ABMA STD 9 or ABMA STD 11.

G. Seals:

1. Provide tandem mechanical shaft seal system running in oil bath.

H. Motor:

1. Base-mounted, enclosed, lubricated oil-free, thermal-overload protected, continuous-duty, permanent split capacitor with oil-resistant, three-prong connector, 6-foot power cord.

2. Watertight with Class F insulation, NEMA B design, complying with NEMA MG 00001.

3. Provide oil filled, air filled with water jacket, or air filled with cooling fins that encircle stator housing.

I. Power Cable:

1. Enters through heavy-duty entry assembly provided with internal grommet assembly to prevent leakage.
2. Separate motor and cable entry junction by terminal board or stator lead sealing gland that prevents foreign material from gaining access to motor interior through top of pump.
3. Standard construction for submersible pump applications; do not use materials consisting of silicones.

J. Controls: Integral, chemically-resistant, vertical plated-steel rod float switch. Cycle pump ON/OFF between 2.5- and 9-inch heights from bottom of pump.

K. Solids Handling Capacity: Pass lint and other small solids up to 1/2 inch in size.

L. Discharge Pipe Size: 2 inches, NPT, female.

M. Maximum Water-Based Effluent Temperature: 120 degrees F.

N. Accessories: Provide reverse flow assembly and high-level audio/visual alarm system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products with related fittings and accessories according to manufacturer instructions.

B. Provide accessories required to complete installation in accordance with ICC (IPC).

3.2 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Tests: Conduct tests to demonstrate satisfactory functional operation and efficiency.

3.3 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.4 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION 221329

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SECTION 223000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water Heaters:

1. Commercial gas fired.

B. Domestic hot water storage tanks.

C. In-line circulator pumps.

D. Sump pumps.

E. Submersible sump pumps.

F. Cooling condensate removal pumps.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

A. UL 778 - Standard for Motor-Operated Water Pumps.

PART 2 PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

2.2 WATER HEATERS

A. Manufacturers:

1. A.O. Smith Water Products Co; _____: www.hotwater.com/#sle.

B. Commercial Gas Fired:

1. Type: Automatic, natural gas-fired, vertical storage.

2. Performance:

3. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

4. Accessories:

a. Water Connections: Brass.

b. Dip Tube: Brass.

c. Drain valve.

d. Anode: Magnesium.

5. Certified For The Following Applications:

2.3 DOMESTIC HOT WATER STORAGE TANKS

A. Manufacturers:

1. A.O. Smith Water Products Co; _____: www.hotwater.com/#sle.

B. Tank: Welded steel, ASME labeled for working pressure of 125 psig, steel support saddles, tappings for accessories, threaded connections of stainless steel, access manhole.

C. Openings: Up to 3 inches, copper-silicone threaded; over 4 inches, flanged; flanged collar for heat exchanger; manway fitting.

D. Accessories: Tank drain, water inlet and outlet, thermometer range of 40 to 200 degrees F, ASME pressure relief valve suitable for maximum working pressure.

2.4 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

2.5 SUMP PUMPS

A. Manufacturers:

1. Zoeller Company; _____: www.zoeller.com/#sle.

B. Type: Vertical centrifugal, direct connected, simplex arrangement.

C. Casing: Cast iron volute with radial clearance around impeller, inlet strainer, slide away couplings.

D. Impeller: Cast iron; open non-clog, keyed to corrosion resistant alloy steel shaft.

E. Support: Cast iron pedestal motor support on steel floor plate with gas tight gaskets.

F. Bearings: Forced grease lubricated bronze sleeve spaced maximum 48 inches and grease lubricated ball thrust at floor plate.

G. Drive: Flexible coupling to vertical, solid shaft ball bearing electric motor.

H. Sump: Steel cover plate with steel curb frame for grouting into concrete sump with inspection opening and cover, and alarm fittings.

I. Controls (Simplex): Float switch with float rod, stops, and corrosion resistant float, and separate pressure switch high level alarm with transformer, alarm bell and stand-pipe.

2.6 COOLING CONDENSATE REMOVAL PUMPS

A. Manufacturers:

1. Franklin Electric Company; _____: www.franklin-electric.com/#sle.

2. Liberty Pumps Inc; _____: www.libertypumps.com/#sle.

B. Construction: Commercial grade, nonferrous pump with stainless steel shaft, integral discharge check valve, integral float switch, safety switch, thermoplastic reservoir, motor assembly, and power cord with ground.

C. Safety: UL 778.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Domestic Water Storage Tanks:

1. Provide steel pipe support, independent of building structural framing members.

2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

D. Pumps:

1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

2. Provide electrical interlocking from cooling condensate pump safety switch to associated HVAC unit(s) furnished under other Sections.

3.2 SCHEDULES

END OF SECTION 223000

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SECTION 224000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Mop sinks.

F. Under-lavatory pipe supply covers.

G. Electric water coolers.

H. Drinking fountains.

1.2 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework: Preparation of counters for sinks and lavatories.

B. Section 114000 - Foodservice Equipment: Food service sinks.

C. Section 221005 - Plumbing Piping.

D. Section 223000 - Plumbing Equipment.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

C. ASME A112.19.2 - Ceramic Plumbing Fixtures.

D. ICC A117.1 - Accessible and Usable Buildings and Facilities.

E. NSF 61 - Drinking Water System Components - Health Effects.

F. NSF 372 - Drinking Water System Components - Lead Content.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Samples: Submit two lavatory supply fittings.

D. Manufacturer's Instructions: Indicate installation methods and procedures.

E. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

F. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

1.7 MOCK-UP

A. Provide mock-up of typical bathroom group.

B. Mock-up may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.

1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.

2. Flush Valve: Exposed (top spud).

3. Flush Operation: Sensor operated.

4. Supply Size: 1-1/2 inches.

5. Outlet Size: 2 inches.

6. Color: White.

7. Manufacturers:

a. Kohler Company; _____: www.kohler.com/#sle.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.

C. Water Closet Carriers:

1. Manufacturers:

a. Zurn Industries, Inc; _____: www.zurn.com/#sle.

2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.3 LAVATORIES

A. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, ___ by ___ inch minimum, with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.

2.4 SINKS

A. Single Compartment Bowl: ASME A112.19.3; _____ by _____ by _____ inch outside dimensions 20 gage, 0.0359 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

2.5 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:

1. Plumberex Specialty Products, Inc; _____: www.plumberex.com/#sle.

B. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com/#sle.

1. Slim Fit Under-Lavatory Insulators (Non-Sewn): Plumberex Trap Gear.

2. Under-Lavatory Covers with Snap-Lock Fasteners (Molded): Plumberex Pro-Extreme.

C. General:

1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.

2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.

a. Comply with ASTM C1822 Type I for covers on accessible lavatory piping.

b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.

c. Comply with ICC A117.1.

3. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.6 DRINKING FOUNTAINS

A. Drinking Fountain Manufacturers:

1. Elkay Manufacturing Company; _____: www.elkay.com/#sle.

2.7 DRINKING FOUNTAINS - BOTTLE FILLERS

A. Manufacturers:

1. Elkay Manufacturing Company; _____: www.elkay.com/#sle.

2.8 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:

1. Elkay Manufacturing Company; _____: www.elkay.com/#sle.

B. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

C. Bottle Filler: Materials to match fountain.

2.9 MOP SINKS

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.3 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.4 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

A. Clean plumbing fixtures and equipment.

B. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.6 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 224000

SECTION 230500 - MECHANICAL GENERAL CONDITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 DESCRIPTION

A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.

B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein.

This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division.

C. The following information contains specifications of Work in connection with, and in addition to, this Division:

1. All drawings associated with the project.

2. All specifications associated with the project.

D. Division of work responsibilities shall be as defined and directed by the Bidding Agent and/or the Bidding General Contractor.

1.3 INTENT

A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation.

B. Furnish, deliver and install any apparatus, appliance, material or Work not shown on Drawings but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the Work complete and perfect in all respects and ready for operation, even if not particularly specified, under their respective Section without additional expense to the Owner.

C. Include in the work minor details not usually shown or specified but necessary for proper installation and operation, as though they were hereinafter shown or specified.

D. Provide Engineer written notice of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of Work omitted. In the absence of such written notice, it is mutually agreed that Work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

E. The Work indicated is diagrammatic. The Architect and/or Engineer may require as part of this Contract, the relocation of devices to reasonable distances from the general locations shown.

F. Verbal clarifications of the Drawings or Specifications during the bid period are not to be relied upon. Refer any questions or clarifications to the Engineer at least five Working days prior to bidding to allow for issuance of an addendum. After the five-day deadline, Bidder must make a decision and qualify the Bid, if the Bidder feels it necessary.

1.4 DRAWINGS

A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. (Do not scale the Drawings.) Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

B. Closely follow Drawings in layout of Work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom. Where space conditions appear inadequate, Engineer shall be notified before proceeding with installations.

C. Engineer may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.

D. Where variances occur between the Drawings and Specifications or within either of the Documents, include the item or arrangement of better quality, greater quantity or higher cost in the Contract price. The Engineer shall decide on the item and the manner in which the work shall be installed.

1.5 SURVEYS AND MEASUREMENTS

A. Before submitting a Bid, the Contractor shall visit the site and shall become thoroughly familiar with all conditions under which the work will be installed. Contractor will be held responsible for any assumptions, omissions or errors made as a result of failure to become familiar with the site and the Contract Documents.

B. Base all measurements, both horizontal and vertical, from established bench marks. All Work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the Work.

C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or the intent of the Drawings and Specifications, notify the Engineer do not proceed with that Work until instructions have been received from the Engineer.

1.6 CODES AND STANDARDS

A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.

B. The current adopted editions of the following State or local Codes apply:

1. 2021 International Building Code

2. 2022 Connecticut State Building Code
3. 2021 International Existing Building Code
4. 2021 International Mechanical Code
5. 2021 International Plumbing Code
6. 2020 National Electrical Code (NFPA 70)
7. 2021 International Energy Conservation Code
8. ICC/ANSI A117.1-2017 Accessible and Usable Buildings and Facilities

C. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.

D. Include in the Work, without extra cost to the Owner, any labor, materials, testing, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings and/or specified.

1.7 PERMITS AND FEES

A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.8 COORDINATION

A. Carry out all work in conjunction with other trades and give full cooperation in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades, and to allow for serviceable access to equipment.

B. Mechanical contractors' shall initiate coordination drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner. The Contractors' shall prepare coordination drawings at a scale no less than 1/4"=1'-0", showing the work of all trades, including but not limited to, the following: proposed ductwork installation in detail, including ceiling heights, approved structural steel shop drawings, duct heights, access doors, light fixtures, registers and diffusers, sprinkler piping, electrical distribution conduits, wires, panels and any other electrical work which may conflict with the sheet metal ducts or piping, waste and vent piping, water piping, storm piping, and rain leaders. Provide elevation details showing connections and equipment layout and configuration based on approved submittals. Each shall use a different color code. A coordination meeting of all Contractors involved is then to be held and all possible conflicts are to be resolved. All trades shall sign acceptance of the drawings and then shall submit two (2) prints of each drawing to the Engineer for record.

C. Contractors are required to examine all of the Project Drawings and mutually arrange Work so as to avoid interference. In general, ductwork, heating piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer regarding the arrangement of Work, which cannot be agreed upon by the Contractors, will make final decisions. Service of equipment will take precedence.

D. Where the Work of the Contractor will be installed in close proximity to or will interfere with Work of other trades, assist in working out space conditions to make a satisfactory adjustment.

E. If Work is installed before coordinating with other Divisions or so as to cause interference with Work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.

F. Initial contact and coordination has been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.9 ACCEPTANCES

A. The equipment, materials, Workmanship, design and arrangement of all Work installed are subject to the review of the Engineer.

B. Within 30 days after the awarding of a Contract, submit to the Engineer for review a list of manufacturers of equipment proposed for the Work. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.

C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, notify the Engineer, in writing, within 30 days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.

D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog or model number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.

E. If material or equipment is installed before shop drawing review, liability for its removal and replacement is assumed by the Contractor, at no extra charge to the Owner, if, in the opinion of the Engineer, the material or equipment does not meet the intent of the Drawings and Specifications.

F. Failure on the part of the Engineer to reject shop drawings or to reject Work in progress shall not be interpreted as acceptance of Work not in conformance with the Drawings and/or Specifications. Correct Work not in conformance with the Drawings and/or Specifications whenever non-conformance is discovered.

1.10 EQUIPMENT DEVIATIONS

A. Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing a minumum of 14 calendar days prior to submitting his bid. The request shall include a detailed decription of the proposed deviation, manufacturer's equipment cuts, copy of manufacturer's warranty and a line-by-line comparison detailing how the proposed product differs from the specified product. The proposed deviation must be equivalent or better than the specified product as judged by the Engineer.

1. The Base Bid shall be based on using the materials and equipment as specified and scheduled with no exceptions. Equipment Manufacturers Scheduled on Drawings are considered Base Product Specification and any other acceptable manufacturers listed in the specifications is considered an equipment deviation and subject to the requirements above. When any alternate manufacturer does not qualify acceptable, as determined by the Engineer, provide the Base Product manufacturer at no additional cost to Owner.

2. Where an equivalent manufacturer is listed in the specifications, it may or may not indicate that there is an equal product available. Any products must meet all criteria of the Base Product Specification as determined by the Engineer.

B. Substitutions and Equipment Deviations will not be considered if they have a direct bearing on the changing or revising of Contract Documents or if it involves other Contractor's scope of work or thier equipment. Coordination with all trades is required and must be acceptable to all other involved Contractors.

C. Substitutions may be considered for one of the following:

1. Substitution for Cause: Changes proposed by the Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of warranty terms.

2. Substitutions for Convenience: Changes proposed by the Contractor that are not required in order to meet other Project requirements, but may offer advantage to either the Owner or Contractor.

D. In these Specifications and on the accompanying Drawings, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation. In the event that only one (1) manufacturer of a product is specified and it is found that the manufacturer has discontinued the product, the Contractor shall use an acceptable equivalent product that meets the requirements of an equivalent product, as noted below, and has all the features of the originally specified product. The details of workmanship, finish and design, and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.

E. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineer's review.

F. Where two or more names are given as equivalents or where one name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with this Specification.

G. Equipment, material or devices submitted for review as an "accepted equivalent" shall meet the following requirements:

1. The equivalent shall have the same construction features such as, but not limited to:

2. Material thickness, gauge, weight, density, etc.

3. Welded, riveted, bolted, etc., construction

4. Finish, undercoatings, corrosion protection

5. The equivalent shall perform with the same or better operating efficiency.

6. The equivalent shall have equal or greater reserve capacity.

7. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.

8. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.

H. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.

I. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

J. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.

1.11 SHOP DRAWINGS

A. Refer to individual specification sections for additional submittal information.

B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed.

C. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.

D. Provide shop drawings for all devices specified under equipment specifications for all systems, materials, equipment and/or devices. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal. Partial submissions shall be rejected.

E. Equipment shop drawings shall contain full range performance curves, graphs, tables or other pertinent data which clearly indicates operational range of a given unit size. Computer generated/plotted curves, based solely on design performance, will not be accepted.

F. All specific options and/or alternatives shall be clearly indicated. Failure to do so shall be grounds for rejection.

G. Submittals shall be marked with the trade involved, i.e., HVAC, plumbing, fire protection, etc. and the specific associated specification section.

H. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.

I. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. Contractor must allow for a one week review at the Engineer's office plus normal delivery time to the G.C., Architect, Engineer, and return to the Architect, and G.C. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer. The Contractor shall incur all costs associated with delay of construction due to equipment and/or materials arriving late due to late or improper shop drawing submittal.

J. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.

K. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not indicate that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

L. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.

M. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.

N. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.

O. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the Engineer at least five (5) working days prior to Bidding to allow for issuance of an Addendum. After the five (5) day deadline, Bidder shall make a decision and qualify the Bid, if the Bidder deems if necessary.

P. Contractor shall make any corrections required by Engineer and shall resubmit required number of corrected copies of shop drawings or new samples until accepted. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than corrections requested by Engineer on previous submissions. Engineer shall review no more than one resubmittal of any shop drawing or sample at Owner's expense. The fees for review of additional resubmittals shall be paid by the Contractor at the Engineer's standard rates.

1.12 CHANGES IN WORK

A. A Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after Contracts have been awarded, authorizing a change in the work or an adjustment in the Contract sum or the Contract time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract sum or the Contract time.

B. All changes in the work shall follow the recommendations of the AIA "General Conditions of the Contract for Construction", Article 12.

1.13 MANUFACTURER'S IDENTIFICATION

A. All component parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial and model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. Nameplate data shall not be obstructed. The nameplate of a Contractor or distributor will not be acceptable.

B. All material and equipment for the electrical portion of the mechanical systems shall bear the label of or be listed by UL, or other accredited authoritative agencies or testing organizations approved by the authority having jurisdiction.

1.14 RECORD DRAWINGS

A. Maintain at the job site a record set of Mechanical Drawings on which any changes in location or routing of all equipment, materials and access panels shall be recorded.

B. At the end of construction, the Contractor shall provide the Owner with a complete set of As-Built Drawings, including all updated coordination drawings, ductwork and piping plans. As-Builts shall be drawn on the latest version of AutoCAD or compatible software, approved in writing, prior to submittal.

1.15 MATERIALS AND WORKMANSHIP

A. All materials and apparatus required for the work, except as otherwise specifically indicated, shall be new, of first-class quality, and shall be furnished, delivered, erected, connected and finished in every detail and be so selected and arranged as to fit properly into the building spaces. Where no specific type or quality of material is given, a first-class standard article as accepted by industry standards shall be furnished.

B. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, fitters, metal workers, welders, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.

C. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.

D. All labor for installation of mechanical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.16 PROTECTION OF MATERIALS AND EQUIPMENT

A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.

B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.

C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.

D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.17 BASES AND SUPPORTS

A. Unless otherwise specifically noted, the Contractor shall furnish all necessary supports, rails, framing, bases and piers required for all equipment furnished under this Division.

B. Unless otherwise indicated in individual trade Sections, pumps, fans, air handlers, boilers, chillers, tanks, compressors and other rotating machinery shall be mounted on a minimum of six (6") inch high concrete pads which shall be furnished and installed per Division 3. All pads shall be extended six (6") inches beyond machine base in all directions with top edge chamfered. Shop drawings of all foundations and pads shall be submitted to the Engineer for review before they are constructed. The Mechanical Contractor shall field coordinate all required dimensional and necessary loading information.

C. Construction of foundations, supports, pads, bases and piers where mounted on the floor shall be of the same finish quality as the adjacent and surrounding flooring material.

D. Unless otherwise shown, all equipment shall be securely attached to the building structure in an acceptable manner. Attachments shall be of a strong and durable nature; any attachments that are insufficient, in the opinion of the Engineer, shall be replaced as directed without extra cost to the Owner.

E. All equipment supports shall be designed and constructed such that the equipment will be capable of resisting both vertical and horizontal movement. The equipment shall be positively anchored to the bases or supports to resist vertical movement. The equipment and its supports shall be provided with suitable restraints to resist horizontal movement from any direction as dictated by applicable seismic Codes.

1.18 SLEEVES, INSERTS AND ANCHOR BOLTS

A. The Contractor shall provide, set in place and be held responsible for the location of all sleeves, inserts and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done at the Contractor's expense.

B. It is the responsibility of the Contractor to furnish cast-in-place steel sleeves, inserts and anchors in sufficient time to be installed during initial concrete pours. Where job schedules make this impossible, coordinate and obtain acceptance from the Structural Engineer for alternate installation methods.

C. All pipes and conduits passing through floors, walls or partitions shall be provided with sleeves having an inside diameter one (1") inch larger than the outside diameter of the pipe, conduit or insulation enclosing the pipe.

D. Piping insulation shall run continuous through sleeve.

E. Penetrations through fire-rated walls, ceilings and all floors (except slab on grade) in which piping or ducts pass shall be filled solidly with acceptable fire-stopping material. Sleeves shall be steel or a UL / FM listed and approved assembly.

F. When ducts, piping or conduit penetrate the floor of a mechanical room located above an occupied space, such penetrations shall be made completely watertight, such that a liquid leak shall not pass through the penetration.

1.19 FIRE-STOPS AND SEALS

A. Refer to Division 7 Specification for additional and more specific information.

B. Fire-stopping systems shall be submitted as shop drawing.

C. Penetrations through fire-rated walls, ceiling or floors shall be sealed with a UL approved fire-stop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling or floor.

D. Thruwall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.

1.20 CUTTING AND PATCHING

A. All cutting and patching shall be done per Division 1 requirements. The Contractor shall furnish sketches showing the location and sizes of all openings, chases, etc., required for the installation of work.

B. Work under this Division shall include furnishing, locating and setting inserts and/or sleeves required before the floors and walls are built or be responsible for cutting, drilling or chopping where sleeves and inserts were not installed or correctly located. The Contractor shall do all drilling required for the installation of hangers.

C. Exercise extreme caution when core drilling or punching openings in concrete floor slabs in order to avoid cutting or damaging structural members. No structural members or structural slabs/floors shall be cut without the written acceptance of the Structural Engineer and all such cutting shall be done in a manner directed by him.

1.21 SCAFFOLDING, RIGGING, HOISTING

A. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises any equipment and apparatus furnished under this Division. Remove same from premises when no longer required.

1.22 EXCAVATION AND BACKFILLING

A. Excavation and backfilling shall be done per Division 2 of the Specifications.

B. It is the responsibility of the Contractor to coordinate sizes, depths, fill and bedding requirements and any other excavation work required under this Division per code and local utility requirements.

1.23 WATERPROOFING

A. Where any work pierces waterproofing, including waterproof concrete and floors in wet areas, the method of installation shall be reviewed by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings absolutely watertight.

1.24 ACCESSIBILITY AND ACCESS PANELS

A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work.

B. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Equipment shall include, but not be limited to: motors, controllers, coil, valves, switchgear, drain points, etc. Access doors shall be furnished if required for better accessibility. Minor deviations from the Drawings may be made to allow better accessibility, but changes of magnitude or which involve extra cost shall not be made without the acceptance of the Engineer.

C. Access doors in walls, ceilings, floors, etc., shall be field coordinated. It is the responsibility of the Contractor to coordinate and provide information regarding the sizes and quantities of access doors required for his work. The Contractor shall arrange his work in such a manner as to minimize the quantity of access doors required, such as grouping shutoff valves in the same area. Where possible, locate valves in already accessible areas, such as lay-in ceilings, etc.

D. On a clean set of prints, the Contractor shall mark in red pencil the location of each required access door, including its size and fire rating (if any), and shall submit the print to the Architect for review before access doors are purchased or installed.

E. Upon completion of the Project, the Contractor shall physically demonstrate that all equipment and devices installed have been located and/or provided with adequate access panels for repair, maintenance and/or operation. Any equipment not so furnished shall be relocated or provided with additional access panels by the installing Contractor at no additional cost to the Owner. All access panel or door locations shall be indicated on Owner's final as-built record drawings.

F. Permanent ladders for access to equipment when shown on Plans shall be furnished and installed. Coordinate exact requirements in field.

1.25 TEMPORARY OPENINGS

A. The Contractor shall ascertain from an examination of the Drawings whether any special temporary openings in the building will be required for the admission of apparatus provided under this Division and shall coordinate the requirements accordingly. In the event of failure of the Contractor to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of providing such openings thereafter.

1.26 SHUTDOWNS

A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner's representative.

B. The Engineer and the Owner shall be notified of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.

C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.27 TAGS AND CHARTS

A. Each valve and piece of apparatus under this Division shall be provided with suitable brass or laminated plastic tags securely fastened with brass chains, screws or rivets. Equipment shall be numbered with laminated plastic tags or neatly stenciled letters two (2") inches high using designations in equipment schedules and/or shall conform to a directory indicating number, location and use of each item. Directories shall be prepared under each Section and shall be glass framed.

B. Directory shall indicate valve tag number and the unit number, floor/area branch line, main line, service or other pertinent data to quickly and easily identify the valve's purpose.

1.28 ESCUTCHEONS

A. The Contractor shall provide escutcheons on pipes wherever they pass through floors, ceilings, walls or partitions in finished visible locations.

1.29 PAINTING

A. All finish painting in completed areas shall be performed per Division 9 of the Specifications.

B. All materials shipped to the job site under this Division, such as grilles, registers and/or radiation covers, shall have standard manufacturer's finish, unless otherwise specified by Architect.

C. The Contractor shall paint the interior of all ducts wherever the interior of the duct can be seen through a register or louver. Paint shall be flat black, rust preventative type.

D. All outdoor piping, fittings and hangers shall be properly primed with zinc-rich primer and finished with a minimum of two (2) coats of high grade exterior enamel.

1.30 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the piping during expansion and contraction without springing. Provide engineered design, layout, details and fabrication, submitted with registered professional engineer sign and seal, of swing joints, expansion loops and expansion joints with proper anchors and guides. Pay particular attention to plastic piping with high coefficients of expansion.

B. Consideration of required seismic lateral restraints shall be given when anchoring piping and making provision for expansion.

1.31 ELECTRICAL CONNECTIONS

A. Unless otherwise specified, all wiring shall be furnished and installed per Division 26 Specifications.

B. All motor controllers not factory mounted on mechanical equipment shall be furnished, mounted, and installed by the Division 26 contractor, and shall be coordinated with this contractor. Provide properly sized overload heaters and all required accessories with all motor controllers. See Division 26 Motor Controllers for motor controller requirements.

C. All power wiring shall be furnished and installed per Division 26 complete from power source to motor or equipment junction box including power wiring through the motor controller and proper means of disconnect per NEC and Division 26. The Division 26 Contractor shall provide all disconnects, unless noted otherwise.

1.32 QUIET OPERATION

A. If noise level is deemed objectionable by the Owner/Engineer, the Contractor shall test and record sound levels in the presence of the Owner/Engineer. The sound level shall be observed on the "A" weighting network of a sound level or sound survey meter. The ASHRAE "Guide and Data Book" provides a means to determine sound level of mechanical equipment when the total of background plus equipment sound levels exceeds the minimum acceptable equipment sound level.

B. If objectionable noises or vibrations of any magnitude are produced and transmitted to occupied portions of the building by apparatus, piping, ducts or other parts of the mechanical work, the Contractor shall make such changes or additions as necessary without extra cost to the Owner.

1.33 MAINTENANCE

A. The Contractor shall provide the necessary skilled labor to assure the proper operation and to provide all required current and preventative maintenance for all equipment and controls provided under this Division until final acceptance of the building by the Owner. The Contractor shall not assume acceptance of the building by the Owner until he receives written notification.

B. The Contractor shall receive calls for any and all problems experienced in the operation of the equipment provided under this Division and he shall take steps to immediately correct any deficiencies that may exist.

C. The Contractor shall provide a check list and shall put a copy of it in the boiler or main mechanical room. The check list shall itemize each piece of equipment furnished under his Section.

D. The Contractor shall certify on this check list that he has examined each piece of equipment and that, in his opinion, it is operating as intended by the manufacturer, it has been properly lubricated, and that all necessary current and preventative maintenance has been performed as recommended by the manufacturer and by good and accepted practice.

E. The Contractor shall check all controls in the building to ascertain that they are functioning as designed. This shall apply to all thermostats, aquastats, humidistats, freezestats and firestats, etc. This portion of the work shall be performed by the Contractor who installed the controls.

F. During construction, the Contractor shall ensure that all filters are in place on all equipment. If the equipment is operated during construction (see restrictions section of this specification), strict attention shall be paid to maintaining clean and effective filters and cleaning ductwork and equipment. Filters shall be new and/or clean when the system testing and balancing takes place. The Contractor shall bear the cost of all filters and media during construction until final acceptance by the Owner. This requirement shall apply equally to fluid filters and strainers.

G. Where normal preventative maintenance for any piece of equipment requires special tools, the Contractor shall furnish the appropriate tools for that piece of equipment (i.e., special filter removal hooks, valve wrenches, etc.).

1.34 DEMOLITION

A. All required demolition work shall be performed by the Contractor. All demolition work shall be performed in a neat and orderly fashion.

B. Demolition work, if indicated on the drawings, is intended for general information only and is not intended to describe the full extent of demolition work required under this Contract. All existing mechanical work and systems, including but not limited to piping, equipment, ductwork, wiring, controls, hangers, and supports, made obsolete by this project, shall be removed in their entirety under this Contract, unless noted otherwise.

C. After piping, ductwork, equipment, etc., has been removed, neatly cap remaining ductwork and piping, and insulate caps to match the existing adjacent ductwork and piping. In finished areas, all ductwork and piping shall be cut back to a concealed location, i.e., within walls, above ceilings, etc., before capping.

D. Before submitting his Bid, the Contractor shall visit the site with the Contract Documents in hand, and shall inspect all existing systems to determine the extent of demolition work involved. Particular attention is drawn to the removal of existing walls or portions of existing walls. In those areas, all exposed and concealed piping, ductwork, equipment, etc., running across or through affected areas shall be removed as required. Piping and ductwork shall then be either capped, or, if required for the proper continuing operation of an existing system to remain, piping and ductwork shall be rerouted around the affected areas and reconnected as required.

E. In general, it shall be the responsibility of the Contractor to remove demolished equipment, piping, ductwork, etc., from the site and properly dispose of it. If the Owner shall so request, however, the Contractor shall turn over demolished equipment, etc., to the Owner for the Owner's use. Unless otherwise noted, demolished work shall not be abandoned in place. Contractor shall make safe all utilities pertaining to this section.

1.35 AIR ELIMINATION

A. The Contractor shall be responsible for bleeding all air from closed hydronic piping systems after the system has been filled, and thereafter rebleeding as often as required to completely eliminate all air from the system.

B. Where work on an existing piping system has allowed air to enter that system, the Contractor shall also bleed that system even if no piping work was done in the area where air has developed.

C. Where air cannot be bled from any piping due to the absence of an air vent, the Contractor shall install a manual air vent in locations required to successfully bleed such air.

D. Where the piping layout would require an air vent in an inaccessible location, the Contractor shall install an extended 1/4-inch copper bleed line and petcock to an accessible location such as a closet, mechanical room, above lay-in ceiling, etc.

1.36 LUBRICATION

A. All equipment installed under this Contract having moving parts and requiring lubrication shall be properly lubricated according to manufacturer's recommendations prior to testing and operation. Any such equipment discovered to have been operated before lubrication by the Contractor is subject to rejection and replacement at no additional cost to the Owner. Units furnished with sealed bearings are exempted.

B. The Contractor shall furnish and install, as appropriate on all equipment requiring lubrication, Zerk pressure gun grease fittings or sight gravity-feed oilers equipped with shutoff and needle valve adjustment. Units furnished with sealed bearings and lifetime lubrication are exempted. All fittings and oilers are to be fully accessible for lubrication with equipment which does not require special adapters. Where fittings would be otherwise inaccessible, furnish and install extended grease lines.

1.37 CLEANING

A. The Contractor shall be responsible for keeping the jobsite clean, safe and neat throughout the duration of construction. The Contractor shall clean up his own debris daily and shall coordinate removal of rubbish and debris with the General Contractor/Construction Manager.

B. No debris, construction materials, cigarette butts, coffee cups, etc., shall be left above suspended ceilings.

C. Terminal equipment and plumbing fixtures shall cleaned at substantial completion.

D. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

E. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.

F. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.

1.38 OPERATING INSTRUCTIONS

A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period of 4 hours for each type of equipment, unless specified otherwise under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least 72 hours notice to the Owner and the Engineer in advance of this period.

B. Training Requirement Matrix:

System	Specification Section	Hours of Training
Mechanical General Conditions	23 05 00 - 1.38A	4
Packaged Rooftop Air-Conditoning Units (DOAS & RTU)	23 74 16 - 3.3C	6
Condensing Boilers	23 52 16- 3.5A	4
Hot Water Pumps	23 21 23 - 3.3C	4
HVAC Power Ventilators	23 34 23 - 3.2C	2
Small-Capacity Split-System Air Conditioners	23 81 26 - 3.9C	4
Direct Digital Controls System for HVAC	23 09 23 - 3.8C	20
Variable Refrigerant Flow Systems	23 81 29 -3.7C	8

C. The Contractor shall formally submit for delivery to the Engineer three (3) complete bound sets of typewritten or blueprinted instructions for operating and maintaining all systems and equipment included in this Division. All instructions shall be submitted in draft for review prior to final issue. Manufacturer's advertising literature or catalogs will not be acceptable for operating and maintenance instruction.

D. The Contractor, in the above-mentioned instructions, shall include the maintenance schedule for the principal items of equipment furnished under this Division.

E. The appropriate Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.

F. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, boilers. These letters will be bound into the operating and maintenance books.

G. Refer to individual trade Sections for any other particular requirements related to operating instructions.

1.39 ADJUSTING AND TESTING

A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment, the control operate as described in the sequence of operation and all systems are in satisfactory, permanent operating condition.

B. Where requested by the Engineer, a factory-trained service engineering representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service engineering representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service engineering representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.

1.40 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service.

B. Complete installation, startup checks and functional tests according to manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the start up procedure.

D. Verify that equipment is installed and commissioned as per manufacturers written instructions/requirements.

E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

F. Contractor shall replace all damaged components and components that failed the inspections at no additional charge.

G. Inspections by the Commissioning Agent shall be on “spot check basis”. Commissioning process does not reduce responsibility of installing contractors to provide a finished and fully functioning product.

H. This section shall in no way diminish the responsibility of the Contractors, Sub-contractors and Suppliers in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this section are in addition to requirements outlined in related specifications.

1.41 GUARANTEES

A. The Contractor shall guarantee all equipment, material and workmanship under these Specifications and the Contract for a period of one (1) year from the date of final acceptance by Owner, unless otherwise noted.

B. All refrigeration compressors shall have five (5) year guarantee from the date of final acceptance by the Owner unless otherwise noted.

C. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by the Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.

1.42 RESTRICTIONS

A. Mechanical equipment provided under this Division may not be used for temporary heating/cooling requirements due to premature wear and dirt/dust infiltration. Equipment shall be protected from dust and debris during construction. Duct opening shall be protected during construction to prevent dust and debris from being transported through ductwork to equipment or other spaces and to ensure ductwork is clean and ready for use at the time of equipment start-up.Written approval may be obtained from the Owner only after submission of a written cleaning plan and guarantee/warranty extension.

B. Piping shall not be run in any concrete floor slab. Written approval from the Structural Engineer may be obtained only after submission and approval of a layout shop drawing.

PART 2 PRODUCTS - NOT USED.

PART 3 EXECUTION - NOT USED.

END OF SECTION 230500

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SECTION 230505 - MECHANICAL DEMOLITION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Removal and disposal of existing heating, cooling, and ventilation systems as shown on the Drawings.

B. Demolition shall include the removal of all hangers and supports, anchors and other items not required for the new work.

1.3 SEQUENCING AND SCHEDULING OF WORK

A. All piping to be completely drained prior to commencing demolition.

B. All power to equipment being removed shall be disconnected by electrical contractor prior to commencing demolition.

C. Schedule and coordinate demolition with new construction to minimize frequency and duration of work in occupied areas.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions in the field. Note which items are to remain and which items are to be removed as indicated on drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Engineer before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Drain systems to be removed.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. All demolition work shall be scheduled and coordinated in order to accommodate construction phasing schedule.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned piping to source of supply, provide isolation valve and cap at mains.

D. Contractor shall make safe all work associated with this division.

E. Disconnect and remove mechanical piping and fittings serving equipment that has been removed .

F. Disconnect and remove existing equipment, piping and fittings as indicated on the drawings.

G. Premature or excessive demolition or failure to retain components of the existing heating and plumbing systems shall result in the Contractor providing replacement at no additional cost to Owner.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused in accordance with manufacturer's reccommended maintenance procedures.

END OF SECTION 230505

SECTION 230516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Flexible pipe connectors.

B. Flexible- hose packless expansion joints.

C. Alignment guides and anchors

D. Expansion joints and compensators.

E. Pipe loops, offsets, and swing joints.

1.3 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC Systems.

B. Section 232113 - Hydronic Piping.

C. Section 232300 - Refrigerant Piping.

1.4 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

B. ASTM A536 - Standard Specification for Ductile Iron Castings.

C. EJMA (STDS) - EJMA Standards.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Delegated Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for the preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.

2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.

3. Alignment Guide Details: Detail field assembly and attachment to building structure.

4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

D. Design Data: Indicate selection calculations.

E. Manufacturer's Instructions: Indicate manufacturer's installation instructions, special procedures, and external controls.

F. Maintenance Data: Include adjustment instructions.

G. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

H. Maintenance Data: Include adjustment instructions.

1.6 WARRANTY

A. 3 Year full replacement warranty from the date of final acceptance by Owner, unless otherwise noted.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Manufacturers:

1. Mercer Rubber Company: www.mercer-rubber.com/#sle.

2. The Metraflex Company: www.metraflex.com/#sle.

3. Unisource Manufacturing, Inc; Series 401, Stainless Steel Threaded Connectors: www.unisource-mfg.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. General: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by center section of flexible hose.

C. Flexible Hose: Corrugated stainless steel (or bronze) close-pitch hose with stainless steel (or bronze) overbraid.

D. Pressure Rating: Design for testing to 1.5 times the maximum rated working pressure and a minimum 4:1 (burst to working) safety factor.

E. Rating: Operating temperatures up to 850 Deg. F for stainless steel and 400 Deg. F for bronze.

F. Size: Use pipe sized units.

G. Inner Hose: Stainless Steel.

H. Exterior Sleeve: Single braided, stainless steel.

I. Pressure Rating: 125 psi up to 12 inch.

J. Maximum Service Temperature: 250 degrees F.

K. End Connections: Flanged or threaded.

L. Size: Use pipe sized units.

2.2 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Manufacturers:

1. Mercer Rubber Company: www.mercer-rubber.com/#sle.

2. The Metraflex Company: www.metraflex.com/#sle.

3. Unisource Manufacturing, Inc; Series 411, Bronze Braided Flex Connectors: www.unisource-mfg.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Inner Hose: Bronze.

C. Exterior Sleeve: Braided bronze.

D. Pressure Rating: 125 psi up to 2 inch.

E. Joint: As specified for pipe joints.

F. Size: Use pipe sized units.

G. Maximum offset: 3/4 inch on each side of installed center line.

H. Application: Copper piping.

2.3 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID

A. Manufacturers:

1. Flex-Weld, Inc; Keflex Ke-Loop: www.kelcoind.com/#sle.

2. The Metraflex Company; Metraloop: www.metraflex.com/#sle.

3. Unisource Manufacturing, Inc; V-Loop: www.unisource-mfg.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Provide flexible loops with two flexible sections of hose and braid, two 45 or 90 degree elbows, and 90 or 180 degree return with support bracketsand plugged FPT drain port..

C. Maximum Allowable Motion: 2 inch in the x, y, and z planes with no thrust loads to the building structure

D. Maximum Working Pressure: 150 psi at 800 degrees F.

E. Construction: Class 150, schedule 40, type 321 stainless steel corrugated hose and type 304 stainless steel single or double layer braid assembly with carbon steel fittings, including elbows and flanged end connections sized to match pipe segment.

F. Flexible hose expansion loop(s) shall be rated with an operating pressure in accordance with manufacturer's documentation. The operating pressure shall be based on burst pressure with a 4 to 1 safety factor.

2.4 ACCESSORIES

A. Pipe Alignment Guides:

1. Manufacturers:

a. Flex-Weld, Inc: www.kelcoind.com/#sle.

b. The Metraflex Company; PGQ Glide Riser Guide: www.metraflex.com/#sle.

c. Substitutions: See Section 016000 - Product Requirements.

2. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inches travel.

B. Engineered Riser Anchor Clamps:

1. Manufacturers:

a. The Metraflex Company; Engineered Riser Anchor Clamp: www.metraflex.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. Applications:

a. Provide one clamp to serve as a riser clip.

1) Verify the total load of filled pipe to be supported will be a safety factor of one less than the maximum loading of the clamp per the manufacturer's instructions.

b. Provide one clamp above and one clamp below the slab to anchor pipe.

1) Coordinate with the structural engineer to determine the maximum thrust loading calculated for the slab or floor structure. Use the maximum thrust loading calculations to verify the clamps will be a safety factor of one less than the maximum loading of clamp per the manufacturer's instructions.

3. Provide two piece, ductile iron in compliance with ASTM A536. Use with metal pipes with an outer diameter of 2.5 inches to 8 inches.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.

C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.

F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

G. Support flexible hose expansion loop return fittings to allow movement.

END OF SECTION 23 05 16 230516

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SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe-sleeve seals.

1.3 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 230523 - General-Duty Valves for HVAC Piping.

C. Section 230553 - Identification for HVAC Piping and Equipment: Piping identification.

D. Section 230716 - HVAC Equipment Insulation.

E. Section 230719 - HVAC Piping Insulation.

1.4 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

2. Extra Valve Stem Packings: Two for each type and size of valve.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.

1. Minimum three years experience.

2. Approved by manufacturer.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Manufacturers:

1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com/#sle.

2. Garlock; Century-Line and Standard Steel Wall Sleeves..

3. Substitutions: See Section 016000 - Product Requirements.

B. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.

2. Provide sealant for watertight joint.

3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.

4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

D. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.

2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

E. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:

1. Galvanized steel pipe or black iron pipe with asphalt coating.

2. Connect sleeve with floor plate except in mechanical rooms.

F. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Engineer.

G. Clearances:

1. Provide allowance for insulated piping.

2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.

3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

A. Manufacturers:

1. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.

2. Garlock; Link-Seal..

3. Substitutions: See Section 016000 - Product Requirements.

B. Modular Mechanical Sleeve-Seal:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.

2. Watertight seal between pipe and wall-sleeve, wall or casing opening.

3. Size and select seal component materials in accordance with service requirements.

4. Glass-reinforced plastic pressure end plates.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.2 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Inserts:

1. Provide inserts for placement in concrete formwork.

2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

E. Structural Considerations:

1. Do not penetrate building structural members unless indicated.

F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.

2. Aboveground Piping:

a. Pack solid using mineral fiber in compliance with ASTM C592.

b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

G. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.

3. Locate piping in center of sleeve or penetration.

4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.

5. Tighten bolting for a water-tight seal.

6. Install in accordance with manufacturer's recommendations.

H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.3 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION 230517

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SECTION 230519 - METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

C. Test plugs

D. Static pressure gauges.

E. Filter gauges.

1.3 RELATED REQUIREMENTS

A. Section 230923 - Direct-Digital Control System for HVAC.

B. Section 230993 - Sequence of Operations for HVAC Controls.

C. Section 232113 - Hydronic Piping.

1.4 REFERENCE STANDARDS

A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

1.6 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 PRESSURE GAUGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Moeller Instrument Company, Inc: www.moellerinstrument.com.
3. Winters Instruments: www.winters.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Pressure Gauges: ASME B40.100, drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 4-1/2 inch diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi.

2.2 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.

C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

D. Syphon: Brass, 1/4 inch angle or straight pattern.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Omega Engineering, Inc: www.omega.com.
3. Winters Instruments: www.winters.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Stem: 3/4 inch NPT brass.

4. Accuracy: 2 percentper ASTM E77.

5. Calibration: Degrees F.

2.4 DIAL THERMOMETERS

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.

2. Omega Engineering, Inc: www.omega.com.

3. Winters Instruments: www.winters.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.

1. Size: 4-1/2 inch diameter dial.

2. Lens: Clear glass.

3. Length of Capillary: Minimum 5 feet.

4. Accuracy: 2 percent.

5. Calibration: Degrees F.

2.5 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.6 TEST PLUGS

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.

2. Weiss Instruments, LLC: www.weissinstruments.com/#sle.

3. Peterson Equipment Company, Inc..

4. Substitutions: See Section 016000 - Product Requirements.

B. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.

C. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.7 STATIC PRESSURE GAUGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.

2. Veris Industries: www.veris.com/#sle.

3. Weksler Glass Thermometer Corp: www.wekslerglass.com.

4. Substitutions: See Section 016000 - Product Requirements.

B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

C. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

D. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 230943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

F. Coil and conceal excess capillary on remote element instruments.

G. Provide instruments with scale ranges selected according to service so that normal operating setpoint is at mid-range of instrument.

H. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

I. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

J. Locate test plugs adjacent thermometers and thermometer sockets.

3.2 SCHEDULE

A. Pressure Gauges, Location and Scale Range:

1. Pumps, 0 to 100 psi.

2. Expansion tanks, 0 to 100 psi.

B. Pressure Gauge Tappings, Location:

1. Control valves 3/4 inch & larger - inlets and outlets.

2. Major coils - inlets and outlets.

3. Heat exchangers - inlets and outlets.

4. Boiler - inlets and outlets.

C. Stem Type Thermometers, Location and Scale Range:

1. Headers to central equipment, 20 to 180 degrees F.

2. Coil banks - inlets and outlets, 20 to 180 degrees F.

3. Boilers - inlets and outlets, 30 to 240 degrees F.

4. Water zone supply and return, 20 to 180 degrees F.

5. After major coils, 20 to 180 degrees F.

D. Thermometer Sockets, Location:

1. Control valves 1 inch & larger - inlets and outlets.

2. Reheat coils - inlets and outlets.

3. Cabinet heaters - inlets and outlets.

4. Unit heaters - inlets and outlets.

END OF SECTION 23 05 19 230519

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SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Globe valves.

B. Ball valves.

C. Butterfly valves.

D. Check valves.

E. Chainwheels.

1.3 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083100 - Access Doors and Panels.

C. Section 230548 - Vibration and Seismic Controls for HVAC.

D. Section 230553 - Identification for HVAC Piping and Equipment.

E. Section 230716 - HVAC Equipment Insulation.

F. Section 230719 - HVAC Piping Insulation.

G. Section 232113 - Hydronic Piping.

1.4 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.5 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves.

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

F. ASME B16.34 - Valves - Flanged, Threaded and Welding End.

G. ASME B31.9 - Building Services Piping.

H. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

I. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

J. ASTM A536 - Standard Specification for Ductile Iron Castings.

K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

L. AWWA C606 - Grooved and Shouldered Joints.

M. MSS SP-45 - Bypass and Drain Connections.

N. MSS SP-67 - Butterfly Valves.

O. MSS SP-68 - High Pressure Butterfly Valves with Offset Design.

P. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.

Q. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves.

R. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.

S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

T. MSS SP-125 - Gray Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.7 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.

2. Company must specialize in manufacturing products specified in this section, with not less than three years of experience.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.

2. Protect valve parts exposed to piped medium against rust and corrosion.

3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.

4. Adjust globe, gate, and angle valves to the closed position to avoid clattering.

5. Secure check valves in either the closed position or open position.

6. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.

a. Provide temporary inlet and outlet caps.

b. Maintain caps in place until installation.

2. Store valves in shipping containers and maintain in place until installation.

a. Store valves indoors in dry environment.

b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:

1. Handle large valves with sling, modified to avoid damage to exposed parts.

2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:

1. Throttling (Hydronic): Butterfly and Globe.

2. Isolation (Shutoff): Butterfly and Ball.

3. Swing Check (Pump Outlet):

a. Size 2 inch and Smaller: Bronze with nonmetallic disc.

b. 2-1/2 NPS and Larger: Iron with center-guided with resilient seat.

4. Dead-End: Butterfly, single-flange (lug) type.

C. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

D. Required Valve End Connections for Non-Wafer Types:

1. Steel Pipe:

a. Size 2 inch and Smaller: Threaded ends.

b. 2-1/2 NPS and Larger: Flanged ends.

c. For Grooved-End Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

2. Copper Tube:

a. Size 2 inch and Smaller: Threaded ends, except solder-joint valve-ends.

b. Size 2-1/2 inch and Larger: Grooved ends.

E. Heating Hot Water Valves:

1. 2 NPS and Smaller, Brass and Bronze Valves:

a. Threaded ends.

b. Ball: Full port, two piece, bronze trim.

c. Swing Check: Bronze disc, Class 125.

d. Globe: Bronze disc, Class 125.

2. Size 2-1/2 inch and Larger, Iron Valves:

a. 2-1/2 inch to 4 inch: Flanged ends.

b. Grooved-End Butterfly: 2-1/2 NPS to 12 NPS, 300 CWP.

c. Butterfly: High performance, single flange, Class 150.

d. Swing Check: Metal seats, Class 125.

e. Swing Check: 2-1/2 inch to 12 inch, lever and spring closure control, Class 125.

f. Grooved-End Swing Check: 3 inch to 12 inch, 300 CWP.

g. Center-Guided Check: Globe, resilient seat, Class 125.

h. Globe: 2-1/2 inch to 12 inch, Class 125.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Gear Actuator: Quarter-turn valves 8 inch and larger.

2. Handwheel: Valves other than quarter-turn types.

3. Hand Lever: Quarter-turn valves 6 NPS and smaller.

4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

D. Valves in Insulated Piping: Provide 2 inch stem extensions and the following features:

1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2. Butterfly Valves: Extended neck.

3. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.

2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.

4. Solder Joint Connections: ASME B16.18.
5. Grooved End Connections: AWWA C606.

F. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Building Services Piping Valves: ASME B31.9.

G. Bronze Valves:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

H. Valve Bypass and Drain Connections: MSS SP-45.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRONZE, GLOBE VALVES

A. CWP Rating: Class 125: 200 psi:

1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. Ends: Threaded or solder joint.
4. Stem and Disc: Bronze.
5. Packing: Asbestos free.
6. Handwheel: Malleable iron.
7. Manufacturers:
   a. Apollo Valves: www.apollovalves.com/#sle.
   b. NIBCO; T-211.
   c. Milwaukee Valve
   d. Substitutions: See Section 016000 - Product Requirements.

2.4 IRON, GLOBE VALVES

A. Class 125: CWP Rating: 200 psig:.

1. Comply with MSS SP-85, Type I.
2. Body: Gray iron; ASTM A126, with bolted bonnet.
3. Ends: Flanged.

4. Trim: Bronze.
5. Packing and Gasket: Asbestos free.
6. Operator: Handwheel or chainwheel.
7. Manufacturers:
    a. Apollo Valves: www.apollovalves.com/#sle.
    b. NIBCO INC; F-718-N: www.nibco.com/#sle.
    c. Milwaukee Valve.
    d. Substitutions: See Section 016000 - Product Requirements.

2.5 BRONZE, BALL VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Brass Trim:
1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. WOG Rating: 400 psi.
4. Body: Forged bronze or dezincified-brass alloy.
5. End Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Bronze or brass.
8. Ball: Chrome plated brass.
9. Operator: Provide lockable handle and stem extension.
10. Manufacturers:
    a. Apollo Valves: www.apollovalves.com/#sle.
    b. NIBCO INC; T-580-70-66: www.nibco.com/#sle.
    c. Milwaukee Valve.
    d. Substitutions: See Section 016000 - Product Requirements.

2.6 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: 175 psi.

1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Two-piece stainless steel.
4. Disc: Coated ductile iron.
5. Disc Seal: EPDM.
6. Operator: Lockable handle or gear operator with chainwheel over direct-mount actuator base.
7. Manufacturers:
    a. Substitutions: See Section 016000 - Product Requirements.

2.7 HIGH-PERFORMANCE, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type; Bidirectional dead end service without downstream flange:

1. Comply with MSS SP-68.
2. Class 150: CWP Rating: 285 psi at 100 degrees F.
3. Body: Provide carbon steel or stainless steel.
4. Seat: Reinforced PTFE.
5. Offset stem: Stainless steel.
6. Disc: Stainless steel.
7. Operator: Lockable handle or gear operator with chainwheel over direct-mount actuator base.
8. Manufacturers:
    a. Apollo Valves: www.apollovalves.com/#sle.
    b. Bray International, Inc: www.bray.com/#sle.
    c. NIBCO INC; Series 6822: www.nibco.com/#sle.
    d. Milwaukee Valve.
    e. Substitutions: See Section 016000 - Product Requirements.

2.8 BRONZE, SWING CHECK VALVES

A. Class 125:

1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WSP Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded.
6. Disc: Bronze.
7. Manufacturers:
    a. Apollo Valves: www.apollovalves.com/#sle.
    b. Kitz Corporation of America; #22: www.kitzus-kca.com/#sle.
    c. NIBCO INC: www.nibco.com/#sle.
    d. Milwaukee Valve.
    e. Substitutions: See Section 016000 - Product Requirements.

2.9 IRON, FLANGED END SWING CHECK VALVES

2.10 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125:

1. Comply with MSS SP-71, Type I.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Body Design: Clear or full waterway.
4. Body Material: ASTM A126, gray iron with bolted bonnet.
5. Ends: Flanged.
6. Trim: Bronze.
7. Gasket: Asbestos free.
8. Closer Control: Factory installed, exterior lever, and spring or weight.
9. Manufacturers:
    a. Apollo Valves: www.apollovalves.com/#sle.
    b. NIBCO.
    c. Milwaukee Valve; F-2974-LW.
    d. Substitutions: See Section 016000 - Product Requirements.

2.11 IRON, GROOVED-END SWING CHECK VALVES

A. Class 300:

1. CWP Rating: 300 psi.
2. Body Material: ASTM A536, Grade 65-45-12 ductile iron.
3. Seal: EPDM or Nitrile.
4. Disc: Ductile iron.
5. Coating: Black, non-lead paint.
6. Manufacturers:
   a. NIBCO INC: www.nibco.com/#sle.
   b. Victaulic; Series 713.
   c. Substitutions: See Section 016000 - Product Requirements.

2.12 IRON, CENTER-GUIDED CHECK VALVES

A. Class 125, Globe:

1. Comply with MSS SP-125.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Sizes 14 to 24 inch: CWP Rating; 150 psi.
4. Body Material: ASTM A126, gray iron.
5. Style: Spring loaded.
6. Ends: Flanged.
7. Metal Seat: Bronze.
8. Resilient Seat: EPDM or NBR.
9. Manufacturers:
   a. NIBCO INC; F-910-LF: www.nibco.com/#sle.
   b. Metraflex.
   c. Milwaukee Valve.
   d. Substitutions: See Section 016000 - Product Requirements.

2.13 CHAINWHEELS

A. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to ball and butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile iron include zinc coating.
4. Chain: Hot-dip galvanized steel. Sized to fit sprocket rim.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Locate Valves for easy access.

D. Install valves in position to allow full stem movement.

E. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

F. Install chainwheels on operators for butterfly, gate and globe valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor. Chains shall not interfere with normal access and shall be restrained to wall or column if necessary.

G. Install check valves where necessary to maintain direction of flow as follows:

1. Lift Check: Install with stem plumb and vertical.
2. Swing Check: Install horizontal maintaining hinge pin level.
3. Orient center-guided into horizontal or vertical position, between flanges.

H. Provide chainwheels on operators for valves 4 NPS and larger where located 96 inches or more above finished floor, terminating 60 inches above finished floor.

END OF SECTION 23 05 23 230523

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SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 230548 - Vibration and Seismic Controls for HVAC.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings.

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

E. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

H. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

K. FM (AG) - FM Approval Guide.

L. MFMA-4 - Metal Framing Standards Publication.

M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

N. UL (DIR) - Online Certifications Directory.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, channel (strut) framing systems, post-installed concrete and masonry anchors, post-installed concrete and masonry anchors, thermal insulated pipe supports, and thermal insulated pipe supports.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

E. Installer's Qualifications: Include evidence of compliance with specified requirements.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

D. Installer Qualifications for Field-Welding: As specified in Section 055000.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 055000.

C. Prefabricated Trapeze-Framed Metal Strut Systems:

1. Manufacturers:

a. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.

b. Gripple, Inc; Fast Track - Standard: www.gripple.com/#sle.

c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.

3. MFMA-4 compliant, prefabricated, side-loading continuous-slot metal strut channel bracket with associated tracks, fittings, and related accessories.

4. Strut Channel or Bracket Material:

a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.

6. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

7. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

D. Strut Channels:

1. Manufacturers:

a. B-Line, a brand of Eaton Corporation; _____: www.eaton.com/#sle.

b. Gripple, Inc; Universal Bracket: www.gripple.com/#sle.

c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.

3. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

E. Channel Nuts:

1. Manufacturers:

a. Unistrut, a brand of Atkore International Inc.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Provide carbon steel channel nut with galvanized steel, stainless steel, or zinc finish and long, regular, or short spring.

F. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

2. Minimum Size, Unless Otherwise Indicated or Required:

a. Equipment Supports: 1/2 inch diameter.

b. Piping up to 1 inch: 1/4 inch diameter.

c. Piping larger than 1 inch: 3/8 inch diameter.

d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

G. Steel Cable:

1. Manufacturers:

a. Ductmate Industries, Inc, a DMI Company; Clutcher Cable Hanging System: www.ductmate.com/#sle.

b. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.

c. Gripple, Inc..

d. Substitutions: See Section 016000 - Product Requirements.

e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

H. Cable Hanging System Kits:

1. Manufacturers:

a. B-Line, a brand of Eaton Corporation: www.eaton.com/#sle.

b. Ductmate Industries, Inc: ductmate.com/#sle.

c. Gripple, Inc: www.gripple.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

e. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb.

3. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.

I. Thermal Insulated Pipe Supports:

1. Manufacturers:

a. Buckaroos, Inc; CoolDry: www.buckaroos.com/#sle.

b. Snappitz: www.snappitz.com/#sle.

c. Armacell; Armafix Ecolight.

d. Substitutions: See Section 016000 - Product Requirements.

2. General Requirements:

a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.

c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch iron pipes.

d. Insulation inserts for use with fiberglass pipe insulation to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.

e. Insulation inserts for use with elasomeric foam pipe insulation to consist of rigid PET foam insulation, with elastomeric foam end caps, surrounded by a 360 degree, PVC foil jacketing.

3. PVC Jacket:

a. Pipe insulation protection shields to be provided hinge and locking seam.

b. Minimum Service Temperature: Minus 40 degrees F.

c. Maximum Service Temperature: 180 degrees F.

d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.

e. Thickness: 60 mil.

f. Connections: Brush on welding adhesive.

4. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

5. Products:

a. Buckaroos, Inc; CoolDry: www.buckaroos.com/#sle.

b. Armaflex ArmaFix EcoLight.

c. Substitutions: See Section 016000 - Product Requirements.

J. Pipe Supports:

1. Manufacturers:

a. Inaba Denko America Inc: www.inabadenko-america.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

3. Liquid Temperatures Up To 122 degrees F:

a. Overhead Support: MSS SP-58 Types 1, 3 through 12.

b. Support From Below: MSS SP-58 Types 35 through 38.

4. Operating Temperatures from 122 to 446 degrees F:

a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.

c. Sliding Support: MSS SP-58 Types 35 through 38.

K. Nonpenetrating Pipe Supports: Not Permitted.

L. Roller Chairs:

1. Manufacturers:
    a. ASC Engineered Solutions: www.asc-es.com/#sle.
    b. FNW; 7901: www.fnw.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.
    d. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
3. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.
4. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

M. Pipe Stanchions:

1. Manufacturers:
    a. Anvil International: www.anvilintl.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.
    c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
3. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
4. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

N. Beam Clamps:

1. Manufacturers:
    a. FNW; 7201: www.fnw.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.
    c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
3. Beam C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.

4. Small or Junior Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish. For inverted usage provide manufacturer listed size(s).

5. Wide Mouth Beam Clamp: MSS SP-58 type 19, malleable iron with plain finish.

6. Centerload Beam Clamp with Extension Piece: MSS SP-58 type 30, malleable iron with plain finish.

7. FM (AG) and UL (DIR) Approved Beam Clamp: MSS SP-58 type 19, plain finish,

8. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

9. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

O. Riser Clamps:

1. Manufacturers:

a. FNW; 7020: www.fnw.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

3. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.

4. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.

5. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.

6. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

P. U-Bolts:

1. Manufacturers:

a. FNW; 7610: www.fnw.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. MSS SP-58 Type 24, carbon steel u-bolt for pipe support or anchoring.

Q. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

R. Strut Clamps:

1. Manufacturers:

a. Gripple Inc; GCS: www.gripple.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, 304 stainless steel with epoxy copper or zinc finish.

3. Service Temperature Range: Minus 65 to 275 degrees F.

S. Insulation Clamps: Not Permitted.

T. Pipe Hangers:

1. Split Ring Hangers:

a. Manufacturers:

1) FNW; 7001: www.fnw.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

3) Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

b. Provide hinged split ring and yoke roller hanger with epoxy copper or zinc finish.

c. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.

d. Provide hanger rod and nuts of the same type and material for a given pipe run.

e. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

2. Band Hangers, Adjustable:

a. Manufacturers:

1) Gripple, Inc; Universal Clamp (Threaded): www.gripple.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

3) Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

b. MSS SP-58 Type 7 or 9, Zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

3. J-Hangers, Adjustable:

a. Manufacturers:

1) FNW; 7025: www.fnw.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

3) Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

b. MSS SP-58 Type 5, Zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.

4. Swivel Ring Hangers, Adjustable:

a. Manufacturers:

1) FNW; 7010: www.fnw.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

3) Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

b. MSS SP-58 Type 10, epoxy-painted, zinc-colored.

c. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

d. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

e. Felt-Lining: Provide for uninsulated pipe to reduce noise and prevent static issues.

5. Clevis Hangers, Adjustable:

a. Manufacturers:

1) FNW; 7005: www.fnw.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

3) Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

b. Copper Tube: MSS SP-58 Type 1, epoxy-plated copper.

c. Felt-Lined: MSS SP-58 Type 1, zinc-plated, silicone-free carbon steel.

d. Light-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.

e. Standard-Duty: MSS SP-58 Type 1, zinc-colored, epoxy plated.

f. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch.

g. FM (AG) listed: Pipe sizes 2-1/2 to 8 inch.

U. Intermediate Pipe Guides:

1. Manufacturers:

a. Anvil International: www.anvilintl.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Pipe Diameter 6 inch and Smaller: Provide minimum clearance of 0.16 inch.

3. Pipe Sizes 8 inch: 0.625 inch U-bolt with double nuts providing minimum clearance of 0.28 inch.

4. Pipe Size 10 inch: 0.75 inch U-bolt.

5. Pipe Sizes 12 to 16 inch: 0.875 inch U-bolt.

6. Pipe Sizes 18 to 30 inch: 1 inch U-bolt.

7. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.

V. Pipe Alignment Guides:

1. Manufacturers:

a. Anvil International: www.anvilintl.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.

3. Pipe Sizes 10 inch and Larger: Roller type.

W. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

X. Nonpenetrating Rooftop Supports for Low-Slope Roofs: Not Permitted.

Y. Pipe Shields for Insulated Piping:

1. Manufacturers:

a. Anvil International: www.anvilintl.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.

2. MSS SP-58 Type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel

3. General Construction and Requirements:

a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.

b. Shields Material: UV-resistant polypropylene with glass fill.

c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.

d. Minimum Service Temperature: Minus 40 degrees F.

e. Maximum Service Temperature: 178 degrees F.

f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

Z. Anchors and Fasteners:

1. Manufacturers - Mechanical Anchors:

a. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.

b. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.

c. Substitutions: See Section 016000 - Product Requirements.

2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

5. Hollow Masonry: Use toggle bolts.

6. Hollow Stud Walls: Use toggle bolts.

7. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

8. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with stainless steel or zinc finish.

9. Sheet Metal: Use sheet metal screws.

10. Wood: Use wood screws.

11. Plastic and lead anchors are not permitted.
12. Powder-actuated fasteners are not permitted.
13. Hammer-driven anchors and fasteners are not permitted.
14. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
    d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
15. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Field-Welding (where approved by Engineer): Comply with Section 055000.

H. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

I. Roof Mounted Piping:

1. Provide piping support pedestals at each support location. Refer to Section 230548 - Vibration and Seismic Controls for HVAC for support pedestal requirements.

2. Provide piping portals at all roof penetrations. Refer to Section 230548 - Vibration and Seismic Controls for HVAC for portal requirements.

J. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.

5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

K. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

L. Secure fasteners according to manufacturer's recommended torque settings.

M. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 230529

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SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Vibration isolation requirements.

B. Vibration-isolated equipment support bases.

C. Vibration isolators.

D. Vibration-isolated and/or seismically engineered roof curbs.

E. Non-isolated roof curbs and supports.

1.3 RELATED REQUIREMENTS

A. Section 23 05 00 - Mechanical General Conditions.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

D. Section 230529 - Hangers and Supports for HVAC Piping and Equipment.

1.4 DEFINITIONS

A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).

1.5 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.

2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.

1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.

C. Shop Drawings - Vibration Isolation Systems:

1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.

D. In-Curb Sound Attenuation Treatment: Provide acoustic test data indicating characteristics of sound absorption and transmission loss through testing in accordance with ASTM E90.

E. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Evidence of qualifications for manufacturer.

H. Manufacturer’s detailed field testing and inspection procedures.

I. Field quality control test reports.

J. Product Data:

1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.

K. Shop Drawings:

1. Provide schedule of vibration isolator type with location and load on each.

2. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.

3. Include selections from prescriptive design tables that indicate compliance with the applicable building code and the vibration isolator manufacturer's requirements.

4. Include the calculations that indicate compliance with the applicable building code for seismic controls and the vibration isolator manufacturer's requirements.

L. Coordination Drawings:

1. Drawings showing equipment base construction for each machine, including dimensions, structural member sizes and support point locations.

2. Drawings showing methods of suspension, support guides for conduit, piping and ductwork.

3. Drawings showing methods for isolation of conduits, pipes and ductwork penetrating walls and floor slabs.

4. Concrete and steel details for bases including anchor bolt locations.

5. Number and location of seismic restraint/expansion and anchors for each piece of equipment and piping system. Coordination drawings shall be reviewed by the seismic engineer of record, detailing restraint/expansion locations. Each coordination drawing shall bear the seismic engineer's stamp certifying review of the designed systems.

6. Specific details of restraint/expansion including anchor bolts for mounting and maximum loading at each location, for each piece of equipment and/or raceway.

7. Submitted drawings shall detail location and construction details of raceway expansion fittings at building seismic joints to accomodate 4" displacement.

8. Refer to the Architectural and/or Structural drawings for locations of seismic joints.

M. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.8 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Perform design and installation in accordance with applicable codes.

D. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA). In the event of a conflict with other specified requirements, the more stringent requirement shall govern.

C. General Requirements:

1. Select vibration isolators to provide required static deflection.

2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

3. Select vibration isolators for outdoor equipment to comply with wind design requirements.

4. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Piping Isolation:

1. Provide vibration isolators for piping supports:

a. Located in equipment rooms.

b. Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.

c. For piping over 2 inch located below or within 50 feet of noise-sensitive areas indicated.

d. As indicated in Part 3, Pipe Isolation Schedule

2. Minimum Static Deflection:

a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.

b. Remainder of Supports: 0.75 inch deflection unless otherwise indicated.

3. Suspended Piping, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.

4. Floor-Mounted Piping, Nonseismic Applications: Use open (unhoused) spring isolators.

5. Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.2 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.

2. Steel springs to function without undue stress or overloading.

3. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches between the base and floor or support beneath unless noted otherwise.

2.3 VIBRATION ISOLATORS

A. Manufacturers:

1. Vibration Isolators:

a. Mason Industries: www.mason-ind.com/#sle.

b. Vibro-Acoustics: www.vibro-acoustics.com/#sle.

c. Novia Corporation

d. Substitutions: See Section 016000 - Product Requirements.

2. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

B. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.

2. Spring Elements for Spring Isolators:

a. Color code or otherwise identify springs to indicate load capacity.

b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.

d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

e. Selected to provide designed deflection of not less than 75 percent of specified deflection.

f. Selected to function without undue stress or overloading.

C. Vibration Isolators for Nonseismic Applications:

1. Type NP - Resilient Material Isolator Pads:

a. Description: Single or multiple layer pads utilizing isolator material.

b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.

c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.

d. Products:

1) Vibro-Acoustics; NP and N.

2. Type GW - Grommet Washers:

a. Rubber grommet washers of sufficient size to accommodate USS standard washers, long enough to sleeve through 1/4” plate material, and with at least 1/8” thick material around bolt holes.

b. Products:

1) Vibro-Acoustics; GW

3. Type RD Resilient Material Isolator Mounts, Nonseismic:

a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or elastomeric (e.g., neoprene, rubber) isolator material; fail-safe type ; fail-safe type.

b. Double-deflection rubber isolators, with rubber-coated metal surfaces, internal threaded holes for securing components, and bolt holes for securing to structure.

c. Products:

1) Vibro-Acoustics; RD.

4. Type SRD - Restrained Resilient Material Isolator Mounts, Nonseismic:

a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or elastomeric (e.g., neoprene, rubber) isolator material; fail-safe type.

b. Double-deflection rubber isolators with mounting brackets and all-directional snubbers for wind restraint. Snubbers shall include elastomeric components to prevent metal-to-metal contact under normal operation and during an extreme wind event.

c. Products:

1) Vibro-Acoustics; SRD

5. Type FS - Open (Unhoused) Spring Isolators:

a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.

b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.

c. Furnished with integral leveling device for positioning and securing supported equipment.

d. Products:

1) Vibro-Acoustics; FS and FST.

6. Type CM - Housed Spring Isolators:

a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.

b. Furnished with integral elastomeric snubbing elements, adjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.

c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.

d. Furnished with integral leveling device for positioning and securing supported equipment.

e. Products:

1) Vibro-Acoustics; CM.

7. Type CSR - Restrained Spring Isolators, Nonseismic:

a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.

b. Bottom Load Plate: Steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.

c. Furnished with integral leveling device for positioning and securing supported equipment.

d. Provides constant free and operating height.

e. Products:

1) Vibro-Acoustics; CSR and SCSR.

8. Type NH - Resilient Material Isolator Hangers, Nonseismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g. neoprene, rubber) isolator material for the lower hanger rod connection.

b. Rubber elements shall be color-coded to identify load capacities and include either internal or external metal washers to prevent pull-out failure.

c. Products:

9. Type SH - Spring Isolator Hangers, Nonseismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.

b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

c. Products:

1) Vibro-Acoustics; SH and SHB.

10. {CH#326047}Combination Resilient Material/Spring Isolator Hangers, Nonseismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g. neoprene, rubber) isolator material for the upper hanger rod connection.

b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

c. Products:

1) Vibro-Acoustics; SHR and SHRB.

2.4 VIBRATION-ISOLATED AND WIND RATED ENGINEERED ROOF CURBS AND RAILS

A. Manufacturers:

1. Vibration-Isolated and Wind Rated Roof Curbs:

a. Mason Industries: www.mason-ind.com/#sle.

b. Vibro-Acoustics: www.vibro-acoustics.com/#sle.

c. Novia Corporation

d. Substitutions: See Section 016000 - Product Requirements.

2. Source Limitations: Furnish vibration-isolated roof curbs and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

B. Vibration Isolation Curbs:

1. Type VRC - Wind Rated Vibration Isolation Curb:

a. Basis of Design: Vibro-Acoustics NCC-VCR

b. Location: Between structure and rooftop equipment.

c. The curb shall bear directly on the roof structure and shall be flashed and waterproofed into the roof's membrane waterproofing system by the installing contractor.

d. The curb height shall be a minimum of 18" in height to top of the wood nailer as required by local requirements'.

e. The curb shall be constructed from a minimum of 18 ga G90 galvanized perimeter steel with a factory attached wood nailer. The perimeter steel seams shall be bolted or welded to provide the required strength and stiffness. The galvanized perimeter curb steel shall be attached to a structural steel frame as required for its seismic rating.

f. The curb shall have factory installed lifting points

g. Curb sides and ends shall be capable of accepting 2" external insulation furnished and installed by the roofing contractor or factory installed.

h. A galvanized and insulated waterproof pan shall be provided under condensing or open sections that are located within the curb perimeter.

i. The curb section shall be complete with factory installed duct supports.

j. Curb access doors or sections shall be installed as required for servicing curb components or accessories.

k. The curb shall be designed to meet all seismic loads and wind loading as defined by the building code having jurisdiction. Calculations and 3D FEA (Finite Element Analysis) shall be provided and stamped by a Professional Engineer.

l. There shall be a continuous closed cell sponge material on top of the curb to provide a waterproof seal between the rooftop unit. This material shall be supplied by the manufacturer.

m. The curb shall be shipped pre-assembled where possible. Where size prohibits one piece shipping, the isolation curb shall be split into a minimum number of sections and all connecting hardware shall be supplied by the manufacturer.

n. The curb shall include a piping enclosure to match the rooftop unit.

o. All installation hardware shall be provided by the isolation curb manufacturer.

p. Where indicated on drawings, provide curb with internal plenums to transition the equipment's bottom duct connections to side duct connections. The internal plenums be fully lined with 2" thick, 3 lb. density, ridgid, mat faced, formaldehyde free, fiberglass insulation.

2.5 NON-ISOLATED ROOF CURBS AND SUPPORTS

A. Manufacturers:

1. Cambridgeport
2. Micrometl
3. Pate Company
4. Substitutions: See Section 016000 - Product Requirements.

B. Type RC - Wind Rated Roof Curbs

1. Location: Between structure and rooftop equipment.
2. Curbs shall be of box section design with full base plate, 18 gauge galvanized steel with raised built-in cant starting 1-1/2" above base plate or as shown on drawings and extended to fully mitered and continuously welded corner seams, factory installed wood nailer with concealed fasteners, and shall be insulated with 1-1/2" thick 3 lb. density rigid fiberglass board.
3. Curbs shall include any required internal stiffeners to support equipment.
4. The curb shall bear directly on the roof structure and shall be flashed and waterproofed into the roof's membrane waterproofing system by the installing contractor.
5. The curb height shall be a minimum of 18" in height to top of the wood nailer as required by local requirements' or as indicated on the drawings..
6. .The curb shall be designed to meet all seismic loads and wind loading as defined by the building code having jurisdiction. Calculations shall be provided and stamped by a Professional Engineer.
7. There shall be a continuous closed cell sponge material on top of the curb to provide a waterproof seal between the rooftop equipment. This material shall be supplied by the manufacturer.
8. Furnish equipment curbs with the following options where indicated on drawings:
   a. Min. 18 ga. galvanized steel internal liner
   b. Damper tray.

C. Type PP - Wind Rated Pipe Portals

1. Location: Between structure and rooftop piping at pipe penetrations.

2. Portal shall consist of a roof curb with pipe flashing system.

3. Roof Curb

   a. Curbs shall be of box section design with full base plate, 18 gauge galvanized steel with raised built-in cant starting 1-1/2" above base plate or as shown on drawings and extended to fully mitered and continuously welded corner seams, factory installed wood nailer with concealed fasteners, and shall be insulated with 1-1/2" thick 3 lb. density rigid fiberglass board.

   b. The curb shall bear directly on the roof structure and shall be flashed and waterproofed into the roof's membrane waterproofing system by the installing contractor.

   c. The curb height shall be a minimum of 18" in height to top of the wood nailer as required by local requirements' or as indicated on the drawings..

   d. The curb shall be constructed to match the pitch of the roof.

4. Pipe Flashing System:

   a. Flashing system include a molded ABS cover with one or more penetrations, attached to the top of the roof curb.

   b. At each cover penetration, one or more molded EPDM rubber caps with stainless steel clamps shall be provided to seal each pipe penetration.

   c. ABS cover shall be laminated with acrylic coating, for resistance to both ozone and ultraviolet sun rays, and have a serviceable temperature range of -40F to + 160F.

   d. EPDM rubber shall have a serviceable temperature range of -60°F to +270°F and be resistant to ozone and ultraviolet rays.

5. The portal shall be designed to meet all seismic loads and wind loading as defined by the building code having jurisdiction. Calculations shall be provided and stamped by a Professional Engineer.

D. Type ER - Wind Rated Equipment Rails

1. Location: Between structure and rooftop equipment, piping, or ductwork.

2. Rails shall be constructed of 18 gauge galvanized steel with raised built-in cant starting 1-1/2" above base plate or as shown on drawings and extended to fully mitered and continuously welded corner seams, factory installed wood nailer with concealed fasteners, and shall be fully nsulated with 1-1/2" thick 3 lb. density rigid fiberglass board.

3. The rail shall bear directly on the roof structure and shall be flashed and waterproofed into the roof's membrane waterproofing system by the installing contractor.

4. The rail height shall be a minimum of 12" in height to top of the wood nailer as required by local requirements'.

5. The rail shall be constructed to match the pitch of the roof.

6. The rail shall be designed to meet all seismic loads and wind loading as defined by the building code having jurisdiction. Calculations shall be provided and stamped by a Professional Engineer.

E. Type DP - Wind Rated Duct and Pipe Pedestals

1. Location: Between structure and rooftop ductwork or piping.

2. Pedestal shall consist of a roof equipment rail with pipe or duct support hardware.

3. Equipment Rail:

   a. Rails shall be constructed of 18 gauge galvanized steel with raised built-in cant starting 1-1/2" above base plate or as shown on drawings and extended to fully mitered and continuously welded corner seams, factory installed wood nailer with concealed fasteners, and shall be fully nsulated with 1-1/2" thick 3 lb. density rigid fiberglass board.

   b. The rail shall bear directly on the roof structure and shall be flashed and waterproofed into the roof's membrane waterproofing system by the installing contractor.

   c. The rail height shall be a minimum of 12" in height to top of the wood nailer as required by local requirements'.

   d. The rail shall be constructed to match the pitch of the roof.

4. Duct Support Hardware

   a. Duct support assembly constructed of:

      1) Horizontal galvanized steel slide channel or strut framing at top of roof equipment rail.

      2) Vertical galvanized steel threaded rods or strut framing supports between rail and duct.

      3) Horizontal galvanized steel strut framing or galvanized steel round duct saddle below duct.

   b. Vertically and horizontally adjustable.

   c. Attached to top of equipment rail with manufacturer supplied hardware.

5. Pipe Support Hardware

   a. Pipe support assembly constructed of:

      1) Horizontal galvanized steel slide channel strut framing at top of roof equipment rail.

2) Vertical galvanized steel threaded rods or strut framing supports between equipment rail and pipes.

3) Horizontal galvanized steel strut framing with galvanized steel "U" shaped mounting brackets or cast iron pipe rollers below piping.

b. Vertically and horizontally adjustable.

c. Attached to top of equipment rail with manufacturer supplied hardware.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Field-Welding (where approved by Engineer): Comply with Section 055000.

E. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Roof mounted piping and ductwork:

1. Provide roof curbs and piping portals at all roof penetrations.

2. Provide duct and piping pedestals at all support locations. Refer to Sections 230529 - Hangers and Supports for HVAC Piping and Equipment and 233100 - HVAC Ducts and Casings for support spacing requirements.

G. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:

a. Provide specified minimum clearance beneath base.

2. Spring Isolators:

a. Position equipment at operating height; provide temporary blocking as required.

b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.

c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

3. Isolator Hangers:

a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.

b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.

4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.

5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.

6. Adjust isolators to be free of isolation short circuits during normal operation.

7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Provide services of a manufacturer's authorized representative for vibration isolation systems to observe installation and assist in inspection and testing. Include manufacturer's detailed testing and inspection procedures and field reports with submittals.

D. Vibration Isolation Systems:

1. Verify isolator static deflections.

2. Verify required clearance beneath vibration-isolated equipment support bases.

3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.4 SCHEDULE

A. Pipe Isolation Schedule.

1. All piping and mechanical appurtenances, including heat exchangers and air separators, connected to, and located within the first 50 feet of total piping length from, vibration-isolated equipment, shall be isolated from the building structure by means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals

2. All piping and mechanical appurtances located in the mechanical room shall be isolated from the building structure by means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals.

3. All pipes with a 4-inch diameter, or larger, shall be isolated throughout the building by means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals.

4. All isolator static deflections shall be at least 1/4 inch.

5. Isolators for the first three support points adjacent to connected equipment, and piping and mechanical appurtenances as noted above shall achieve half of the specified static deflection of the isolators supporting the connected equipment.

6. Rubber mounts equal to Mason model ND or rubber hangers equal to Mason Model HD shall be used when the required static deflection is less than or equal to ½-inch.

7. Spring floor mounts equal to Mason model SLF or combination spring and rubber hangers equal to Mason model 30N shall be used when the required static deflection is greater than ½-inch.

B. Equipment Isolation Schedule.

Equipment Type	Base Type	Isolator Type	Min. Deflection (In.)
Floor Mounted Vertical Inline Pumps	-	NP	0.25
Glycol Makeup Unit (GMU-)	-	NP	0.25
Suspended Vertical Inline Pumps and Wet Rotor Circulators	-	CSR	1.50
Condensing Boilers (B-)	-	NP	0.30
Roof Mounted Centrifugal Exhaust Fans (EF-,KEF-,LEF-)	RC	-	-
Wall Mounted Propeller Fans (WEF-)	-	GW	0.10
Packaged Rooftop Units (RTU-,MAU-,DOAS-)	VCR	CM	1.50
Ducted Fan Coil Units (FCU-)	-	SHR	0.75
Split System Indoor Units (FCU-)	-	SHR	0.75
Air Cooled Condensing Units (CU-,HP-)	ER	SHR	0.75
Unit Heaters (UH-)	-	NH	0.25
Ceiling Mounted Cabinet Unit Heaters (CUH-)	-	NH	0.25
Wall Mounted Cabinet Unit Heaters (CUH-)	-	GW	0.10
Roof Mounted Piping and Ductwork	DP	-	-
Pipe Penetration Through Roof	PP	-	-
Duct Penetration Through Roof	RC	-	-

Base Types: **Isolator Types**

-	No base, isolators attached directly to equipment.	-	Not Required.
VRC	Wind Rated Vibration Isolation Curb	NP	Resilient Material Isolator Pads
RC	Wind Rated Roof Curb	GW	Grommet Washers
ER	Wind Rated Equipment Rail	RD	Resilient Material Isolator Mounts, Nonseismic
PP	Wind Rated Pipe Portal	SRD	Restrained Resilient Material Isolator Mounts, Nonseismic
DP	Wind Rated Duct and Pipe Pedestals	FS	Open (Unhoused) Spring Isolators
		CM	Housed Spring Isolators
		CSR	Restrained Spring Isolators, Nonseismic
		NH	Resilient Material Isolator Hangers, Nonseismic
		SH	Spring Isolator Hangers, Nonseismic
		SHR	Combination Resilient Material/Spring Isolator Hangers, Nonseismic

END OF SECTION 23 05 48 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Pipe markers.

E. Ceiling tacks.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Automatic Controls: Tags. Key to control schematic.

D. Control Panels: Nameplates.

E. Dampers: Ceiling tacks, where located above lay-in ceiling.

F. Ductwork: Adhesive backed duct markers.

G. Major Control Components: Nameplates.

H. Piping: Pipe markers.

I. Pumps: Nameplates.

J. Small-sized Equipment: Tags.

K. Tanks: Nameplates.

L. Valves: Tags.

M. Water Treatment Devices: Nameplates.

2.2 NAMEPLATES

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com/#sle.
2. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
4. Seton Identification Products, a Tricor Direct Company: www.seton.com.
5. Substitutions: See Section 016000 - Product Requirements.

B. Letter Color: White.

C. Letter Height: 1/2 inch.

D. Background Color: Black.

E. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Brimar Industries, Inc: www.pipemarker.com/#sle.
3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
4. Seton Identification Products, a Tricor Company: www.seton.com.
5. Substitutions: See Section 016000 - Product Requirements.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 ADHESIVE-BACKED DUCT MARKERS

A. Manufacturers:

1. Brimar Industries, Inc: www.pipemarker.com/#sle.

2. Craftmark Pipe Markers: www.craftmarkid.com/#sle.

3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

C. Style: Individual Label.

D. Color: Green for cold-air supply ducts; yellow for hot air supply ducts; blue for exhaust, outside, relief, return and mixed air ducts..

E. Size: 16" x 2-1/4".

2.5 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.

2. Brimar Industries, Inc: www.pipemarker.com/#sle.

3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.

4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.

5. Seton Identification Products, a Tricor Company: www.seton.com.

6. Substitutions: See Section 016000 - Product Requirements.

B. Color: Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

2.6 CEILING TACKS

A. Manufacturers:

1. Craftmark Pipe Markers: www.craftmarkid.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

B. Description: Steel with 3/4 inch diameter color coded head.

C. Color code as follows:

1. HVAC Equipment: Yellow.

2. Fire Dampers and Smoke Dampers: Red.

3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Use tags on piping 3/4 inch diameter and smaller.

1. Identify service, flow direction, and pressure.

2. Install in clear view and align with axis of piping.

F. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

G. Install ductwork with adhesive-backed duct markers. Identify with system, i.e., supply, exhaust, outdoor air. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

H. Identify air handling units, pumps, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be idenfified with tags..

I. Identify control panels and major control components outside panels with plastic nameplates.

J. Idenfify thermostats relating to terminal boxes or valves with nampletes.

K. idenfify valves in main and branch pipiping with tags.

L. Idenfify air terminal units and radiator valves with numbered tags.

M. Tag automatic controls, instruments, and relays. Key to control schematic.

N. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 05 53 230553

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SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

D. Commissioning activities.

1.3 RELATED REQUIREMENTS

A. Section 014000 - Quality Requirements: Employment of testing agency and payment for services.

B. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

C. Section 230800 - Commissioning of HVAC.

1.4 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems.

C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Engineer.

2. Submit to the Commissioning Provider.

3. Submit six weeks prior to starting the testing, adjusting, and balancing work.

4. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Engineer and other installers to sufficiently understand the design intent for each system.

5. Include at least the following in the plan:

    a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

    b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

    c. Identification and types of measurement instruments to be used and their most recent calibration date.

    d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

    e. Final test report forms to be used.

    f. Detailed step-by-step procedures for TAB work for each system and issue, including:

        1) Terminal flow calibration (for each terminal type).

        2) Diffuser proportioning.

        3) Branch/submain proportioning.

        4) Total flow calculations.

        5) Rechecking.

        6) Diversity issues.

    g. Expected problems and solutions, etc.

    h. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.

    i. Details of how TOTAL flow will be determined; for example:

        1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.

        2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

k. Confirmation of understanding of the outside air ventilation criteria under all conditions.

l. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

m. Method of checking building static and exhaust fan and/or relief damper capacity.

n. Methods for making coil or other system plant capacity measurements, if specified.

o. Time schedule for deferred or seasonal TAB work, if specified.

p. False loading of systems to complete TAB work, if specified.

q. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

r. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

s. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least twice a week to the Construction Manager.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit under provisions of Section 014000.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.

3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.

4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.

6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

7. Units of Measure: Report data in I-P (inch-pound) units only.

8. Include the following on the title page of each report:

   a. Name of Testing, Adjusting, and Balancing Agency.

   b. Address of Testing, Adjusting, and Balancing Agency.

   c. Telephone number of Testing, Adjusting, and Balancing Agency.

   d. Project name.

   e. Project location.

   f. Project Engineer.

   g. Project Contractor.

   h. Report date.

G. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC (NSTSB), AABC National Standards for Total System Balance.

2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

4. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Having minimum of three years documented experience.

3. Certified by one of the following:

   a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.

   b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

   c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.

5. Duct systems are clean of debris.

6. Fans are rotating correctly.

7. Fire and volume dampers are in place and open.

8. Air coil fins are cleaned and combed.

9. Access doors are closed and duct end caps are in place.

10. Air outlets are installed and connected.

11. Duct system leakage is minimized.

12. Hydronic systems are flushed, filled, and vented.

13. Pumps are rotating correctly.

14. Proper strainer baskets are clean and in place.

15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Engineer to facilitate spot checks during testing.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.

2. Discrepancies, deficient or uncompleted work by others.

3. Contract interpretation requests.

4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

N. Where available fan capacity is less then total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.7 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 COMMISSIONING

A. See Sections 019113 - General Commissioning Requirements and 230800 for additional requirements.

B. Perform prerequisites prior to starting commissioning activities.

C. Fill out Prefunctional Checklists for:

1. Air side systems.

2. Water side systems.

D. Furnish to the Commissioning Provider, upon request, any data gathered but not shown in the final TAB report.

E. In the presence of the Commissioning Provider, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.

2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.9 SCOPE

A. Test, adjust, and balance the following:

1. Plumbing Pumps; balance domestic hot water recirculation system, refer to plumbing plans.

2. HVAC Pumps.

3. Packaged Steel Water Tube Boilers.

4. Packaged Steel Fire Tube Boilers.
5. Air Cooled Refrigerant Condensers.
6. Packaged Roof Top Heating/Cooling Units.
7. Unit Air Conditioners.
8. Air Coils.
9. Terminal Heat Transfer Units.
10. Fans.
11. Air Terminal Units.
12. Air Inlets and Outlets.

3.10 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. V-Belt Drives:

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

C. Pumps:

1. Identification/number.

2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

D. Combustion Equipment:

1. Boiler manufacturer.
2. Model number.
3. Serial number.
4. Firing rate.
5. Overfire draft.
6. Gas meter timing dial size.
7. Gas meter time per revolution.
8. Gas pressure at meter outlet.
9. Gas flow rate.
10. Heat input.
11. Burner manifold gas pressure.
12. Percent carbon monoxide (CO).
13. Percent carbon dioxide (CO2).
14. Percent oxygen (O2).
15. Percent excess air.
16. Flue gas temperature at outlet.

17. Ambient temperature.
18. Percent stack loss.
19. Percent combustion efficiency.
20. Heat output.

E. Air Cooled Condensers:

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

F. Cooling Coils:

1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Saturated suction temperature, design and actual.
11. Air pressure drop, design and actual.

G. Heating Coils:

1. Identification/number.
2. Location.

3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual.
7. Water pressure drop, design and actual.
8. Entering water temperature, design and actual.
9. Leaving water temperature, design and actual.
10. Entering air temperature, design and actual.
11. Leaving air temperature, design and actual.
12. Air pressure drop, design and actual.

H. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

I. Return Air/Outside Air:

1. Identification/location.
2. Design air flow.

3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

J. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

K. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.

5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

L. Air Monitoring Stations:

1. Identification/location.
2. System.
3. Size.
4. Area.
5. Design velocity.
6. Design air flow.
7. Test velocity.
8. Test air flow.

M. Flow Measuring Stations:

1. Identification/number.
2. Location.
3. Size.
4. Manufacturer.
5. Model number.
6. Serial number.
7. Design Flow rate.
8. Design pressure drop.
9. Actual/final pressure drop.
10. Actual/final flow rate.
11. Station calibrated setting.

N. Terminal Unit Data:

1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Location.
5. Model number.
6. Size.
7. Minimum static pressure.
8. Minimum design air flow.
9. Maximum design air flow.
10. Maximum actual air flow.
11. Inlet static pressure.

O. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

END OF SECTION 23 05 93 230593

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SECTION 230713 - DUCT INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Jacketing and accessories.

1.3 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.4 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation.

F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

G. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

H. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

I. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

K. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

M. FM 4924 - Examination Standard for Pipe and Duct Insulation.

N. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth.

O. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

P. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

Q. UL 181A - Closure Systems for Use with Rigid Air Ducts.

R. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors.

S. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation: www.knaufinsulation.com.
2. Johns Manville: www.jm.com.
3. Knauf Insulation; Performance+ Duct Wrap: www.knaufinsulation.com/#sle.
4. Owens Corning Corporation: www.ocbuildingspec.com.
5. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. 'K' value: 0.27 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 250 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.
4. Density: 0.75 lb/cuft
5. Equal to Johns Manville Microlite XG.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

E. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. CertainTeed Corporation: www.certainteed.com/#sle.
2. Knauf Insulation: www.knaufinsulation.com.
3. Johns Manville: www.jm.com.
4. Knauf Insulation: www.knaufinsulation.com/#sle.
5. Owens Corning Corporation: www.ocbuildingspec.com.
6. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C612; rigid, noncombustible.

1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Maximum Density: 8.0 pcf.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

2.4 OUTDOOR DUCT INSULATION

A. Closed cell expanded polystyrene foam insulation (minimum R-value of 5 per inch thickness) covered with self-adhering modified bitumen weather barrier.

2.5 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA; AEROFLEX Breathe-EZ: www.aeroflexusa.com/#sle.
2. Armacell LLC; AP ArmaFlex: www.armacell.us/#sle.
3. K-Flex USA LLC; Insul-Sheet: www.kflexusa.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

4. Flammability Rating: FM 4924 approval for reduced combustibility testing.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.6 JACKETING AND ACCESSORIES

A. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.

B. Flexible Weather-Proofing Outdoor Jacket: Self-healing, field-applied outdoor cladding.

1. Material: Aluminum foil/polymer laminate with rubberized asphalt layer and acrylic adhesive.

2. Thickness: 34 mil, 0.034 inch.

3. Finish: Embossed.

4. Color: White.

5. Water Vapor Transmission: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

6. Mold Resistance: Pass when tested in accordance with ASTM C1338.

7. Emissivity: 0.30 when tested in accordance with ASTM C1371.

8. Manufacturers:

a. Polyguard Products; Alumaguard: www.polyguardproducts.com.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements

C. Reinforced Tape:

1. Manufacturers:

a. Ideal Tape Co., Inc: www.idealtape.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.

3. Comply with UL 723 or ASTM E84.

4. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.

5. Finish: Match insulation.

D. Plain Foil Tape:

1. Manufacturers:

a. Ideal Tape Co., Inc: www.idealtape.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. Aluminum foil with pressure-sensitive adhesive on paper release liner.

3. Finish: Plain foil.

E. UL181 Tape for Rigid and Flexible Ductwork:

1. Manufacturers:

a. Ideal Tape Co., Inc: www.idealtape.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. Comply with UL 181A for rigid ductwork.

3. Comply with UL 181B for flexible ductwork.

4. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.

5. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.

2.7 DUCT LINER

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville: www.jm.com.

3. Knauf Insulation; Performance+ Duct Liner: www.knaufinsulation.com/#sle.

4. Owens Corning Corporation: www.ocbuildingspec.com.

5. Substitutions: See Section 016000 - Product Requirements.

6. Minimum Service Temperature: Minus 40 degrees F.

7. Maximum Service Temperature: 180 degrees F.

8. Fungal Resistance: No growth when tested according to ASTM G21.

9. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F.

10. Minimum Noise Reduction Coefficients:

    a. 1 inch Thickness: 0.70.

11. Erosion Resistance: Does not show evidence of breaking away, flaking off, or delamination at velocities of 10,000 fpm when tested in accordance with ASTM C1071.

12. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.

C. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; Greenguard certified, flexible blanket; impregnated surface and edges coated with poly vinyl acetate polymer or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G21 and G22.

1. Equal to Johns Manville Linacoustic RC.

2. Fungal Resistance: No growth when tested according to ASTM G21.

3. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.

4. Service Temperature: Up to 250 degrees F.

5. Rated Velocity on Coated Air Side for Air Erosion: 6,000 fpm, minimum.

6. Minimum Noise Reduction Coefficients:

    a. 1 inch Thickness: 0.70.

D. Adhesive: Waterproof, fire-retardant type, ASTM C916.

1. Manufacturers:

    a. Design Polymerics; DP 2502 Water Based, Low VOC, Duct Liner Adhesive: www.designpoly.com/#sle.

    b. Substitutions: See Section 016000 - Product Requirements

E. Liner Fasteners: Galvanized steel, impact applied with integral head.

1. Manufacturers:

    a. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.

    b. Substitutions: See Section 016000 - Product Requirements

2.8 FIRE-RATED INSULATION SYSTEMS

A. Manufacturers:

1. Fyre Wrap: www.firewrap.com
2. Fire Master Duct Wrap: www.thermalceramics.com
3. Johns Manville, Firetemp-wrap: www.jm.com

B. High temperature, flexible blanket insulation with FSK jacket, 1-1/2" thick, 6 pcf, tested and certified to provide a 1 hour fire rating and zero clearance to combustible material.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints, up to and including diffuser and grille box adapters.
5. All longitudinal and butt seams shall be properly taped.

D. Insulated Ducts Conveying Air Above Ambient Temperature:

1. Provide with or without standard vapor barrier jacket.
2. Continue insulation through walls, sleeves, hangers and other duct penetrations.
3. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
4. All longitudinal and butt seams shall be properly taped.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with PVC jacket.

F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket.

G. Slope exterior ductwork to shed water.

H. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

I. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.
6. If duct liner is called out or specified, it does not eliminate the need to externally insulate the ductwork as specified.

3.3 SCHEDULES

A. Duct Insulation Schedule

Duct Type	Equipment Served	Duct Location	Insulation	Min. Insulation Thickness (in.)	Min. Installed Insulation R-Value	Jacket
Combustion Air	All	All	FGF or RGF	2	6	FSK
Exhaust Ducts	All	Interior, within 10 ft of Exterior Openings	FGF or RGF	2	6	FSK
	Units with Energy Recovery	All	FGF or RGF	2	6	FSK
Supply and Return	All	Concealed or located in unconditioned space.	FGF	2	6	FSK
		Exposed to view, but not located in space	RGF	2	6	FSK

		served by unit.				
		Outdoors	PS	3	12	AL
Outdoor Air Intake	All	All	FGF or RGF	2	6	FSK

1. Abbreviations:
    a. FGF - Flexible Glass Fiber Duct Insulation
    b. RGF - Rigid Glass Fiber Duct Insulation
    c. PS - Polystyrene Board
    d. PVC - PVC Jacketing
    e. AL - Aluminum Jacketing
    f. FSK - Foil Scrim Kraft Jacketing

B. Kitchen Hood Exhaust Ducts: 1-1/2" thick fire-rated insulation, 2 layers, where factory-fabricated fire rated ductwork systems are not provided.

C. Duct Liner: 1" thick

1. Provide duct liner for 10' upstream and downstream of all terminal units, fan coil units, air handling units, and packaged rooftop units. Where sound attenuators are provided, the sound attenuator length does not reduce the above length requirement.
2. Refer to drawings, schedules, and Sheet M0.1 Acoustical General Notes for additional duct liner lengths and locations. Where sound attenuators are provided, the sound attenuator length does not reduce the indicated length requirement.
3. All duct liner shall be fiberglass unless otherwise noted.
4. Provide fiberglass duct liner inside of double wall ductwork annular spaces.

END OF SECTION 23 07 13 230713

SECTION 230716 - HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Equipment insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

1.3 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

C. Section 232114 - Hydronic Specialties.

1.4 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

E. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type).

F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

G. ASTM C1393 - Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes and Tanks.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than three years of experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville Corporation: www.jm.com/#sle.

3. Owens Corning Corporation: www.ocbuildingspec.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible.

1. K Value: 0.36 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.

2. Maximum Service Temperature: 1,000 degrees F.

3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Insulation: ASTM C1393; pipe and tank, end grain adhered to jacket.

1. K Value: ASTM C177, 0.27 at 75 degrees F.

2. Maximum Service Temperature: 850 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.

1. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

2. Secure with self-sealing longitudinal laps and butt strips.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

A. Manufacturers:

1. Firwin: www.firwin.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

B. Description: Custom cut and fabricated, removable and reusable blanket insulation system, consisting of inner liner, insulation layer, outer protective jacket, and fastening system.

C. Provide insulation system based on surface temperature of piping, installed location of piping, and maximum safe-to-touch temperature of jacketing.

D. Performance Criteria:

1. Maximum Service Temperature: Constructed for temperatures up to 500 degrees F.

2. Safe-to-Touch Temperature of Jacketing: 140 degrees F.

3. Space Ambient Temperature, High: 85 degrees F.

4. Space Ambient Temperature, Low: 40 degrees F.

E. Components:

1. Inner Liner: Use silicone-impregnated fiberglass.

2. Insulation:

a. Material: Needled fiberglass felt mat.

b. Density: 11 pcf.

c. Thermal Conductivity k-factor in Btu inch/hr sq ft degrees F: 0.50 at 500 degrees F.

d. Outer Jacket: Silicone-impregnated fiberglass.

e. Fastening System: Straps.

2.4 GLASS FIBER, RIGID

A. Manufacturer:

1. CertainTeed Corporation: www.certainteed.com.

2. Johns Manville Corporation: www.jm.com.

3. Knauf Insulation; Earthwool Insulation Board: www.knaufinsulation.com/#sle.

4. Owens Corning Corp: www.owenscorning.com.

5. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C612 or ASTM C592; rigid, noncombustible.

1. K Value: 0.25 at 75 degrees F, when tested in accordance with ASTM C177 or ASTM C518.

2. Maximum Service Temperature: 1,200 degrees F.

3. Maximum Water Vapor Absorption: 5.0 percent by weight.

4. Maximum Density: 8.0 pcf.

C. Facing: 1 inch galvanized steel hexagonal wire mesh stitched on one face of insulation.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.5 JACKETING AND ACCESSORIES

A. PVC Plastic:

1. Manufacturers:

a. Johns Manville Corporation: www.jm.com.

b. Substitutions: See Section 016000 - Product Requirements.

2. Jacket: Sheet material, off-white color.

a. Minimum Service Temperature: Minus 40 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil, 0.010 inch.

e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Factory Insulated Equipment: Do not insulate.

C. Exposed Equipment: Locate insulation and cover seams in least visible locations.

D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. For hot equipment containing fluids 140 degrees F or less, do not insulate flanges and unions, but bevel and seal ends of insulation.

G. For hot equipment containing fluids over 140 degrees F, insulate flanges and unions with removable sections and jackets.

H. Fiber glass insulated equipment containing fluids above ambient temperature; provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Finish with glass cloth and adhesive.

I. Inserts and Shields:

1. Application: Equipment 1-1/2 inches diameter or larger.

2. Shields: Galvanized steel between hangers and inserts.

3. Insert Location: Between support shield and equipment and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Finish insulation at supports, protrusions, and interruptions.

K. Equipment in Finished Spaces: Finish with colored PVC jacket and fitting covers. Jacket color to be selected by Architect from manufacturer's standard color chart.

L. Equipment in Mechanical Equipment Rooms: Finish with white PVC jacket and fitting covers.

M. Cover glass fiber insulation with metal mesh and finish with heavy coat of insulating cement.

N. Nameplates and ASME Stamps: Bevel and seal insulation around; do not insulate over.

O. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.3 SCHEDULE

A. Heating Systems:

1. Pump Bodies: 2" Rigid Glass Fiber or Removable and Reusable Insulation Blanket

2. Air Separators: 2" Glass Fiber

3. Expansion Tanks: 2" Glass Fiber

END OF SECTION 23 07 16 230716

SECTION 230719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

1.3 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

B. Section 232300 - Refrigerant Piping: Placement of inserts.

1.4 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

F. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

G. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

J. FM 4924 - Examination Standard for Pipe and Duct Insulation.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum three years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.8 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, RIGID

A. Manufacturers:

1. CertainTeed Corporation: www.certainteed.com.

2. Johns Manville Corporation: www.jm.com.

3. Knauf Insulation; Performance+ Earthwool 1000 Pipe Insulation: www.knaufinsulation.com/#sle.

4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.owenscorning.com/en-us/#sle.

5. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: ASTM C547; rigid molded, noncombustible, Greenguard certified.

1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.3 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

A. Manufacturers:

1. Firwin: www.firwin.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Description: Custom cut and fabricated, removable and reusable blanket insulation system, consisting of inner liner, insulation layer, outer protective jacket, and fastening system.

C. Provide insulation system based on surface temperature of piping, installed location of piping, and maximum safe-to-touch temperature of jacketing.

D. Performance Criteria:

1. Maximum Service Temperature: Constructed for temperatures up to 500 degrees F.
2. Safe-to-Touch Temperature of Jacketing: 140 degrees F.
3. Space Ambient Temperature, High: 85 degrees F.
4. Space Ambient Temperature, Low: 40 degrees F.

E. Components:

1. Inner Liner: Use silicone-impregnated fiberglass.
2. Insulation:
   a. Material: Needled fiberglass felt mat.
   b. Thickness: 2 inches.
   c. Density: 11 pcf.
   d. Thermal Conductivity k-factor in Btu inch/hr sq ft degrees F: 0.50 at 500 degrees F.
3. Outer Jacket: Silicone-impregnated fiberglass.

4. Fastening System: Straps.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:

1. Aeroflex USA; AEROFLEX Self-Seal: www.aeroflexusa.com/#sle.

2. Armacell LLC; AP ArmFlex: www.armacell.us/#sle.

3. K-Flex USA LLC; Insul-Tube: www.kflexusa.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.

2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

4. Flammability Rating: FM 4924 approval for reduced combustibility testing.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.5 JACKETING AND ACCESSORIES

A. PVC Plastic.

1. Manufacturers:

a. Johns Manville Corporation; Zeston 2000: www.jm.com/#sle.

b. Proto Corporation; Proto LoSmoke.

c. Substitutions: See Section 016000 - Product Requirements.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.

b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.

d. Thickness: 10 mil, 0.010 inch.

e. Connections: Brush on welding adhesive.

3. Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum Jacket:

1. Manufacturers:

a. Johns Manville Corporation.

b. Substitutions: See Section 016000 - Product Requirements.

2. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.

3. Thickness: 0.016 inch sheet.

4. Finish: Embossed.

5. Joining: Longitudinal slip joints and 2 inch laps.

6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.

7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fiberglass insulation in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature; insulate entire system.

E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

G. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings and joints with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Insulate valves with flexible removable and reuseable insulation blanket, or insulation of like material and thickness as adjoining pipe. Finish fiberglass insulation with glass cloth and adhesive or PVC jacketing.

H. Install thermal insulated pipe supports at all hanger and support locations in accordance with 230529 - Hangers and Supports for HVAC Piping and Equipment.

I. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger, where thermal insulated pipe supports are not provided.

2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.

3. Insert location: Between support shield and piping and under the finish jacket.

4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

K. Pipe Exposed in Finished Spaces: Finish with colored PVC jacket and fitting covers. Color to be determined by Architect from manufacturer's standard color chart.

L. Pipe Exposed in Mechanical Equipment Rooms: Finish with white PVC jacket and fitting covers.

M. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 SCHEDULE

A. Heating Systems:

1. Heating Water Supply and Return: Rigid glass fiber insulation.

a. Piping less than 1-1/2": 1-1/2" thickness

b. Piping 1-1/2" and greater: 2" thickness

B. Cooling Systems:

1. Condensate Drains from Cooling Coils: Flexible elastomeric foam insulation.

a. Piping less than 1-1/2": 1/2" thickness.

b. Piping 1-1/2" and greater: 1" thickness

2. Refrigerant Suction: Flexible elastomeric foam insulation.
    a. Piping less than 1-1/2": 1/2" thickness
    b. Piping 1-1/2" and greater: 1" thickness
3. Refrigerant Hot Gas: Flexible elastomeric foam insulation.
    a. Piping less than 1-1/2": 1" thickness
    b. Piping 1-1/2"" and greater: 1-1/2"" thickness

END OF SECTION 23 07 19 230719

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SECTION 230913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Control panels.

B. Control Valves:

1. Ball valves with factory-mounted actuators.
2. Globe valves with factory-mounted actuators.
3. Butterfly valves with factory-mounted actuators.
4. Electronic valve operators.

C. Dampers.

D. Damper Operators:

1. Electric operators.

E. Humidistats:

1. Room humidistats.
2. Limit duct humidistats.

F. Wall-, Surface-, and Duct-Mounted Sensors:

1. Temperature sensors.
2. Humidity sensors.
3. IAQ (indoor air quality) sensors.
4. Building static pressure transmitters.
5. Static air pressure sensors.
6. Air pressure transmitters.
7. Airflow meters; thermal dispersion.
8. Damper position indicators.
9. R-454B refrigerant sensors.
10. Carbon dioxide sensors.

G. Thermostats:

1. Freezestats.

2. Room-mount thermostat accessories.
3. Electric high/low limit duct thermostats.
4. Fire thermostats.

H. Fan and pump motor run-status monitoring.

I. Pipe-Mounted Sensors and Transmitters:

1. Temperature sensors.
2. Pressure transmitters.
3. Differential pressure transmitters.

1.2 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

B. Section 262726 - Wiring Devices: Elevation of exposed components.

1.3 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage.

B. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks.

C. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code).

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

F. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Design Data: Provide design data for sizing and selection of compressor.

E. Manufacturer's Instructions: Provide for all manufactured components.

F. Designer's qualification statement.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

J. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.

1. Revise shop drawings to reflect actual installation and operating sequences.

K. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements for additional provisions.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section documented experience approved by manufacturer.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA EN 10250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.3 CONTROL VALVES

A. Segemented and Characterized Ball Valves with Factory-Mounted Actuators:

1. Manufacturers:

a. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle.

b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

c. Schneider Electric: www.schneider-electric.us/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Service: Use for chilled water, hot water, condenser water, brine (50 percent glycol), or steam.

3. Flow Characteristic: Fully proportioning, equal percentage.

4. Rangeability: 500 to 1.

5. Leakage: Tested in accordance with ANSI/FCI 70-2.

a. Straight-Through Flow on 2-Way and 3-Way Valves: Class IV.

b. Bypass Flow on 3-Way Valves: Class III.

6. Service Temperature Range: Minus 20 to 250 degrees F.

7. Valve Body:

a. Under 2-1/2 inches:

1) Connection: NPT.

2) Pressure Rating: 400 psi.

3) Materials:

(a) Body: Brass.

(b) Ball: Chrome-plated brass.

(c) Stem: Nickel-plated brass.

(d) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.

(e) Stem Seal: EPDM O-Rings.

(f) Flow Control Disk: Thermoplastic synthetic-resin.

b. 2-1/2 inches and Above:

1) Connection Type: Flanged.

2) ANSI Rating: Class 125 or 150.

3) Materials:

(a) Body: Manufactured from brass with ductile iron flanges, cast iron, carbon steel, or stainless steel.

(b) Ball: 300 series stainless steel.

(c) Stem: 300 series stainless steel.

(d) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.

(e) Stem Seal: EPDM O-Rings.

(f) Flow Control Disk: Thermoplastic synthetic-resin.

c. Service Temperature:

8. Hydronic Systems: Size for 3 psig maximum pressure drop at design flow rate.

9. Actuator Requirements:

a. Assembly: Factory-mounted.

b. Input: 0 to 5 VDC configured for proportional control.

c. Accessories: Provide with valve position indicator and manual override.

B. Globe Valves with Factory-Mounted Actuators:

1. Manufacturers:

a. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.

b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

c. Schneider Electric: www.schneider-electric.us/#sle.

d. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle..

e. Substitutions: See Section 016000 - Product Requirements.

2. Up to 2 inches: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.

3. Over 2 inches: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.

4. Hydronic Systems:

   a. Rate for service pressure of 125 psig at 250 degrees F.

   b. Replaceable plugs and seats of stainless steel.

   c. Size for 3 psig maximum pressure drop at design flow rate.

   d. Provide two-way valves with equal percentage characteristics and three-way valves with linear characteristics. Size two-way valve operators to close valves against pump shut-off head.

C. Butterfly Valves with Factory-Mount Actuators:

1. Manufacturers:

   a. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.

   b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

   c. Schneider Electric: www.schneider-electric.us/#sle.

   d. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle..

   e. Substitutions: See Section 016000 - Product Requirements.

2. Iron body, bronze disc, resilient replaceable seat for service to 180 degrees F wafer or lug ends, extended neck.

3. Hydronic Systems:

   a. Rate for service pressure of 125 psig at 250 degrees F.

   b. Size for 1 psig maximum pressure drop at design flow rate.

D. Electronic Valve Actuators:

1. Manufacturers:

   a. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.

   b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

   c. Schneider Electric: www.schneider-electric.us/#sle.

   d. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle..

   e. Substitutions: See Section 016000 - Product Requirements.

2. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.

3. Select operator for full shut-off at maximum pump differential pressure.

2.4 DAMPERS

A. See Section 233300 for dampers and this section for actuators and operators.

2.5 DAMPER OPERATORS

A. General:

1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.

2. Provide spring return for two position control and for fail safe operation.

3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.

4. Provide one operator for maximum 36 sq ft damper section.

B. Electric Operators:

1. Manufacturers:

a. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.

b. Schneider Electric: www.schneider-electric.us/#sle.

c. Belimo Aircontrols (USA), Inc: www.belimo.com/#sle..

d. Substitutions: See Section 016000 - Product Requirements.

2. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.6 HUMIDISTATS

A. Room Humidistats:

1. Manufacturers:

a. Siemens Industry, Inc: www.siemens.com/#sle.

b. Veris Industries: www.veris.com/#sle.

c. Belimo Aircontrols (USA).

d. Substitutions: See Section 016000 - Product Requirements.

2. Wall mounted, proportioning type.

3. Throttling Range: Adjustable 2 percent relative humidity.
4. Operating Range: 30 to 80 percent.
5. Maximum Temperature: 110 degrees F.
6. Cover: Set point indication.

B. Limit Duct Humidistats:

1. Manufacturers:
   a. Siemens Industry, Inc: www.siemens.com/#sle.
   b. Veris Industries: www.veris.com/#sle.
   c. Belimo Aircontrols (USA).
   d. Substitutions: See Section 016000 - Product Requirements.
2. Insertion, two-position type.
3. Throttling Range: Adjustable 2 percent relative humidity.
4. Operating Range: 20 to 80 percent.
5. Maximum Temperature: 150 degrees F.

2.7 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

A. Temperature Sensors:

1. Manufacturers:
   a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.
   b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
   c. Setra Systems, Inc: www.setra.com/#sle.
   d. Veris Industries: www.veris.com/#sle.
   e. Substitutions: See Section 016000 - Product Requirements.
2. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
3. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F.
4. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
5. Temperature Sensing Device: Compatible with project DDC controllers.

6. Performance Characteristics:

   a. RTD:

      1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.

      2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.

      3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.

      4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.

      5) Range: Minus 40 degrees F through 220 degrees F minimum.

   b. Thermistor:

      1) Accuracy (All): Plus/minus 0.36 degrees F minimum.

      2) Range: Minus 25 degrees F through 122 degrees F minimum.

      3) Heat Dissipation Constant: 2.7 mW per degree C.

   c. Temperature Transmitter:

      1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.

      2) Output: 4 to 20 mA.

   d. Sensing Range:

      1) Provide limited range sensors if required to sense the range expected for a respective point.

      2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.

      3) Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.

   e. Wire Resistance:

      1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F or use temperature transmitter when offset is greater than 1.0 degree F due to wire resistance.

      2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.

   f. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.

   g. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.

   h. Ceiling and Recessed Mount Temperature Sensors: Ceiling-mounted sensor in a low-profile housing.

i. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.

j. Room Temperature Sensors:

1) Construct for surface or wall box mounting.

2) Provide the following:

(a) Setpoint reset slide switch with an adjustable temperature range.

(b) Individual heating/cooling setpoint slide switches.

(c) Momentary override request push button for activation of after-hours operation.

(d) Analog thermometer.

k. Room Temperature Sensors with Integral Digital Display:

1) Construct for surface or wall box.

2) Provide a four button keypad with the following capabilities:

(a) Indication of space and outdoor temperatures.

(b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.

(c) Display and control fan operation status.

(d) Manual occupancy override and indication of occupancy status.

(e) Controller mode status.

(f) Password enabled setpoint and override modes.

l. Temperature Averaging Elements:

1) Use on duct sensors for ductwork 10 sq ft or larger.

2) Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.

3) Provide for all mixed air and heating coil discharge sensors regardless of duct size.

m. Insertion Elements:

1) Use in ducts not affected by temperature stratification or smaller than 11 sq inches.

2) Provide dry type, insertion elements for liquids, installed in immersion wells, with minimum insertion length of 2.5 inches.

B. Humidity Sensors, Outdoor-Mount:

1. Manufacturers:

a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.

b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

c. Setra Systems, Inc: www.setra.com/#sle.

d. Veris Industries: www.veris.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

2. Digitally profiled thin-film capacitive sensor encased in a die-cast metal, weather-proof plastic or metal housing with solar shield.

3. Measuring Scale: 0 to 100 percent RH, noncondensing, temperature compensated.

4. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

5. Accuracy: Plus/minus 1 percent between 20 to 40 percent RH linear range, NIST traceable with multi-point calibration.

6. Temperature Sensor, Combined: Platinum RTD.

a. Transmitter: Fitted within device-interface enclosure, calibrated.

b. Monitoring Range: 32 to 122 degrees F, adjustable.

c. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

d. Accuracy: Plus/minus three percent. Adjustable on the transmitter end.

7. Service Temperature: Minus 40 to 122 degrees F.

8. Service Humidity: 0 to 100 percent RH, noncondensing.

C. Humidity Sensors, Duct-Mounted:

1. Manufacturers:

a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.

b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

c. Veris Industries: www.veris.com/#sle.

2. Digitally profiled thin-film capacitive sensor probe extended from die-cast metal, weather-proof plastic or metal housing designed for duct mounting.

3. Measuring Scale: 0 to 100 percent RH, noncondensing, temperature compensated.

4. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

5. Accuracy: Plus/minus 1 percent between 20 to 40 percent RH linear range, NIST traceable with multi-point calibration.
6. Temperature Sensor, Combined: Platinum RTD.
    a. Transmitter: Fitted within device-interface enclosure, calibrated.
    b. Monitoring Range: 32 to 122 degrees F, adjustable.
    c. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
    d. Accuracy: Plus/minus three percent. adjustable on the transmitter end.
7. Service Temperature: Minus 40 to 122 degrees F
8. Service Humidity: 0 to 100 percent RH, noncondensing.

D. Humidity Transmitters, Surface-Mounted:

1. Manufacturers:
    a. Honeywell International, Inc; _____: buildingcontrols.honeywell.com/#sle.
    b. Setra Systems, Inc: www.setra.com/#sle.
    c. Veris Industries: www.veris.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.
2. Plastic housing encased, wall-mounted, humidity and temperature indicating sensor.
3. Humidity Sensor Type: Thin-film capacitive.
4. Accuracy: 1 percent at rated measuring scale and capable of withstanding 95 percent relative humidity without loss of calibration.
5. Output: Two-wire, 4 to 20 mA, 0 to 5 VDC or 0 to 10 VDC, non-loop powered, selectable.
6. User Control Interface: Include button for setpoint and override control.
7. Temperature Sensor, Combined: Platinum RTD.
    a. Transmitter: Fitted within device-interface enclosure, calibrated.
    b. Monitoring Range: 32 to 122 degrees F, adjustable.
    c. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.
    d. Accuracy: Plus/minus three percent. adjustable on the transmitter end.

E. IAQ (Indoor Air Quality) Sensors:

1. Manufacturers:

a. Automated Logic, a company of Carrier Global Corporation: www.automatedlogic.com/#sle.

b. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.

c. Setra Systems, Inc: www.setra.com/#sle.

d. Veris Industries: www.veris.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

2. Form Factor: Surface mounted, desk mounted, or single-gang electrical-box-mounted module made of high-impact plastic or other resilient material.

3. Display: LCD screen with 3-button interface for setpoint control.

4. Setpoint Control: Adjust temperature and humidity.

5. Temperature Sensor:

a. Soild-state, integrated circuit type, 32 to 122 deg F range.

b. Accuracy: Plus/minus two percent within 0.1 deg resolution.

6. CO2 (Carbon Dioxide) Monitoring Sensor:

a. Non-dispersive infrared (NDIR) type, 0 to 100 %RH range.

b. Accuracy: Plus/minus 30 ppm within three percent of measured value.

7. Humidity Monitoring Sensor:

a. Thin-film capacitive, replaceable type, 0 to 2,000 or 5,000 ppm range, noncondensing.

b. Accuracy: Plus/minus two percent within 1.5 percent of measured value.

8. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

9. Service Temperature: 32 to 122 degrees F.

10. Service Humidity: 0 to 90 percent RH, noncondensing.

F. Building Static Pressure Transmitters:

1. Manufacturers:

a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.

b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

c. Setra Systems, Inc: www.setra.com/#sle.

d. Veris Industries: www.veris.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

2. Single port for direct or tubing connection into wall or ceiling static pressure tip, direct acting, double bell, scale range 0.01 to 6.0 in-wc positive or negative, and sensitivity of 0.0005 in-wc. Transmit electronic signal to receiver with matching scale range.

G. Static-Air Pressure Sensors:

1. Manufacturers:

a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.

b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

c. Veris Industries: www.veris.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Unidirectional with ranges not exceeding 150 percent of maximum expected input.

3. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.

4. Accuracy: One percent of full scale with repeatability 0.3 percent.

5. Output: 0 to 5 vdc with power at 12 to 28 vdc.

H. Air Pressure Transmitters:

1. Manufacturers:

a. Veris Industries: www.veris.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. General: Provide dry air media, differential pressure transducers to monitor duct and room pressure.

3. Accuracy: Plus/minus 2 percent full scale of range with combined linearity and hysteresis.

4. Zero Adjust: Pushbutton auto-zero and digital input using 2-position terminal block.

5. Measuring Range: 1 to 10 in-wc, unidirectional or bidirectional.

6. Response Time: 2 seconds, adjustable.

7. Hardwired Output: 2-wire, loop-powered 4 to 20 mA, field selectable.

8. Service Temperature: 32 to 122 degrees F.

9. Proof and Burst Pressure (pressure differential): 3 and 5 psid.

10. Fittings: Brass barb, UL 94 V-O fire retardant ABS, 0.24 inches outer diameter.

I. Airflow Meters; Thermal Dispersion:

1. Manufacturers:

a. Air Monitor, a brand of Onicon, Inc; ELECTRA-Flo Series: www.onicon.com/#sle.

b. Ebtron, Inc: www.ebtron.com/#sle.

c. Ruskin Company: www.ruskin.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Configuration: Duct or plenum inserted assembly using up to eight water-resistant thermal dispersion sensors per metal probe wired into external access box holding self-diagnosing sensor interface electronics with respective field wire and cable landing terminals.

3. Provide thermal dispersion flow meters complete with matched transducers, self aligning installation hardware, and transducer cables.

4. Optimize thermal dispersion transducer for the specific duct or pipe and process conditions for the application.

5. Signal Monitoring Range:

a. Air Velocity: 0 to 2000 fpm, bidirectional converted to airflow using section area and air velocity from listed range.

b. Temperature: 32 to 104 degrees F.

c. Humidity: 5 to 95 percent RH, noncondensing.

d. Dewpoint Temperature: Calculate using temperature and humidity signal.

e. Enthalpy: Calculate using temperature and humidity signal.

6. Accuracy: Plus or minus 1 percent, NIST with a plus or minus 0.25 percent repeatability over listed range. Include means to zero, adjust, and calibrate outputs.

7. Access Box: NEMA EN 10250, Type 1 with hinged cover housing and cable access ports.

8. Interface: Fitted with 16-character, 2-line, backlit, alphanumeric display and labeled pad-type surface membrane buttons.

9. Controller: Fitted with factory-installed module to handle up to 16 external ancillary probes to form an extended measuring probe array for custom duct or plenum sizes.

10. Outputs: Two-wire, 4 to 20 mA, for each measured signal, configurable.

11. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.

J. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.

K. R-454B Refrigerant Sensors:

1. Manufacturers:

a. Bacharach Inc, a company of MSA Safety, Inc; _____: www.mybacharach.com/#sle.

b. Macurco, a brand or Aerionics, Inc; _____: www.macurco.com/#sle.

c. Veris Industries; GWN Series with AG05 sensor: www.veris.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Gas sensing module that holds fixed or replaceable refrigerant gas-sensor cartridge.

3. Form Factor: IEC 60529, IP20 enclosure, single-gang electrical box mounted.

4. Electromechanical sensor with 0 to 2,000 ppm measurement range.

5. Accuracy: Plus/minus two percent of range with 1 ppm resolution.

6. Hardwired Output: Three-wire, 4 to 20 mA, loop powered.

7. Alarm: Auxiliary dry contact relay driven by setpoint adjustable between 100 to 500 ppm.

8. Service Temperature: Minus 4 to 122 degrees F.

9. Service Humidity: 0 to 90 percent RH, noncondensing.

L. Carbon Dioxide Sensors, Duct and Wall:

1. Manufacturers:

a. Veris Industries: www.veris.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. General: Provide nondispersive infrared (NDIR), diffusion sampling CO2 sensors with integral transducers and linear output.

3. Air Temperature: Range of 32 to 122 degrees F.

4. Relative Humidity: Range of 0 to 95 percent (noncondensing).

5. Calibration Characteristics:

a. Automatically compensating algorithm for sensor drift due to sensor degradation.

b. Maximum Drift: 2 percent.

c. User calibratable with a minimum calibration interval of 5 years.

6. Construction:

a. Sensor Chamber: Noncorrosive material for neutral effect on carbon dioxide sample.

b. Provide duct mounted sensors with duct probe designed to protect sensing element from dust accumulation and mechanical damage.

c. Housing: High impact plastic.

2.8 THERMOSTATS

A. Freezestats:

1. Manufacturers:

a. Siemens Industry, Inc: www.siemens.com/#sle.

b. Veris Industries: www.veris.com/#sle.

c. Belimo Aircontrols (USA): 01DTS.

d. Substitutions: See Section 016000 - Product Requirements.

2. Configuration: Vapor-filled capillary.

3. Probe Sensing Length: As required.

4. Reset Type: Automatic.

5. Switching Differential: 1.8 deg F.

6. Setpoint Adjust Control: Screw.

7. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.

8. Sensing Range: 10 to 54 deg F.

9. Mounting: Locate on cooling coil intake side.

10. Field Interface: Connect to starter, vfd/vsd (variable frequency drive/variable speed drive), electronically commutated motor, or packaged equipment emergency stop terminals with interface relay or safety alarm circuit board..

B. Room-Mounted Thermostat Accessories:

1. Thermostat Covers: Brushed aluminum.

2. Insulating Bases: For thermostats located on exterior walls.

3. Thermostat Guards: Metal mounted on separate base.

4. Adjusting Key: As required for device.

5. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

C. Electric High/Low Limit Duct Thermostats:

1. Manufacturers:
    a. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.
    b. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
    c. Siemens Industry, Inc: www.siemens.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.
2. Snap acting, single pole, single throw, automatic reset switch that trips if temperature sensed across any 12 inches of bulb length is above, equal to, or below setpoint,
3. Bulb length: Minimum 20 feet.
4. Provide one thermostat for every 20 sq ft of coil surface.

D. Fire Thermostats:

1. UL labeled, factory set in accordance with NFPA 90A.
2. Normally closed contacts, manual reset.

2.9 FAN AND PUMP MOTOR RUN-STATUS MONITORING

A. Current Switches:

1. Manufacturers:
    a. Automation Components, Inc: www.workaci.com/#sle.
    b. Functional Devices, Inc: www.functionaldevices.com/#sle.
    c. Schneider Electric: www.schneider-electric.us/#sle.
    d. Veris Industries: www.veris.com/#sle.
    e. Substitutions: See Section 016000 - Product Requirements.
2. Micro-Split Core: 2-state, On/Off digital output of motor status.
3. Mini Solid-Core: 2-State, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure.
4. Mini Split-Core: 2-state, On/Off digital output of inverter-duty motor status with adjustable trip point to detect belt loss or mechanical failure.
5. Maximum AC Current Monitoring Value: As indicated on drawings.

B. Differential Pressure Switches:

1. Manufacturers:
    a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.

b. Honeywell International, Inc: buildingcontrols.honeywell.com/#sle.

c. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

d. Veris Industries: www.veris.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

2. Fan Status: Select for adjustable range between 0 to 5 in-wc across fan discharge and external or fan inlet. Include static pressure tips.

3. Pump Status: Select for adjustable range between 8 to 60 psi across pump discharge and suction sides. Include static pressure tips and 3-way valve manifold.

2.10 PIPE-MOUNTED SENSORS AND TRANSMITTERS

A. Temperature Sensors:

1. Manufacturers:

a. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.

b. Siemens Industry, Inc: www.siemens.com/#sle.

c. Veris Industries: www.veris.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Pipe-mounted temperature probe tied to weather-resistant enclosure for direct insertion into compatible liquids or gases or inserted into intermediary thermal grease-filled pipe-well compatible with interfaced fluid.

3. Sensor Type: 1,000 ohm Platinum RTD.

4. Transmitter: Fitted within probe-interface enclosure, calibrated.

a. Monitoring Range: 32 to 122 degrees F, adjustable.

b. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

c. Accuracy: Plus/minus three percent. adjustable on the transmitter end.

5. Accessories: Provide downstream PT test plug and brass pipe-well.

B. Pressure Transmitters:

1. Manufacturers:

a. Dwyer Instruments Inc: www.dwyer-inst.com/#sle.

b. Setra Systems, Inc: www.setra.com/#sle.

c. Veris Industries; PH Series: www.veris.com/#sle.

d. Winters Instruments: www.winters.com/#sle.

e. Substitutions: See Section 016000 - Product Requirements.

2. Self-contained transducer for monitoring of pneumatic, gas, liquid, or steam service with proportional range scaled over selected electronic output.

3. Service Monitoring Range: 0 to 15 psig.

4. Wetted Material: Brass for general service or stainless steel for steam and corrosive.

5. Hardwired Output: Two-wire, 4 to 20 mA, loop powered.

6. Accessories: Provide gauge-port plug, isolation ball valve, and snubber.

C. Differential Pressure Transmitters:

1. Manufacturers:

a. Veris Industries: www.veris.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. General: Provide wet media differential pressure transducers with 6 ft (1.83 m) armored cable, to allow local or remote pressure sensing capability using existing plumbing runs.

a. Input Power: Class 2; 15 to 30 VDC, 24VAC nominal, 50/60 Hz.

b. Maximum Current Draw: 125 mA, DC.

c. Output: 3-wire transmitter; 4 to 20 mA, 0 to 5V, or 0 to 10V, selectable,

d. Sensor:

1) Media Compatibility: 17 to 4 PH stainless steel.

2) Status Indication: Dual color LED.

3) Proof Pressure: 2x max. F.S. range.

4) Burst Pressure: 5x max. F.S. range.

5) Accuracy at 77 degrees F for less than or equal 20 ft:

(a) Ranges A and B: Plus/minus 1 percent F.S. typical.

(b) Range C: Plus/minus 1.5 percent F.S. typical.

(c) Range D: Plus/minus 2 percent F.S. typical.

6) Surge Damping: Electronic; 1 second averaging.

7) Long Term Stability: Plus/minus 0.25 percent.

8) Zero Offset (Bidirectional and Port Swap Modes Only: 0.5 percent.

e. Reverser:

1) Zero Adjust: Push button auto-zero and digital input (2-position terminal block).

f. Pressure Ranges:

1) 0 psi to 50 psi (Gauge): 5 psid/10 psid/25 psid/50 psid (pressure differential).

2) 0 psi to 100 psi (Gauge): 10 psid/20 psid/50 psid/100 psid (pressure differential).

3) 0 psi to 250 psi (Gauge): 25 psid/50 psid/125 psid/250 psid (pressure differential).

g. Operating Conditions:

1) Temperature Compensated Range:

(a) 32 degrees F.

(b) TC Zero less than 1.5 percent of product F.S. (full scale) per sensor.

(c) TC Span less than 1.5 percent of product F.S. (full scale) per sensor.

2) Sensor Operating Range: Minus 4 to 185 degrees F.

h. Enclosure: NEMA EN 10250, Type 4.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches and humidistats; see Section 262726.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide thermostats in aspirating boxes in front entrances.

G. Provide guards on thermostats in entrances.

H. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

I. Provide separate steam valves for each bank of coils. Provide two valves in parallel where steam load exceeds 1,500 lb/hr with 1/3 to 2/3 load capacities sequenced with smaller valve opening first.

J. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.

K. Provide isolation (two-position) dampers of parallel blade construction.

L. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

M. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

N. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

O. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

END OF SECTION 230913

SECTION 230923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Control panel enclosures.
2. Humidistats.
3. Thermostats.
4. Time clocks.
5. Control air dampers.
6. Electric damper actuators.
7. Control valves.
8. Electric valve actuators.
9. Air measuring and modulation device.
10. Direct digital control system components.
11. Differential pressure monitor.
12. Variable Frequency Drives.

B. Related Sections:

1. Section 01 91 13 - General Commissioning Requirements.
2. Section 23 05 00 - HVAC General Conditions.
3. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation implemented using products specified in this section.
4. Section 23 21 14 - Hydronic Piping Specialties: Product requirements for thermometer sockets and gage taps for placement by this section. Installation requirements for piping products furnished in this section.
5. Section 23 33 00 - Air Duct Accessories: Product requirements for duct mounted thermometers. Installation requirements for dampers and other duct mounted products furnished in this section.

1.2 WORK INCLUDED

A. Furnish a Building Automation System comprised of a network utilizing high-speed BACnet for communications between Building Controllers and PC Workstations. LonTalk or BACnet sub-networks shall be used for communications between Building Controllers, Custom Application Controllers and Application Specific Controllers. Include an operator's workstation using the most current Microsoft Windows Professional operating system based on a distributed control system in accordance with this specification. The operator's workstation and all building controllers shall communicate using protocols and network standards as defined by ANSI/ASHRAE Standard 135-2001, BACnet. Programmable controllers, and all input/output devices shall communicate using the LonTalk FTT-10 and LonMark profiles and/or use BACnet MSTP protocols and network standards as defined by ANSI/ASHRAE Standard 135-2001, BACnet. No gateways shall be used for communication to controllers installed under this section. Gateways may be used for communication to existing systems or to systems installed under other sections.

B. Provide all necessary LonTalk and/or BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and the System Controller

C. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

D. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

E. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

F. Provide and install all interconnecting cables between supplied cabinets, Programmable controllers, and input/output devices.

G. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

H. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

I. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.

J. Provide a comprehensive operator and technician training program as described herein.

K. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

L. Provide new sensors, dampers, valves, and install only new electronic actuators. No used components shall be used as any part or piece of installed system.

M. This contractor shall be responsible for all required control wiring, including 120v back to electrical panels.

1.3 SYSTEM DESCRIPTION

A. A distributed logic control system complete with all software and hardware functions shall be provided and installed. The Enterprise wide network will be provided by the owner and supports the Internet Protocol (IP). Local connections of the Building Controller shall be on ISO 8802-3 (Ethernet). Each Building Controller shall perform communications to a network of Custom Application and Application Specific Controllers using LonTalk FTT-10 and LonMark profiles and/or use BACnet MSTP as prescribed by the BACnet standard to perform communications to a network of Custom Application and Application Specific Controllers. This system is to control all mechanical equipment, including all unitary equipment such as, heat pumps, fan-coils, AC units, etc. and all air handlers, boilers, and any other listed equipment using LonTalk FTT-10 and LonMark profiles and/or use BACnet MSTP as prescribed by the BACnet standard. Proprietary equipment or systems (including gateways) shall not be acceptable and are specifically prohibited.

B. Operator's workstation software shall be the latest version of Microsoft Windows as the computer operating system. The Energy Management and Control System (EMCS) application program shall be written to communicate specifically utilizing BACnet protocols. Software functions delivered on this project shall include password protection, scheduling (including optimum start), alarming, logging of historical data, full graphics including animation, after-hours billing program, demand limiting, full suite of field engineering tools including graphical programming and applications. Systems using operating systems other than that described above are strictly prohibited. All software required to program Programmable specific controllers and all field level devices and controllers will be left with the owner. All software passwords required to program and make future changes to schedules, trends and related program changes will also become the property of the Owner.

C. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.

D. Room sensors shall be provided with digital readout that allow the user to view room temperature, adjust the room setpoint within preset limits and allow occupied override set by OWS. User shall also be able to start and stop unit from the digital sensor. Include all necessary wiring and firmware such that room sensor includes field service mode. Field service mode shall allow technician to balance VAV zones and access any parameter in zone controller.

1.4 APPROVED MANUFACTURERS

A. Approved Control Manufacturers

1. Schneider EcoStruxure as installed by SNE Building Systems.

2. No others will be accepted

1.5 QUALITY ASSURANCE

A. The BAS system shall be designed and installed, commissioned and serviced by factory trained personnel. Manufacturer shall have an in-place support facility within 1 hours response time of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment.

B. The Bidder shall be regularly engaged in the installation and maintenance of BAS systems and shall have demonstrated technical expertise and experience in the manufacture, installation and maintenance of BAS systems similar in size and complexity to this project. Bidders shall provide a list of at least 10 projects, similar in size and scope to this project completed within the past 3 years.

C. The BAS system manufacturer must have a Dealer or Customer Support call-in Center located at the corporate headquarters or corporate manufacturing facilities. The Customer Support call-in Center will be staffed by fully trained and certified technicians.

D. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturers latest standard design that complies with the specification requirements.

E. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.

F. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

G. Control system shall be engineered, programmed and supported completely by representative's local office that must be within 50 miles of the project site.

1.6 REFERENCE STANDARDS

A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof , shall govern design and selection of equipment and material supplied:

1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
2. ANSI/ASHRAE Standard 135-2001, BACnet.
3. ANSI/EIA/CEA-709.1 (LonTalk)
4. ANSI MC85.1 - Terminology for Automatic Control
5. International Building Code (IBC), including local amendments.
6. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
7. National Electrical Code (NEC).
8. FCC Part 15, Subpart J, Class A

B. City, county, state, and federal regulations and codes in effect as of contract date.

C. Except as otherwise indicated the system supplier shall secure and pay for all permits, inspections, and certifications required for his work and arrange for necessary approvals by the governing authorities.

1.7 SUBMITTALS

A. Drawings

1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.

2. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).

3. Eight complete sets (copies) of submittal drawings shall be provided.

4. Drawings shall be available on CD-ROM.

B. System Documentation

1. System configuration diagrams in simplified block format.

2. All input/output object listings and an alarm point summary listing.

3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.

4. Complete bill of materials, valve schedule and damper schedule.

5. System graphics showing monitored systems, data (connected and calculated) point addresses, and operator notations. [Submit demonstration diskette containing graphics.]

6. System configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

7. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.

8. Overall system operation and maintenance instructions-including preventive maintenance and troubleshooting instructions.

9. For operator's workstation(s) and building controller(s) provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135-2001.

10. Provide complete description and documentation of any proprietary services and/or objects used in the system.

11. A list of all functions available and a sample of function block programming that shall be part of delivered system.

C. Project Management

1. The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases. Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

1.8 CLOSEOUT SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.

1. Revise shop drawings to reflect actual installation and operating sequences.

2. Submit data specified in "Submittals" in final "Record Documents" form.

C. Operation and Maintenance Data:

1. Submit interconnection wiring diagrams complete field installed systems with identified and numbered system components and devices.

2. Submit keyboard illustrations and step-by-step procedures indexed for each operator function.

3. Submit inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

4. Submit a point-to-point matrix of the ATC points mapping and final testing/calibration.

5. Submit as-built sequence to the BAS graphic display.

6. Incorporate Electronic versions of the O&M Manuals into the BAS Graphic Display.

7. Provide a link from equipment graphic screen(s) to electronic files(s), which will contain the equipment sequence(s) of operation.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01 31 00 - Project Management Procedures: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution Requirements: Requirements for maintenance service.

B. Furnish service and maintenance of control systems for one years from Date of Substantial Completion.

C. Include systematic examination, adjustment, and lubrication of unit, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturers operating and maintenance data. Use parts produced by manufacturer of original equipment.

D. Perform work without removing units from service during building normal operating hours.

E. Provide emergency call back service during working hours for this maintenance period.

F. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.

G. Perform maintenance work using competent and qualified personnel under supervision of manufacturer or original installer.

H. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

1.12 WARRANTY

A. Manufacturer's warranties shall not start until the date of Substantial Completion or, until all aspects of the commissioning of the respective system are complete and accepted by the Commissioning Authority and the Owner, whichever date is later. The contractor responsible for this section shall include in their base bid any additional cost for extending manufacturer's warranties until the date of Substantial Completion or, until all aspects of the commissioning of the respective system are complete and accepted by the Commissioning Authority and the Owner, whichever date is later.

B. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year.

C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours Monday through Friday, 48 hours on Saturday and Sunday.

D. This warranty shall apply equally to both hardware and software.

PART 2 PRODUCTS

2.1 OPERATOR'S WORKSTATION

A. General structure of workstation interaction shall be a standard client/server relationship. Server shall be used to archive data and store system database. Clients shall access server for all archived data. Each client shall include flexibility to access graphics from server or local drive. Server shall support a minimum of 50 clients simultaneously.

B. BACnet Conformance

1. Operator's workstation shall as a minimum support Point-to-Point (PTP) and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a BACnet device. Operator's terminal shall comply with the requirements of a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

    a. Clock Functional Group

    b. Event Response Functional Group

    c. Time Master Functional Group

    d. Device Communications

2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types accessed by the workstation shall include as a minimum: Analog Value, Analog Input, Analog Output, Binary Value, Binary Input, Binary Output, Calendar, Device, Event Enrollment, File, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

4. The Operator Workstation shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs). Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network.

C. Power Supply

1. Provide an uninterruptible power source (UPS) for main controller and workstation computer. Coordinate the location of the main controller and workstation.

D. Displays

1. Operator's workstation shall display all data associated with project as called out on drawings and/or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings and wiring diagrams from as-built drawings. Install the latest version of AUTO-CAD and Microsoft. Provide a 24" monitor. Operator's workstation shall display all data using three-dimensional graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Workstation shall allow user to change all field-resident EMCS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.

2. All displays and programming shall be generated and customized by the local EMCS supplier and installer. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.

3. Binary objects shall be displayed as ACTIVE/INACTIVE/NULL or with customized text. Text shall be justified left, right or center as selected by the user. Also, allow binary objects to be displayed as individual change-of-state graphic objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three graphic files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the object's commanded status when the graphic item is selected with the system mouse. Similarly, allow the workstation operator to toggle the binary object's status by selecting with the mouse a graphic of a switch or light, for example, which then displays a different graphic (such as an "ON" switch or lighted lamp). Additionally, allow binary objects to be displayed as an animated graphic. Animated graphic objects shall be displayed as a sequence of multiple graphics to simulate motion. For example: when a pump is in the OFF condition, display a stationary graphic of the pump. When the operator selects the pump graphic with the mouse, the represented object's status is toggled and the graphic of the pump's impeller rotates in a time-based animation. The operator shall be able to click on an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change graphic file assignment and also create new and original graphics online. System shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.

4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic. Each analog input object may be assigned a minimum of five graphic files, each with high/low limits for automatic selection and display of these graphics. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Selection for display type shall be individual for each object. Analog object values may be changed by selecting either the "increase" or "decrease" arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trendlogs.

5. Analog objects may also be assigned to an area of a system graphic, where the color of the defined area changes based on the analog object's value. For example, an area of a floor-plan graphic served by a single control zone would change color with respect to the temperature of the zone or its deviation from setpoint. All editing and area assignment shall be created or modified online using simple icon tools.

6. A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label push buttons may be mixed on the same display to allow sub-displays to exist for each item. Each display may be protected from viewing unless operator has appropriate security level. A security level may be assigned to each display and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.

7. A mouse shall be used to move the pointer arrow to the desired item for selection of new display or to allow the operator to make changes to object data.

E. Password Protection

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on. This includes displays as outlined above.

2. Each operator's terminal shall provide security for 200 users minimum. Each user shall have an individual User ID, User Name and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID shall be 0-8 characters, User Name shall be 0-29 characters, and Password shall be 4-8 characters long. Each system user shall be allowed individual assignment of only those control functions and menu items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Each user shall also have a set security level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct security levels for assignment to users.

3. System shall include an Auto Logout Feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.

F. Operator Activity Log

1. Operator Activity Log shall be included with system that tracks all operator changes and activities. System shall track what is changed in the system, who performed this change, date and time of system activity and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation.

2. Log shall be gathered and archived to hard drive on operator workstation as needed. Operator shall be able to export data for display and sorting in a spreadsheet.

3. Any displayed data, that is changeable by the operator, may be selected using the right mouse button and the operator activity log shall then be selectable on the screen. Selection of the operator activity log using this method shall show all operator changes of just that displayed data.

G. Scheduling

1. Operator's workstation shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily with events being the highest.

2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.

3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.

4. System shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right clicking on value displayed on graphic and then selecting Schedule.

5. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.

H. Alarm Indication and Handling.

1. Operator's workstation shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s),currently running. Printout of alarms shall be sent to the assigned terminal and port.

2. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment and identification of operator acknowledging alarm .

3. Alarm messages shall be in user-definable text (English or other specified language) and shall be entered either at the operator's terminal or via remote communication.

4. System shall include an Alarm Wizard for set up of alarms. Wizard shall walk user through all steps necessary for alarm generation. Wizard shall have its own pull-down selection for startup or may be started by right clicking on value displayed on graphic and then selecting alarm setup.

I. Trendlog Information

1. System server shall periodically gather historically recorded data stored in the building controllers and archive the information Archived files shall be appended with new sample data, allowing samples to be accumulated. Systems that write over archived data shall not be allowed, unless limited file size is specified. Samples may be viewed at the operator's workstation. Operator shall be able to scroll through all trended data. All trendlog information shall be displayed in standard engineering units.

2. Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x,y) graphs that display up to ten object types at the same time in different colors. Graphs shall show object values relative to time.

3. Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations shall be password protected. Setup and viewing may be accessed directly from any and all graphics on which object is displayed.

4. System shall include a trend Wizard for setup of logs. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right clicking on value displayed on graphic, and then selecting Trendlogs from the displayed menu.

J. Energy Log Information

1. System server shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.

2. All data shall be stored in data base file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.

3. Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.

4. System shall display archived data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format the user shall be able to select a specific period of data to view.

K. Demand Limiting

1. System shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.

2. Binary shedding shall include minimum of 5 priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one the loads shall be shed/restored in a "first off-first on" mode and in the other the loads are just shed/restored in a linear fashion.

3. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.

4. Status of each and every load shed program shall be capable of being displayed on every operator terminal connected to system. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.

L. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.

M. Field Engineering Tools - Engineering Tools Must Be Submitted on.

1. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.

2. User shall be able to pick graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.

3. Programming tools shall include a real time operation mode. Function blocks shall display real time data and be animated to show status of data inputs and outputs when in real time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.

5. Field engineering tool shall include Device Manager for automatic detection of devices connected anywhere on the BACnet network by scanning of the entire network. This function shall display device instance, network identification, model number and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computers hard drive. If needed, this file shall be downloaded to the appropriate controller by selection using the mouse.

6. System shall include backup/restore function that will back up entire system to selected medium and then restore system from that media.

N. Local Workstation Hardware

1. Provide local operator's workstation located in the custodian's office area, or as directed by the school principal.

2. Workstation Computer Minimum Requirements

   a. Pentium 2 Duo core, 2.8 Ghz or better

   b. 1 GB RAM or better

   c. 80GB hard disk or better

   d. High-performance graphics adapter

   e. Ethernet 10/100 network interface card

   f. Keyboard, monitor, mouse, 3.5-inch disk drive, and CD-ROM

   g. Windows 10

   h. Modem, 56Kb Minimum

i. Color Printer (Inkjet, Color Dye or Laser)

O. Software

1. At the conclusion of project, contractor shall leave with owner a CD ROM that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

2.2 WEB INTERFACE

A. General

1. BAS supplier shall provide web-based access to the system as part of standard installation. User shall be able to access all displays of real-time data that are part of the BAS via a standard Web browser. Web browser shall tie into the network via owner-supplied Ethernet network connection. Web-page host shall be a separate device that resides on the BAS BACnet network, but is not the BAS server for the control system. BAS server must be a separate computer from the Web-page host device to ensure data and system integrity. The web-page software shall not require a per user licensing fee or annual fees. The web-page host must be able to support on average 50 simultaneous users with the ability to expand the system to accommodate an unlimited number of users.

B. Browser Technology

1. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows XP Pro or Microsoft Windows 7 Pro. No special vendor-supplied software shall be needed on computers running browser. All displays shall be viewable and the Web-page host shall directly access real-time data from the BAS BACnet network. Data shall be displayed in real time and update automatically without user interaction. User shall be able to change data on displays if logged in with the appropriate user name and password.

C. Communications

1. Web-page host shall include two Ethernet network connections. One network connection shall be dedicated to BAS BACnet network and shall be used to gather real-time data from all the BACnet devices that form the BAS. This network shall communicate via BACnet, allowing the Web-page host to gather data directly from units on the local LAN or from other projects connected over a WAN. This network shall also provide the connection to the BAS server for Web page generation.

2. The second Ethernet connection shall provide the physical connection to the Internet or an IP-based WAN. It shall be the port that is used for the browser to receive Web pages and data from the Web-page host. The Web-page host shall act as a physical barrier between the BAS network and the WAN or Internet connection that allows the browser to receive web pages and data. The two separate network connections provide for a physical barrier to prevent raw BACnet traffic being exposed on the IP network.

3. The Web-page host shall provide for complete isolation of the IP and BACnet networks by not routing networking packets between the two networks.

4. BAS BACnet Ethernet network shall be provided and installed by the BAS supplier. Owner shall provide and incur any monthly charges of WAN/Internet connection.

D. Display of Data

1. Web page graphics shown on browser shall be replicas of the BAS displays. User shall need no additional training to understand information presented on Web pages when compared to what is shown on BAS displays. Web page displays shall include animation just as BAS displays. Fans shall turn, pilot lights shall blink, coils shall change colors, and so on.

2. Real-time data shall be shown on all browser Web pages. This data must be directly gathered via the BACnet network and automatically updated on browser Web page displays without any user action. Data on the browser shall automatically refresh as changes are detected without re-drawing the complete display.

3. It shall be possible for user from browser Web page to change data if the user is logged on with the appropriate password. Clicking on a button or typing in a new value shall change digital data. Using pull-down menus or typing in a new value shall change analog data.

4. Data displays shall be navigated using pushbuttons on the displays that are simply clicked on with the mouse to select a new display. Alternatively, the standard back and forward buttons of the browser can be used for display navigation.

E. Time Schedule Adjustment

1. Web access shall allow user to view and edit all schedules in the system. This includes standard, holiday and event schedules as described in BAS specification. Display of schedules shall show interaction of all schedules on a single display so user sees an overview of how all work together. User shall be able to edit schedules from this display.

2. Display of all 3 schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.

3. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.

F. Logging of Information

1. User shall use standard browser technology to view all trend logs in system. User shall be able to view logged data in tabular form or graphical format. User shall be able to adjust time interval of logged data viewed and shall be able to adjust y axis of data viewed in graphical format. User shall also be able to download data through the web interface to local computer. Data shall be in CSV format.

G. Alarm Handling

1. Web interface shall display alarms as they occur. User shall be able to acknowledge alarms using browser technology. In addition, user shall be able to view history of alarm occurrence over a user selected time frame. In addition, those alarms may be filtered for viewing per user selected options. A single selection shall display all alarms that have not been acknowledged.

H. Web Page Generation

1. Web pages shall be generated automatically from the BAS displays that reside on the BAS server. User shall access Web-page host via the network and shall initiate a web page generation utility that automatically takes the BAS displays and turns them into Web pages. The Web pages generated are automatically installed on the Web page host for access via any computer's standard browser. Any system that requires use of an HTML editor for generation of Web pages shall not be considered.

I. Password Security and Activity Log

1. Access via Web browser shall utilize the same hierarchical security scheme as BAS system. User shall be asked to log in once the browser makes connection to Web-page host. Once the user logs in, any and all changes that are made shall be tracked by the BAS system. The user shall be able to change only those items that the user has authority to change. A user activity report shall show any and all activity of the users that have logged in to the system regardless of whether those changes were made using a browser or via the BAS workstation.

J. BACnet Communication

1. Web server shall directly communicate to all devices on the BAS network using BACnet protocol. No intermediate devices shall be necessary for BACnet communication.

K. The HVAC O&M manual shall be made available on the graphic display. The equipment code and translation for the following equipment shall be made available on the graphic display on a section referred to as equipment decoding.

1. Boilers
2. Pumps
3. Packaged rooftop AC units
4. Split system a/c units
5. Radiant panels
6. Cabinet unit heaters

2.3 BUILDING CONTROLLER

A. General Requirements

B. Building Controller shall consist of a power supply, BACnet Ethernet-MS/TP, BACnet MS/TP, LonTalk FTT-10, and modem module for telephone communication as a minimum. Those projects that require special interfaces may use Modbus modules as needed. However, all Ethernet communications and all controllers including central plant controllers, advanced Programmable controllers and unitary controllers supplied by BMS manufacturer shall utilize the LonTalk or BACnet protocol standards.

C. All communication with operator workstation shall be via BACnet Ethernet. All communication with Programmable controllers shall be LonTalk FTT-10 or BACnet MS/TP Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) and MS/TP, FTT-10 LANS. Ethernet - MS/TP, FFT module shall also route messages from all other Building Controller modules onto the BACnet Ethernet network.

1. MS/TP LAN must be software configurable from 9.6 to 76.8Kbps.

2. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).

D. The Building Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs) and function as a BACnet Broadcast Management Device (BBMD).

E. Building Controller MS/TP module communications shall be via BACnet master slave token passing (MS/TP) LAN. Building Controller FFT-10 module communications shall be via LONtalk FFT-10 LAN using transceivers to all advanced Programmable and Programmable specific controllers. MS/TP module shall also route messages to Ethernet-MS/TP module for communication over WAN.

1. MS/TP LAN must be software configurable from 9.6 to 76.8Kbps

2. Configuration shall be via RS-232 connection.

F. All controllers shall be capable of providing global control strategies for the system based on information from any objects in the system regardless if the object is directly monitored by a building controller. The software program implementing these strategies shall be completely flexible and user definable. Any systems utilizing factory preprogrammed global strategies that cannot be modified by field personnel on-site, via a wide area network or downloaded via remote communications are not acceptable. Changing global strategies via firmware changes is also unacceptable.

G. Programming shall be object-oriented using control function blocks, supporting DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller.

H. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's workstation or field computer.

I. Controller shall have a memory needed to ensure high performance and data reliability. Battery shall provide power for orderly shutdown of controller and storage of data in nonvolatile flash memory. Battery back up shall maintain real-time clock functions for a minimum of 20 days.

J. Global control algorithms and automated control functions shall execute via 32-bit processor.

K. Schedules

1. Each building controller module shall support a minimum of 80 BACnet Schedule Objects and 80 BACnet Calendar Objects.

2. Building controller modules shall provide normal 7 day scheduling, holiday scheduling and event scheduling.

L. Logging Capabilities

1. Each building controller shall log as minimum 320 values. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.

2. Logs may be viewed both on-site or off-site via WAN or remote communication.

3. Building controller shall periodically upload trended data to networked operator's workstation for long term archiving if desired.

4. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

M. Alarm Generation

1. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

2. Each alarm may be dialed out as noted elsewhere.

3. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.

4. Controller must be able to handle up to 320 alarm setups stored as BACnet event enrollment objects - system destination and actions individually configurable.

N. Demand Limiting

1. Demand limiting of energy shall be built a built in function that shall be user configurable. Each controller module shall support shedding of up to 200 loads using a minimum of two types of shed programs.

2. Load shedding programs in Building Controller Modules shall operate as defined in section 2.1.J of this specification.

3. Monitor total power consumption for each power meter and shed associated loads automatically to reduce power consumption to an operator set maximum demand level.

4. Input: Pulse count from incoming power meter connected to pulse accumulator in control unit.

5. Forecast demand (kW): Predicted by sliding window method.

6. Automatically shed loads throughout the demand interval selecting loads with independently adjustable on and off time of between one and 255 minutes.

7. Demand Target: Minimum of 3 for each demand meter; change targets based upon (1) time, (2) status of pre-selected points, or (3) temperature.

8. Load: Assign load shed priority, minimum "ON" time and maximum "OFF" time.

9. Limits: Include control band (upper and lower limits).

10. Output advisory when loads are not available to satisfy required shed quantity, advise shed requirements [and requiring operator acknowledgment].

O. Duty Cycling:

1. Periodically stop and start loads, based on space temperature, and according to various On/Off patterns.

2. Modify off portion of cycle based on operator specified comfort parameters. Maintain total cycle time by increasing on portion of cycle by equal quantity off portion is reduced.

3. Set and modify following parameters for each individual load.

   a. Minimum and maximum off time.

   b. On/Off time in one-minute increments.

   c. Time period from beginning of interval until cycling of load.

   d. Manually override the DDC program and place a load in an On or Off state.

   e. Cooling Target Temperature and Differential.

   f. Heating Target Temperature and Differential.

   g. Cycle off adjustment.

P. Automatic Time Scheduling:

1. Self-contained programs for automatic start/stop/scheduling of building loads.

2. Support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary day schedules.

3. Special day's schedule supporting up to 30 unique date/duration combinations.

4. Number of loads assigned to time program; with each load having individual time program.
5. Each load assigned at least 16 control actions for each day with 1 minute resolution.
6. Furnish the following time schedule operations:
    a. Start.
    b. Optimized Start.
    c. Stop.
    d. Optimized Stop.
    e. Cycle.
    f. Optimized Cycle.
7. Capable of specifying minimum of 30 holiday periods up to 100 days in length for the year.
8. Create temporary schedules.
9. Broadcast temporary "special day" date and duration.

Q. Start/Stop Time Optimization:

1. Perform optimized start/stop as function of outside conditions, inside conditions, or both.
2. Adaptive and self-tuning, adjusting to changing conditions unattended.
3. For each point under control, establish and modify:
    a. Occupancy period.
    b. Desired temperature at beginning of occupancy period.
    c. Desired temperature at end of occupancy period.

R. Night Setback/Setup Program: Reduce heating space temperature set point or raise

1. cooling space temperature set-point during unoccupied hours; in conjunction with scheduled start/stop and optimum start/stop programs.

S. Calculated Points: Define calculations and totals computed from monitored points (analog/digital points), constants, or other calculated points.

1. Employ arithmetic, algebraic, Boolean, and special function operations.
2. Treat calculated values like any other analog value; use for any function where a "hard wired point" might be used.

T. Event Initiated Programming: Any data point capable of initiating event, causing series of controls in a sequence.

1. Define time interval between each control action between 0 to 3600 seconds.
2. Output may be analog value.
3. Provide for "skip" logic.
4. Verify completion of one action before proceeding to next action. When not verified, program capable of skipping to next action.

U. Direct Digital Control: Furnish with each control unit Direct Digital Control software so operator is capable of customizing control strategies and sequences of operation by defining appropriate control loop algorithms and choosing optimum loop parameters.

1. Control loops: Defined using "modules" are analogous to standard control devices.
2. Output: Paired or individual digital outputs for pulse width modulation, and analog outputs.
3. Firmware:
    a. PID with analog or pulse-width modulation output.
    b. Floating control with pulse-width modulated outputs.
    c. Two-position control.
    d. Primary and secondary reset schedule selector.
    e. Hi/Low signal selector.
    f. Single pole double-throw relay.
    g. Single pole double throw time delay relay with delay before break, delay before make and interval time capabilities.
4. Direct Digital Control loop: Downloaded upon creation or on operator request. On sensor failure, program executes user defined failsafe output.
5. Display: Value or state of each of lines interconnecting DDC modules.

V. Fine Tuning Direct Digital Control PID or floating loops:

1. Display information:
    a. Control loop being tuned.
    b. Input (process) variable.
    c. Output (control) variable.
    d. Set-point of loop.
    e. Proportional band.
    f. Integral (reset) Interval.

g. Derivative (rate) Interval.

2. Display format: Graphic, with automatic scaling; with input and output variable superimposed on graph of "time" versus "variable".

W. Trend logging:

1. Each control unit capable of storing samples of control unit's data points.

2. Update file continuously at operator assigned intervals.

3. Automatically initiate upload requests and then stores data on hard disk.

4. Time synchronize sampling at operator specified times and intervals with sample resolution of one minute.

5. Co-ordinate sampling with specified on/off point- state.

6. Display trend samples on workstation in graphic format. Automatically scale trend graph with minimum 60 samples of data in plot of time versus data.

X. Tenant Activity Logging

1. Tenant Activity logging shall be supported by Building Controller Module. Each independent module shall support a minimum of 80 zones.

2. Tenant Activity logging shall functions as defined in section 2.1.K of this specification.

2.4 CENTRAL PLANT AND AIR HANDLER PROGRAMMABLE CONTROLLERS

A. Provide one or more Programmable controllers for each air handler and provide programmable controllers as needed for central plant control that adequately cover all objects listed in object list. All controllers shall interface to building controller via MS/TP or FTT-10 LAN using BACnet or LonTalk protocol.

B. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. No auxiliary controllers shall be used.

C. Communication Conformance

1. Programmable controllers shall communicate using LonTalk or BACnet MSTP, ANSI/ASHRAE Standard 135-2004 (BACnet). Controllers communicating using LonTalk shall use FTT-10 transceivers and communicate using LonMark-approved SNVTs

a. Files Functional Group

b. Reinitialize Functional Group

c. Device Communications Functional Group

2. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet or LonMark object types supported shall include as a minimum-Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. Programmable controllers shall include universal inputs with 10-bit resolution that accept 3K and 10K thermistors, 0-10VDC, 0-5 VDC, 4-20 mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of 3 inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0-10VDC or 0-20mA. Software shall include scaling features for analog outputs. Programmable controller shall include 24VDC voltage supply for use as power supply to external sensors.

E. All program sequences shall be stored on board Programmable controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal. Programming of Programmable controller shall be completely modifiable in the field over installed BACnet and LonTalk LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Programmable controller shall be programmed using programming tools.

F. Programmable controller shall include support for intelligent room sensor (see section 2.6.B.) Display on intelligent room sensor shall be programmable at Programmable controller and include an operating mode and a field service mode. See sequence of operation for specific display requirements at intelligent room sensor.

2.5 TERMINAL UNIT PROGRAMMABLE CONTROLLERS (INCLUDING BUT NOT LIMITED TO HEAT PUMPS, AC UNITS, FAN COILS)

A. Provide one controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller via MS/TP LAN using BACnet or FTT-10 using LonTalk protocols. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. Communication Conformance

1. Programmable controllers shall shall communicate using LonTalk or BACnet MSTP, ANSI/ASHRAE Standard 135-2004 (BACnet). Controllers communicating using LonTalk shall use FTT-10 transceivers and communicate using LonMark-approved SNVTs

a. Files Functional Group

b. Reinitialize Functional Group

c. Device Communications Functional Group

2. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet or LonMark object types supported shall include as a minimum-Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Programmable controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0-5 VDC, 4-20 mA, dry contact signals and a minimum of 3 pulse inputs. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of Programmable controller shall be completely modifiable in the field over installed BACnet and LonTalk LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen.

E. Programmable controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. See sequence of operation for specific display requirements at intelligent room sensor.

2.6 VAV BOX CONTROLLERS-SINGLE DUCT

A. Provide one controller for each VAV box that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller via MS/TP LAN using BACnet or FFT-10 using LonTalk protocol. No gateways shall be used. Controllers shall include on board CFM flow sensor, inputs, outputs and programmable, self-contained logic program as needed for control of units.

B. Programmable controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0-5 VDC, and dry contact signals. Inputs on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall also include binary outputs on board. For applications using variable speed parallel fans, provide a single analog output selectable for 0-10 V or 0-20 mA control signals. Programmable controller shall include microprocessor driven flow sensor for use in pressure independent control logic. All boxes shall be controlled using pressure independent control algorithms and all flow readings shall be in CFM (LPS if metric).

C. All program sequences shall be stored on board Programmable controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of Programmable controller shall be completely modifiable in the field over installed BACnet or LonTalk LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Programmable controller shall be programmed using the same programming tool as Building Controller and as described in operator workstation section. All programming tools shall be provided as part of system.

D. Programmable controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on room sensor shall be programmable at Programmable controller and include an operating mode and a field service mode. See sequence for specific display requirements for intelligent room sensor.

E. On board flow sensor shall be microprocessor driven and precalibrated at the factory. Precalibration shall be at 16 flow points as a minimum. All factory calibration data shall be stored in EEPROM. Calibration data shall be field adjustable to compensate for variations in VAV box type and installation. Provide duct temperature sensor at discharge of each VAV box that is connected to controller for reporting back to operator workstation.

2.7 SENSORS AND MISCELLANEOUS DEVICES

A. Temperature Sensors

1. All temperature sensors to be solid state electronic, factory-calibrated to within 0.5°F, totally interchangeable with housing appropriate for application. Wall sensors to be installed as indicated on drawings. Mount 48 inches about finished floor. Duct sensors to be installed such that the sensing element is in the main air stream. Immersion sensors to be installed in wells provided by control contractor, but installed by mechanical contractor. Immersion wells shall be filled with thermal compound before installation of immersion sensors. Outside air sensors shall be installed away from exhaust or relief vents, not in an outside air intake and in a location that is in the shade most of the day.

B. Intelligent Room Sensor with LCD Readout

1. Sensor shall contain a backlit LCD digital display and user function keys along with temperature sensor. Controller shall function as room control unit, and shall allow occupant to raise and lower setpoint, and activate terminal unit for override use-all within limits as programmed by building operator.

2. The Intelligent Room Sensor shall display room setpoint, room temperature, and fan status (if applicable) at each controller. This unit shall be programmable, allowing site developers the flexibility to configure the display to match their application. Unit must have the capability to show temperatures in Fahrenheit or Centigrade.

3. Override time count down shall be automatic, but may be reset to zero by occupant from the sensor. Time remaining shall be displayed. Display shall show the word "OFF" in unoccupied mode unless a function button is pressed.

4. See sequence of operation for specific operation of LCD displays and function keys in field service mode and in normal occupant mode. Provide intelligent room sensors as specified in point list.

5. Field service mode shall be customizable to fit different applications.

C. Wall Sensor

1. Standard wall sensor shall use solid-state sensor identical to intelligent room sensor and shall be packaged in aesthetically pleasing enclosure. Sensor shall provide override function, warmer/cooler lever for set point adjustment. Override time shall be stored in Operator Workstation and be adjustable on a zone-by-zone basis. Adjustment range for warmer/cooler lever shall also be stored in EEPROM on controller.

D. Dew Point Sensor

1. Dew point sensors (EE10-04 or equal) shall employ a non-reactive organic bobbin material to give precise dew point readings with error of no more than plus or minus 1.3 degrees at 68 degrees F. The dew point sensor shall incorporate an integral draft shield as part of the instrument for air velocities in excess of 50 feet per minute. Sensor shall be suitable for wall mounting with the accuracy mentioned above and required in the sequence of operation and the time constant necessary for stable, hunt free, control.

E. Humidity Sensors:

1. The sensor shall be a solid-state type, relative humidity sensor of the bulk polymer design. The sensor element shall resist service contamination.

2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered 4-20ma, 0-100% linear proportional output.

3. The humidity transmitter shall meet the following overall accuracy, including lead loss and analog to digital conversion. Three percent between 205 and 80% RH at 77 deg F.

4. A single point humidity calibrator shall be provided for field calibration. Transmitters shall be shipped factory pre-calibrated.

5. Duct type sensing probes shall be constructed of 304 stainless steel and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.

F. LCD Operator Terminal

1. The LCD operator terminal is a small wall- or panel-mounted operator terminal that connects directly to the BACnet or LonTalk LANs. The communication design and messaging structure shall comply with ANSI/ASHRAE Standard 1352001, BACnet or ANSI/EIA/CEA-709.1 (LonTalk). Each operator terminal shall be able to display any object from anywhere in the network.

2. Each of these operator's terminals shall have a keypad and an adjustable backlit LCD, with a simple menu structure to give occupants and technicians intuitive access to system information. It shall have a minimum 4-line by 20-character display to allow an operator to query and adjust system values.

3. The system shall allow the connection of up to 16 LCD operator terminals to each Building Controller. The operator shall have the ability to connect to each of these operator terminals with a laptop computer via an RS-232 cable to gain system access, troubleshooting, and display programming.

4. Provide LCD operator terminals in the locations shown on the drawings.

2.8 ELECTRONIC ACTUATORS AND VALVES

A. Quality Assurance for Actuators and Valves

1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.

2. NEMA 2 rated enclosures for inside mounting, provide with weather shield for outside mounting.

3. Five-year manufacturers warranty. Two-year unconditional and three-year product defect from date of installation.

B. Execution Details for Actuators and Valves

1. Furnish a Freeze-stat and install "Hard Wire" interlock to disconnect the mechanical spring return actuator power circuit for fail-safe operation. Use of the control signal to drive the actuators closed is not acceptable.

2. Each DDC analog output point shall have an actuator feedback signal, independent of control signal, wired and terminated in the control panel for true position information and troubleshooting. Or the actuator feedback signal may be wired to the DDC as an analog input for true actuator position status.

3. VAV box damper actuation shall be Floating type or Analog (2-10vdc, 4-20ma).

4. Booster-heat valve actuation shall be Floating type or Analog (2-10vdc, 4-20ma).

5. Primary valve control shall be Analog (2-10vdc, 4-20ma).

C. Actuators for Damper and Control Valves 1/2" to 6" shall be Electric unless otherwise specified, provide actuators as follows:

1. UL Listed Standard 873 and Canadian Standards association Class 481302 shall certify Actuators.

2. NEMA 2 rated actuator enclosures are. Use additional weather shield to protect actuator when mounted outside.

3. 5 year Manufacturers Warranty. Two-year unconditional + Three year product defect from date of installation.

4. Mechanical spring shall be provided when specified. Capacitors or other non-mechanical forms of fail-safe are not acceptable.

5. Position indicator device shall be installed and made visible to the exposed side of the Actuator. For damper short shaft mounting, a separate indicator shall be provided to the exposed side of the Actuator.

6. Overload Protection: Actuators shall provide protection against actuator burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit shall insure that actuators cannot burn out due to stalled damper or mechanical and electrical paralleling. End switches to deactivate the actuator at the end of rotation are acceptable only for Butterfly Valve actuators.

7. A push button gearbox release shall be provided for all non-spring actuators.

8. Modulating actuators shall be 24Vac and consume 10VA power or less.

9. Conduit connectors are required when specified and when code requires it.

D. Damper Actuators:

1. Outside Air and Exhaust Air Damper Actuators shall be Mechanical Spring Return. Capacitors or other non-mechanical forms of fail-safe are not acceptable. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the damper as required.

2. Economizer Actuators shall utilize Analog control 2-10 VDC, Floating control is not acceptable.

3. Electric damper actuators (including VAV box actuators) shall be direct shaft mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or setscrew type fasteners are not acceptable.

4. One electronic actuator shall be direct shaft mounted per damper section. No connecting rods or jackshafts shall be needed. Small outside air and return air economizer dampers may be mechanically linked together if one actuator has sufficient torque to drive both and damper drive shafts are both horizontal installed.

5. Multi-section dampers with electric actuators shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft mounted per damper section. (See below execution section for more installation details.)

E. Valve Actuators 1/2"TO 6"

1. Mechanical spring shall be provided on all actuators for pre-heat coil and actuators for AHU heating or cooling coil when units are mounted outside. See plans for fail save flow function: Normal Open or Normal Closed. Capacitors or other non-mechanical forms of fail-safe are not acceptable.

2. All zone service actuators shall be non-spring return unless otherwise specified.

3. The valve actuator shall be capable of providing the minimum torque required for proper valve close off for the required application.

4. All control valves actuators shall have an attached 3-foot cable for easy installation to a junction box.

5. Override handle and gearbox release shall be provided for all non-spring return valve actuators.

F. Control Valves 1/2" to 6": The BAS contractor shall furnish all specified motorized control valves and actuators. BAS contractor shall furnish all control wiring to actuators. The Plumbing contractor shall install all valves. Equal Percentage control characteristic shall be provided for all water coil control valves. Linear valve characteristic is acceptable for 3-way valves 2x2 inch and above.

1. Characterized Control Valves shall be used for hydronic heating or cooling applications and small to medium AHU water coil applications to 100GPM. Actuators are non-spring return for terminal unit coil control unless otherwise noted. If the coil is exposed to the Outside Air stream then see plans for Spring Return requirement.

   a. Leakage is Zero percent, Close-off is 200psi, Maximum differential is 30psi. Rangeablity is 500:1.

   b. Valves 1/2 inch through 2 inches shall be nickel-plated forged brass body, NPT screw type connections.

   c. Valves 1/2 inch through 1-1/4 inches shall be rated for ANSI Class 600 working pressure. Valves 1-1/2 inch and 2 inches shall be rated for ANSI Class 400 working pressure.

   d. The operating temperature range shall be 0° to 250° F.

   e. Stainless steel ball & stem shall be furnished on all modulating valves.

   f. Seats shall be fiberglass reinforced Teflon.

   g. Two-way and three-way valves shall have an equal percentage control port. Full stem rotation is required for maximum flow to insure stable BTU control of the coil.

   h. Three-way valve shall be applicable for both mixing and diverting.

   i. The characterizing disc is made of TEFZEL and shall be keyed and held secure by a retaining ring.

   j. The valves shall have a blow out proof stem design.

   k. The stem packing shall consist of 2 lubricated 0-rings designed for on-off or modulating service and require no maintenance.

   l. The valves shall have an ISO type, 4-bolt flange, for mounting actuator in any orientation parallel or perpendicular to the pipe.

m. A non-metallic thermal isolation adapter shall separate valve flange from actuator.

n. One fastening screw shall secure the direct coupling of the thermal isolation adapter between the actuator and the valve. This will prevent all lateral or rotational forces from affecting the stem and it's packing 0-rings.

2. Globe valves 1/2" to 2" shall be used for steam control or water flow applications.

a. Valves shall be bronze body, NPT screw type, and shall be rated for ANSI Class 250 working pressure.

b. Valves 1/2 inch (DN15) through 2 inches (DN50) with spring return actuators shall close off against 50 psi pressure differential with Class III leakage (.1%).

c. The operating temperature range shall be 20° to 280° F.

d. Spring loaded TFE packing shall protect against leakage at the stem.

e. Two-way valves shall have an equal percentage control port.

f. Three-way valves shall a linear control and bypass port.

g. Mixing and diverting valves must be installed specific to the valve design.

2.9 BUTTERFLY VALVES

A. Butterfly Valves shall be sized for modulating service at 60-70 degree stem rotation. Isolation valves shall be line-size. Design velocity shall be less than 12 feet per second when used with standard EPDM seats.

1. Body is Cast Iron.

2. Disc is Aluminum Bronze standard.

3. Seat is EPDM Standard.

4. Body Pressure is 200 psi, -30F to 275F.

5. Flange is ANSI 125/250.

6. Media Temperature Range is -22F to 240F.

7. Maximum Differential Pressure is 200 psi for 2" to 6" size.

2.10 ACTUATOR MOUNTING FOR DAMPER AND VALVE ARRANGEMENTS SHALL COMPLY TO THE FOLLOWING:

A. Damper Actuators: Shall not be installed in the air stream

B. A weather shield shall be used if actuators are located outside. For Damper Actuators use clear plastic enclosure.

C. Damper or valve actuator ambient temperature shall not exceed 122 degrees F through any combination of medium temperature or surrounding air. Appropriate air gaps, thermal isolation washers or spacers, standoff legs, or insulation shall be provided as necessary

D. Actuator cords or conduit shall incorporate a drip leg if condensation is possible. Water shall not be allowed to contact actuator or internal parts. Location of conduits in temperatures dropping below dew point shall be avoided to prevent water from condensing in conduit and running into actuator.

E. Damper mounting arrangements shall comply to the following:

1. The ventilation subcontractor shall furnish and install damper channel supports and sheet metal collars.

2. No jack shafting of damper sections shall be allowed.

3. Multi-section dampers shall be arranged so that each damper section operates individually. One electronic actuator shall be direct shaft mounted per section.

F. Size damper sections based on actuator manufacturers specific recommendations for face velocity, differential pressure and damper type. In general:

1. Damper section shall not exceed 24 ft-sq. with face velocity £ 1500 FPM.

2. Damper section shall not exceed 18 ft-sq. with face velocity £ 2500 FPM.

3. Damper section shall not exceed 13 ft-sq. with face velocity £ 3000 FPM.

G. Multiple section dampers of two or more shall be arranged to allow actuators to be direct shaft mounted on the outside of the duct.

H. Multiple section dampers of three or more sections wide shall be arranged with a 3-sided vertical channel (8" wide by 6" deep) within the duct or fan housing and between adjacent damper sections. Vertical channel shall be anchored at the top and bottom to the fan housing or building structure for support. The sides of each damper frame shall be connected to the channels. Holes in the channel shall allow damper drive blade shafts to pass through channel for direct shaft mounting of actuators. Open side of channel shall be faced down stream of the airflow, except for exhaust air dampers.

I. Multiple section dampers to be mounted flush within a wall or housing opening shall receive either vertical channel supports as descried above or sheet metal standout collars. Sheet metal collars (12" minimum) shall

1. Valve Sizing for Water Coil

a. On/Off Control Valves shall be line size.

b. Modulating Control Valve Body Size may be reduced at most two pipe sizes from the line size or not less than 1/2 the pipe size. The BAS contractor shall size all water coil control valves for the application as follows:

1) Booster-heat valves shall be sized not to exceed 4-9psi differential pressure. Size valve for 50% Valve Authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.

2) Primary valves shall be sized not to exceed 5-15psi differential pressure. Size valve for 50% Valve Authority. Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.

3) Butterfly valves shall be sized for modulating service at 60-70 degree rotation. Design velocity shall be 12 feet per second or less when used with standard EPDM seats.

4) Valve Mounting arrangements shall comply to the following:

5) Unions shall be provided on all ports of two-way and three-way valves.

6) Install three-way equal percentage Characterized Control valves in a mixing configuration with the "A" port piped to the coil.

7) Install 2V2 inch and above, Three-Way globe valves, as manufactured for mixing or diverting service to the coil.

2.11 ENCLOSURES

A. All controllers, power supplies and relays shall be mounted in enclosures.

B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment.

C. Enclosures shall have hinged, locking doors.

D. Provide laminated plastic nameplates for all enclosures in any mechanical room or electrical room. Include location and unit served on nameplate. Laminated plastic shall be 1/8" thick sized appropriately to make label easy to read.

2.12 AIRFLOW/TEMPERATURE MEASUREMENT DEVICES

A. Provide airflow/temperature measurement devices (ATMD) where required to meet the sequence of operations specified in Section 23 09 93.

1. Fan inlet measurement devices shall not be substituted for duct or plenum measurement devices indicated on the plans.

B. Each ATMD shall consist of one or more sensor probes and a single, remotely mounted, microprocessor-based transmitter capable of independently processing up to 16 independently wired sensor assemblies.

1. Each sensor assembly shall contain two individually wired, hermetically sealed bead-in-glass thermistors.

2. Thermistors shall be mounted in the sensor assembly using a marine-grade, waterproof epoxy. Thermistor leads shall be protected and not exposed to the environment.

3. The airflow rate of each sensor assembly shall be equally weighted and averaged by the transmitter prior to output.

4. The temperature of each sensor assembly shall be velocity weighted and averaged by the transmitter prior to output.

5. Each transmitter shall have a 16-character alpha-numeric display capable of displaying airflow, temperature, system status, configuration settings and diagnostics.

6. Devices using chip-in-glass or diode-case chip thermistors are not acceptable.

7. Devices using less than two thermistors in each sensor assembly are not acceptable.

8. Devices using platinum wire RTDs are not acceptable.

9. Devices having electronic circuitry mounted in or at the sensor probe are not acceptable.

10. Vortex shedding devices are not acceptable.

C. All Sensor Probes

1. Each sensor assembly shall independently determine the airflow rate and temperature at each measurement point.

2. Each sensor assembly shall be calibrated at a minimum of 16 airflow rates and 3 temperatures to standards that are traceable to the National Institute of Standards and Technology (NIST).

3. Airflow accuracy shall be +/-2% of Reading over the entire operating airflow range.

   a. Devices whose accuracy is the combined accuracy of the transmitter and sensor probes must demonstrate that the total accuracy meets the performance requirements of this specification throughout the measurement range.

4. Temperature accuracy shall be +/-0.15° F over the entire operating temperature range of -20° F to 160° F.

5. The operating humidity range for each sensor probe shall be 0-99% RH (non-condensing).

6. Each sensor probe shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to the remotely mounted transmitter. All terminal plug interconnecting pins shall be gold plated.

7. Each sensor assembly shall not require matching to the transmitter in the field.

8. A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter for each measurement location.

D. Duct and Plenum Probes

1. Probes shall be constructed of extruded, gold anodized, 6063 aluminum tube. All wires within the aluminum tube shall be Kynar coated.

2. Probe assembly mounting brackets shall be constructed of 304 stainless steel. Probe assemblies shall be mounted using one of the following options:

   a. Insertion mounted through the side or top of the duct

   b. Internally mounted inside the duct or plenum

   c. Standoff mounted inside the plenum

3. Duct of Plenum Area/Total # Sensors/Location

Duct or Plenum Area (Sq. Ft.)	Total No. of Sensors
Less than 2	4
2 to 4	6
4 to 8	8
8 to 16	12
More than 16	16

4. The operating air flow range shall be 0 to 5000 fpm.

E. Fan inlet probes:

1. Sensor assemblies shall be mounted on 304 stainlss steel housings.

2. Mounting rods shall be field adjustable to fit the fan inlet and constructed of nickel plated steel.

3. Mounting feet shall be constucted of 304 stainless steel.

4. The operating range shall be 0 to 10,000 fpm.

2.13 VARIABLE FREQUENCY DRIVES

A. The VFD package as specified herein shall be enclosed in a UL Listed Type enclosure, (NEMA rated enclosures are not acceptable) completely assembled and tested by the manufacturer in an IS09001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

1. Environmental operating conditions: 0 - 400 C continuous. Altitude 0 to 3300 feet above sea level, up to 95% humidity, non-condensing. All circuit boards shall have conformal coating.

2. Enclosure shall be rated UL type 1 and shall be UL listed as a plenum rated VFD.

B. All VFDs shall have the following features:

1. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.

2. The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.

3. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery back up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings. Capacitor backup is not acceptable.

4. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).

5. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.

6. The VFD shall have 5% equivalent impedance internal reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% equivalent impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add an AC line reactor.

7. The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% equivalent impedance internal reactors.

8. The VFD shall provide a programmable proof of flow Form-C relay output (broken belt / broken coupling). The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.

C. All VFDs to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.

2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network.

3. Two (2) programmable analog inputs shall accept current or voltage signals.

4. Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.

5. Six (6) programmable digital inputs.

6. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.

7. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.

8. Two independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.

9. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.

10. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.

11. The VFD shall include password protection against parameter changes.

D. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (LED and alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.

E. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

1. Output Frequency
2. Motor Speed (RPM, %, or Engineering units)
3. Motor Current
4. Drive Temperature
5. DC Bus Voltage
6. Output Voltage

F. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed or operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback . The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlock, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation.

G. Serial Communications

1. The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, BACnet, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.
2. The BACnet connection shall be an RS485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
    a. Data Sharing - Read Property - B.
    b. Data Sharing - Write Property - B.
    c. Device Management - Dynamic Device Binding (Who-Is; I-AM).
    d. Device Management - Dynamic Object Binding (Who-Has; (Have).

e. Device Management - Communication Control - B.

3. Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

H. EMI / RFI filters. All VFDs shall include EMI/RFI filters. The VFD shall comply with standard EN 61800-3 for the First Environment, restricted level with up to 100' of motor cables. No Exceptions. Certified test lab test reports shall be provided with the submittals.

I. All VFDs through 60HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not be damaged by this condition.

J. Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. The bypass enclosure door and VFD enclosure must be interlocked such that input power is turned off before either enclosure can be opened. The VFD and Bypass as a package shall have a UL listed short circuit rating of 100,000 amps and shall be indicated on the data label.

1. A complete factory wired and tested bypass system consisting of an output contactor and bypass contactor, service (isolation) switch and VFD input fuses are required. Bypass designs, which have no VFD only fuses, or that incorporate fuses common to both the VFD and the bypass will not be accepted

2. Door interlocked padlockable circuit breaker that will disconnect all input power from the drive and all internally mounted options.

K. The following operators shall be provided:

1. Bypass Hand-Off-Auto

2. Drive mode selector and light

3. Bypass mode selector and light

4. Bypass fault reset

5. Bypass LDC display, 2 lines, for programming and status / fault / warning indications

6. Motor protection from single phase power conditions - The Bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in Bypass mode are not acceptable.

7. The system (VFD and Bypass) tolerated voltage window shall allow the system to operate from a line of +30%, -35% nominal voltage as a minimum. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain "sealed in" over this voltage tolerance at a minimum.

8. The Bypass system shall NOT depend on the VFD for bypass operation. The bypass shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the enclosure for repair / replacement.

9. Serial communications - the bypass and VFD shall be capable of being monitored and or controlled via serial communications. Provide communications protocols for ModBus; Johnson Controls N2; Siemens Building Technologies FLN (P1) and BACnet in the bypass controller.

10. BACnet Serial communication bypass capabilities shall include, but not be limited to; bypass run-stop control; the ability to force the unit to bypass; and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the DDC to monitor feedback such as, bypass current (in amps), bypass kilowatt hours (resettable), bypass operating hours (resettable), and bypass logic board temperature. The DDC shall also be capable of monitoring the bypass relays output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible. The following additional bypass status indications and settings shall be transmitted over the serial communications bus - keypad "Hand" or "Auto" selected, and bypass selected. The DDC system shall also be able to monitor if the motor is running under load in both VFD and bypass (proof of flow) in the VFD mode over serial communications or Form-C relay output. A minimum of 40 field parameters shall be capable of being monitored in the bypass mode.

11. Run permissive circuit - there shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD and bypass shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD system input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.

12. The bypass control shall monitor the status of the VFD and bypass contactors and indicate when there is a welded contactor contact or open contactor coil. This failed contactor operation shall be indicated on the Bypass LCD display as well as over the serial communications protocol.

13. The bypass control shall include a programmable time delay for bypass start and keypad indication that this time delay is in process. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 -120 seconds.

14. The bypass control shall be programmable for manual or automatic transfer to bypass. The user shall be able to select via keypad programming which drive faults will generate an automatic transfer to bypass and which faults require a manual transfer to bypass.

15. There shall be an adjustable motor current sensing circuit for the bypass and VFD mode to provide proof of flow indication. The condition shall be indicated on the keypad display, transmitted over the building automation protocol and on a relay output contact closure.

16. The bypass controller shall have six programmable digital inputs, and five programmable Form-C relay outputs.

17. The relay outputs from the bypass shall programmable for any of the following indications.

    a. System started

    b. System running

    c. Bypass override enabled

    d. Drive fault

    e. Bypass fault

    f. Bypass H-O-A position

    g. Motor proof of flow (broken belt)

    h. Overload

    i. Bypass selected

    j. Bypass run

    k. System started (damper opening)

    l. Bypass alarm

    m. Over temperature

18. The digital inputs for the system shall accept 24VAC or 24VDC. The bypass shall incorporate internally sourced power supply and not require an external control power source. The bypass power board shall supply 250 ma of 24 VDC for use by others to power external devices.

19. Customer Interlock Terminal Strip - provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in VFD or Bypass mode. The remote start/stop contact shall operate in VFD and bypass modes. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.

20. The user shall be able to select the text to be displayed on the keypad when the safety opens. Example text display indications include "Firestat", "Freezestat", "Over pressure" and "Low pressure". The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.

21. Class 10, 20, or 30 (selectable) electronic motor overload protection shall be included.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the owners' representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.2 INSTALLATION (GENERAL)

A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.3 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3'-0" clear access space in front of units where not subject to excessive vibration. Obtain approval on locations from owner's representative prior to installation.

B. Install software in controlunits and in operator workstation. Implement features of programs to specified requirements and appropriate to sequence of operations.

C. Install with 120 volt alternating current, 15 amp dedicated circuit to each programmable control unit or local UPS provided by ATC.

D. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

E. Identify all equipment and panels. Provide permanently mounted tags for all panels.

F. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections-sized to suit pipe diameter without restricting flow.

3.4 INTERLOCKING AND CONTROL WIRING

A. Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 26 and all national, state and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for all control components from nearest BMS electrical power junction box. Refer to division 26 for the BMS electrical power junction box. All BMS electrical power junction boxes are on emergency power. BMS junction box will contain (1) 120V, 20A circuit. BMS Contractor to extend circuit as necessary to complete BMS work. BMS contractor is responsible for 120V wiring connections for BMS work including but not limited to transformers, wiring, conduit, junction boxes, identification etc as specified in division 26 for a complete operating BMS system. Limit five (5) VAV controllers per transformer.

F. All control wiring in the mechanical, electrical, telephone and boiler rooms to be installed in raceways. All other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit).

3.5 DDC OBJECT TYPE SUMMARY

A. Provide all database generation.

B. Displays

1. System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the owner. Provide outside air temperature indication on all system displays associated with economizer cycles.

C. Run Time Totalization

1. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, hot water and chilled water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.

D. Trendlog

1. All binary and analog object types (including zones) shall have the capability to be automatically trended.

E. Alarm

1. All analog inputs (High/Low Limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per owner's requirements.

F. Database Save

1. Provide back-up database for all stand-alone Programmable controllers on disk.

3.6 FIELD SERVICES

A. Prepare and start logic control system under provisions of this section.

B. Start-up and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

C. Provide the capability for off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download. Owner shall provide phone line for this service for 1 year or as specified.

D. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.7 AS BUILT DOCUMENTATION REQUIRED

A. Refer to 23 05 00 HVAC General Conditions.

3.8 TRAINING

A. Provide application engineer to instruct owner in operation of systems and equipment.

B. Provide system operator's training to include (but not limited to) such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of 3 persons.

C. Provide on-site training above as required, up to 20 hours as part of this contract.

D. Refer to Section 01 91 00 - General Commissioning Requirements for additional training requirements.

3.9 COORDINATION MEETING

A. Division 23 900 shall coordinate a meeting with the groups listed below prior to the ATS submittal. This meeting shall be arranged by the Division 23 900. The purpose of the meeting is to coordinate integrate the equipment controls with temperature controls. A manufacturer's representative must participate in such meeting and should be accomplished along with meeting minutes prior to ATC submittal.

1. A meeting between Division 23 900 and the approved DOA and RTU equipment representative.

2. A meeting between division 23 900 and the approved VRF or VRV equipment representative

3. A meeting between division 23 900 and the approved boiler representative

3.10 DEMONSTRATION

A. Provide systems demonstration at the Owner's location under provisions of Section 01 90 00 - General Commissionig Requirements.

B. Demonstrate complete operating system to owner's representative.

C. Provide certificate stating that control system has been tested and adjusted for proper operation.

END OF SECTION 230923

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SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:

1. General
2. Refrigerator & Freezer Monitoring
3. Domestic Hot Water System
4. Ejector Pit System
5. Boiler Room Exhaust Fan and Outdoor Air Louver
6. Kitchen Hood Exhaust Fans
7. Ceiling Fans
8. Boiler Plant
9. Single Zone Constant Volume Dedicated Outdoor Air System Unit with Energy Recovery
10. Single Zone Variable Volume Rooftop Unit with Perimeter Radiation
11. Single Zone Variable Volume Rooftop Unit with Exhaust Fan Interlock
12. Split System Heat Pump Units
13. Variable Refrigerant Flow Heat Pump Units with Perimeter Radiation
14. Unit Heaters and Cabinet Unit Heaters
15. Fin Tube Radiation
16. Energy Meters
17. Generator and Transfer Switch

1.3 CONTROLS ELECTRICAL POWER

A. 120V and low voltage power for controls shall be installed by the Temperature Controls Contractor.

1.4 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. An instrumentation list for each controlled system. Label each element of the controlled system in table format. Show, in the table element name, type of device, manufacturer, model number, and control device product data sheet number.

2. A complete description of the operation of the control system, including sequences of operation. Include and reference a schematic diagram of the controlled system.

C. Shop Drawings:

1. Riser diagrams showing control network layout, communication protocol, and wire types.

2. Schematic diagram of each controlled system. Include all control points labeled with point names shown or listed. Show the location of control elements in the system.

3. Wiring diagram for each controlled system. Show all control elements labels. Where a control element is the same as that shown on the control system schematic, label with the same name. Label all terminals.

4. Draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

5. Coordinate submittals with information requested in Section 23 09 13

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Unless noted otherwise herein, all control functions described in this sequence of operation shall be accomplished by the Building Automation System (BAS), and all equipment shall be started, stopped and positioned (if a modulating device) by the BAS. All hardware necessary to accomplish the control functions shall be provided by the contractor, unless noted otherwise. The contractor shall coordinate the quantity of required final drive devices (damper motors, control valves, etc.) and sensors with the mechanical equipment vendor’s products.

B. All setpoints described in this sequence of operation shall be fully adjustable throughout the entire range of the sensors being used to measure the variable being controlled. All controlled variables identified in the following sequence of operation shall be maintained at setpoint using proportional-integral control algorithms, in order to ensure that no error exists between the controlled variable and its setpoint at steady-state conditions. Proportional-integral-derivative algorithms shall be used if the process so warrants, at the discretion of the control software programmer.

C. Alarms will be set up initially by the BAS contractor. The system will be capable of unlimited alarms, but the selected alarms will not be the left for the customer to set. Any alarms that the customer requests to be set up will be done by the Contractor at no additional charge.

D. Trending. At a minimum, all points of physical control shall be trended and stored for a minimum of one (1) year. Digital points shall be trended on change of value. Analog points shall be trended in 15-minute intervals.

E. The contractor shall provide all necessary points and sensors for monitoring and controlling the sequence of operations as well as all points shown on the DDC schematics in the contract documents.

F. All points shall be alarmed at the DDC workstation if found to be deviating from their normal operating conditions.

G. The Building Automation System (BAS) or direct digital controls (DDC) or Building Management System (BMS) are used interchangeably and share the same meaning.

H. The boiler plant and heating system shall only be enabled when the system is indexed to heating mode, which shall occur when outside air temperature is equal to or below 64F.

I. Temperature Sensors

1. Where temperature ranges, reset temperatures, setback temperatures, setup temperatures, dead-bands, override times, etc. are indicated, those values shall be adjustable both globally and locally.

J. The operator station software configuration shall allow the Owner to easily select the occupied and unoccupied hours by individual zone or by the global air hander or space category.

K. Unless otherwise noted, provide each space temperature sensor with LCD temperature display, unoccupied over-ride and local temperature adjustment. BAS shall provide upper and lower temperature adjustability limits.

L. Where sensors are indicated on the plans, provide utility rooms and janitor closet zones with a temperature sensor mounted behind a stainless-steel cover plate.

M. Water pressure transmitter shall be installed 2/3 of the distance in the effectively longest pipe run downstream from the pump.

N. Static pressure transmitters shall be installed 2/3 of the distance in the effectively longest duct run downstream from the supply fan.

O. A unique schedule shall be provided for each piece of equipment controlled by the BAS. Applying a single schedule to multiple pieces of equipment is not permissible.

P. All motorized damper positions shall be monitored.

1. Two position dampers will be monitored by end switches, and modulating dampers will be monitored utilizing damper actuator feedback.

2. Modulating valves shall be monitored for valve position utilizing valve actuator position feedback hard wired to the DDC field controller.

Q. Variable Frequency Drives: BAS shall control start/stop of each VFD and shall monitor the run contact at the VFD. If the VFD is not running when it is commanded to, an alarm shall be activated at the operator workstation. BAS shall control speed of each VFD.

R. Electronically Commutated Motors: BAS shall control start/stop of each ECM and shall monitor the run contact at the motor. If the ECM is not running when it is commanded to, an alarm shall be activated at the operator workstation. Where the sequence of operation calls for variable speed operation, the BAS shall control speed of each ECM.

S. Alarm Contacts: BAS shall monitor alarm contacts as shown on the drawings. If a device is in alarm mode, an alarm shall be activated at the central PC.

T. Fire Alarm: If fire alarm system is in alarm mode, BAS shall disengage controls associated with all fan systems (in addition to hard wire shutdowns). When signal is received from the fire alarm system that all alarms are “cleared”; BAS shall restart all fan system incrementally.

U. Filter Differential Pressure Transmitters: BAS shall monitor DPT’s and alarm if the differential pressure is above setpoint.

V. Carbon Dioxide at Exterior of the Building: BAS shall monitor and record carbon dioxide levels.

W. Leak Detectors: If a detector is in alarm mode, the BAS shall shut down the respect fan, AC unit, etc. and an alarm shall be activated at the central PC.

X. Provide damper actuator and valve as follows:

1. OA, MA damper actuator:

a. Furnished by AHU or RTU manufacturer:

1) Modulating control with feedback

2) Fail in last position

2. Energy wheel bypass damper actuator:

a. Furnished by AHU or RTU manufacturer

1) 2-position with end-switch built into actuator.

2) Fail in last position

3. EA damper actuator serving Exhaust fans:
    a. Furnished by contractor:
        1) 2-position with end-switch built into actuator.
        2) Fail in last position
4. Boiler isolation HW valve:
    a. Furnished by boiler manufacturer:
        1) Wired to boiler factory controller
        2) 2-position with end-switch built into actuator.
        3) Fail in last position
5. HW bypass valve:
    a. Furnished by contractor:
        1) Modulating with feedback
        2) Fail in last position
6. RTU or AHU HW coil valve:
    a. Furnished by contractor:
        1) Modulating with feedback
        2) Normally open – spring return.
7. CUH/UH HW valve:
    a. Furnished by contractor.
        1) Modulating.
        2) Normally open - spring return
8. Perimeter HW valve:
    a. Furnished by contractor.
        1) 2-position
        2) Normally open - spring return.

Y. Morning Warm-up where noted in sequence of operations

1. The HVAC equipment shall be indexed to warm-up modes via the BAS where indicated.
2. Morning warm-up shall be enabled to operate when any one of the following are true:

a. Boiler plant is enabled.

1) Any space temperature sensor is below morning warm-up set point.

b. Cooling is enabled.

1) Any space temperature sensor is above morning warm-up set point.

3. Optimal start/stop shall be programmed in for all equipment so that equipment start times are determined based on outside air conditions and system learns based on past building history.

4. The BAS shall trend the outside air temperature with respect to the warm-up start time, and shall optimize the warm-up start time such that the spaces reach occupied temperature by the time selected.

5. The associated system shall remain in the warm-up mode until the zone reaches the occupied temperature setpoint, at which point the zone shall be indexed to occupied mode.

Z. Economizer where noted in sequence of operations

1. The HVAC equipment shall be indexed to economizer modes via the BAS or the equipment manufacturer where indicated.

2. Economizer cooling shall be enabled when all of the following are true:

a. The outside air enthalpy is less than the return air enthalpy.

b. AND the outside air temperature is less than 65°F (adj.).

c. AND the outside air enthalpy is less than 22 Btu/lb (adj.).

d. AND the outside air temperature is less than the return air temperature.

3.2 REFRIGERATOR & FREEZER MONITORING

A. General:

1. All walk-in refrigerator and freezer temperatures will be monitored.

B. Alarms:

1. High Refrigerator or Freezer Temperature: If any temperatures rises above alarm setpoint for more than 5 minutes, an alarm shall be generated at the operator workstation.

3.3 DOMESTIC HOT WATER SYSTEM

A. General:

1. The domestic hot water system will be enabled /disabled based on a time of day schedule and shall be enabled during the occupied period.

2. An aquastat provided by Division 22 will start / stop the pumps

B. Domestic Hot Water Temperature:

1. Monitor the temperature of each domestic hot water heater.

C. Pump Status

1. The pump run status will be monitored.

D. Alarms:

1. Low Domestic Hot Water Temperature: If the domestic hot water temperature drops 15 degrees below setpoint, an alarm will be generated at the operator workstation.

2. Pump Failure: If the domestic hot water recirculation pump fails to start when commanded On, an alarm shall be generated.

3.4 EJECTOR PIT SYSTEM

A. General:

1. The ejector pit system shall be monitored only.

B. Pump Status

1. Pump 1 on

2. Pump 2 on

3. Both pumps off

C. Alarms:

1. High water level alarm

3.5 BOILER ROOM EXHAUST FAN AND OUTDOOR AIR LOUVER

A. Applies to EF-1 and associated louvers.

B. Run Conditions:

1. The time schedule is occupied OR

2. The boiler room temperature exceeds the cooling setpoint of 85°F (adj.) with a deadband of 5°F (adj.).

C. Fan:

1. The fan shall run anytime the schedule is occupied or the boiler room temperature exceeds the cooling setpoint unless shutdown on safeties.

D. Exhaust Air Damper:

1. The damper shall open anytime the unit runs and shall close anytime the unit stops. The exhaust air damper shall close 30 sec after the fan stops.

E. Exhaust Air Damper Status:

1. The fan shall be enabled after the damper status has proven.

F. Outdoor Air Damper:

1. The damper shall open anytime the unit runs and shall close anytime the unit stops. The outdoor air damper shall close 30 sec after the fan stops.

G. Outdoor Air Damper Status:

1. The fan shall be enabled after the damper status has proven.

H. Zone Temperature Control:

1. The controller shall measure the zone temperature.
2. When zone temperature rises above setpoint:
    a. The exhaust air and outdoor air dampers shall fully open.
    b. The fan shall run.
3. When zone temperature decreases below setpoint;
    a. The fan shall shut off.
    b. The exhaust air and outdoor air dampers shall fully close.

I. Fan Status:

1. The controller shall monitor the fan status.

J. Alarms:

1. Alarms shall be provided at the operator workstation as follows:
    a. Exhaust Air Damper Failure: Commanded open, but the status is closed.
    b. Exhaust Air Damper in Hand: Commanded closed, but the status is open.
    c. Outdoor Air Damper Failure: Commanded open, but the status is closed.
    d. Outdoor Air Damper in Hand: Commanded closed, but the status is open.
    e. Fan Failure: Commanded on, but the status is off.
    f. Fan in Hand: Commanded off, but the status is on.
    g. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit.

3.6 KITCHEN HOOD EXHAUST FANS

A. Applies to all KEF-# fans.

B. General:

1. The kitchen hood exhaust fan speeds will be controlled by the kitchen hood control panels (provided by others). The BAS contractor shall provide control wiring (0-10V) from the kitchen hood control panels to the kitchen exhaust fans.

C. Fan Status:

1. The controller shall monitor the fan status.

D. Alarms:

1. Alarms shall be provided at the operator workstation as follows:

a. Fan Failure: Commanded on, but the status is off.

b. Fan in Hand: Commanded off, but the status is on.

c. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

3.7 CEILING FANS

A. General:

1. The fans shall operate manually based on user selections at the manufacturerer furnished control panel.

B. Fan Status:

1. The controller shall monitor fan run status via a current sensing relay.

3.8 BOILER PLANT

A. Hydronic Heating Boilers

1. The hydronic gas-fired boiler/burner units shall be controlled by a microprocessor based pre-engineered and programmed control system furnished by the boiler manufacturer. The Building Automation System will communicate with boiler provided controls. All boiler/burner control wiring from burner control panels to multiple boiler control system shall be provided by the Automatic Temperature Control Contractor per manufacturer's instructions. The factory boiler control system shall be furnished with supply water temperature sensor, outdoor air sensors, and automatic isolation valve (provided by the BAS contractor) will be wired directly to the factory panel by the BAS Contractor.

2. The boiler primary pumps shall operate when the associated boiler is enabled. Each boiler’s integral controller shall enable/disable it’s associated primary pump and modulate the pump’s speed to maintain the hot water return temperature setpoint.

3. The boiler controller shall be set to achieve supply water temperature reset indicated below while optimizing the energy consumption of the plant. The boiler controller shall initiate respective boiler automatic isolation valve prior to firing respective boiler.

4. The BAS shall monitor the boilers via BACnet, but as a minimum interface must allow the user to view all operating points, firing rates, energy consumptions, etc.

5. The boiler system shall be enabled when the system pumps are on and the system is in heating mode. In general, the boiler plant shall be enabled at outdoor temperatures below 65°F (adj.). BAS unit controller to operate if all of the following devices are not activated.

   a. Internal safety devices.

   b. Low flow.

6. The factory boiler control system shall modulate as required to maintain supply water temperature. Based on the following outdoor air schedule, the hot water supply temperature shall be reset. The reset schedule range shall be linear.

O.A. TEMP.	SUPPLY TEMP.
10°F	140°F
60°F	110°F

7. Provide two (2) remote shutoff switches for the boiler room. One (1) switch shall be located just outside the interior door to the boiler room. The switch must be located in a break glass or equal tamper resistant enclosure properly labeled. The second switch should be located just inside the boiler room exterior door properly labeled as to its service. Switches must be wired and programmed so that when either switch is placed in the off position a disable signal shall be immediately sent to all the heating boilers and domestic hot water heaters.

B. Hot Water Secondary Variable Pumping System

1. Pumps and boiler system shall be enabled by the BAS whenever:

   a. A definable number of hot water coils need heating.

   b. AND the outside air temperature is less than 65°F (adj.).

2. Lead Lag Control:

   a. The lead pump shall be selected based on lowest cumulative run time.

   b. Upon failure of the lead pump or failure of the drive it shall shut down and the lag pump shall start automatically.

3. When the boiler system is enabled, the pumps shall be enabled as follows:

   a. Start the hot water pumps. The controller shall monitor pump status.

b. The pumps shall slowly ramp up and down in speed to maintain system pressure control setpoint. As the system pressure drop increases, the BAS will command the hot water pumps VFD to decrease its output. As the system pressure drop decreases, the BAS will command the hot water pump VFD to increase its output. VFD output will be monitored by the BAS.

C. Hot Water Static Pressure Reset

1. The static pressure setpoint shall be reset based upon the position of the zone valves, with a goal of reducing the pressure until at least one modulating valve is nearly fully open.

a. The pressure setpoint shall initially be equal to the design pressure setpoint for the system as determined by the TAB Contractor.

b. If no valve is open to 90% or greater, the pressure setpoint shall be incrementally decreased until one modulating valve is 95% open.

c. When more than one valve is open to 90% or greater, the pressure setpoint shall be incrementally increased until one control valve is 95% open. The pressure setpoint shall not exceed the design pressure setpoint.

D. Hot Water Bypass Valve

1. When the operating secondary pump VFD is at minimum operating speed and the system differential pressure continues to rise above setpoint, the system bypass valve shall modulate open to maintain the supply and return differential pressure at setpoint. ATC shall be provided with the minimum operating speed of thirty-five percent (35%) for the hot water pumps. Refer to location on Mechanical Drawings.

E. Glycol Fill Station

1. BAS shall monitor the glycol fill station alarm contacts.

F. Glycol Concentration

1. The BAS shall monitor the system’s glycol concentration.

G. Limits and Alarms:

1. Boiler Failure: If boiler enable status does not match command, alarm shall be generated at the operator workstation.

2. Boiler Fault: Boiler fault code input from Boiler BACnet interface. Alarm shall be generated at operator work station. Alarm shall identify code and brief verbal description.

3. Lead Pump Failure: If the lead pump status does not match the commanded value, the lead pump shall be commanded off, and the lag pump shall be commanded on and an alarm shall be generated at the Operator Workstation.

4. Standby Pump Failure: If the standby pump status does not match the commanded value, an alarm shall be generated at the Operator Workstation, the standby pump shall be commanded off, and the lead pump shall be commanded on.

5. Pump VFD Fault: BAS shall monitor VFD fault. Provide alarm at operator workstation in fault condition.

6. Secondary Pump Pressure: BAS shall monitor secondary pumping system operating pressure. If pressure does not match command, alarm shall be generated at the operator workstation.

7. Low or High Hot Water Supply Temperature: If hot water supply temperature does not match setpoint for a predetermined time period, an alarm shall be generated at the operator workstation.

8. Bypass Valve Failure: BAS shall monitor bypass valve feedback position. Provide alarm if command does not match position.

9. Glycol Fill Station Alarm.

10. Glycol Fill Station Low level.

11. Glycol Fill Station High level.

12. High or Low Glycol Concentration: If glycol percentage does not match setpoint, alarm shall be generated at the Operator Workstation.

3.9 SINGLE ZONE CONSTANT VOLUME DEDICATED OUTDOOR AIR SYSTEM UNITS WITH ENERGY RECOVERY

A. This sequence applies to the following rooftop air handling units:

1. DOAS-1 THROUGH DOAS-6

B. General:

1. BAS shall command the unit into unoccupied mode or occupied mode based on scheduling. The unit shall be prohibited from operating in any mode if any of the following safety devices are activated.

a. Internal safety devices.

b. Fire Alarm Control Panel.

c. Low temperature limit.

2. Only one operational mode shall be active at any time. Mode selection shall follow the hierarchy: Safety Shutdown → Dehumidification → Occupied → Unoccupied.

3. The packaged rooftop unit will be furnished without DDC controls. The BAS contractor shall be responsible for providing all DDC controls on the rooftop air handling unit. The BAS contractor shall provide and field mount all controllers and end-devices unless otherwise noted.

    a. Control dampers and actuators are provided with unit. BAS contractor to wire actuators.

    b. Airflow station provided by BAS contractor. Airflow reading monitored at operation's work station.

    c. All fans and compressors shall require proof of operation via status feedback before associated downstream devices are enabled. Failure to prove operation within 30 seconds shall generate an alarm and inhibit dependent equipment.

C. Return Air Smoke Detection:

1. When a return air duct smoke detector is in alarm mode, the fire alarm system shall be notified, the unit shall shutdown, the respective fans shall be de-energized, and an alarm shall be activated at the Operator Workstation.

D. Supply Air Smoke Detection:

1. When a supply air duct smoke detector is in alarm mode, the fire alarm system shall be notified, the unit shall shutdown, the respective fans shall be de-energized, and an alarm shall be activated at the Operator Workstation.

E. Heating Control:

1. Whenever the heating is enabled and the discharge air temperature is below setpoint.

    a. The supply air fan shall operate continuously.

    b. The DX heat pump will be used as the first stage of heating.

        1) Initiate DX compressor(s) and reversing valve.

        2) Modulating compressors shall operate as the first heating stage.

        3) If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint.

        4) Compressors, once enabled will be on until the minimum run time has elapsed.

        5) Compressor shall not operate if the supply air fan current relay is not activated or low temperature lockout is activated or compressor high pressure is activated.

        6) Roof top equipment manufacturer shall take control of the condenser fan operation.

7) If discharge air temperature cannot be maintained with both compressors operating at maximum capacity, the hot water heating coil shall be enabled.

c. The hot water heating coil will be used as the second stage of heating.

1) The hot water coil valve shall modulate to maintain discharge air temperature setpoint.

2) The hot water heating coil shall be enabled only when the DX heat pump alone cannot maintain discharge air temperature setpoint. When both systems are active, DX heating shall operate at maximum available capacity and hot water heating shall provide only supplemental trim heat.

F. Cooling Control:

1. Whenever cooling is enabled and discharge air temperature is above setpoint:

a. The supply air fan shall operate continuously.

b. DX cooling shall provide all cooling capacity and shall modulate to maintain discharge air temperature setpoint.

1) Initiate DX compressor(s).

2) Modulating compressors shall operate as the first cooling stage.

3) If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint.

4) Compressors, once enabled will be on until the minimum run time has elapsed.

5) Compressor shall not operate if supply air fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated.

6) Enabled compressors will not be allowed to deactivate until the minimum run time has elapsed.

7) Rooftop equipment manufacturer shall take control of the condenser fan operation.

G. Discharge Air Temperature Control:

1. During occupied operation, the DOAS unit shall maintain a neutral discharge air temperature setpoint. The active discharge air temperature setpoint shall be as follows:

a. 72°F (adj) whenever heating mode is enabled.

b. 68°F (adj) whenever cooling mode or dehumidification mode is enabled.

2. The discharge air temperature setpoint shall not reset based on zone temperature or outdoor air temperature.

3. During dehumidification operation, the cooling coil and hot gas reheat sequence shall operate as required to maintain humidity control while maintaining the active discharge air temperature setpoint.

H. Supply Air Fan Control:

1. Supply air fan shall operate at a constant airflow setpoint as determined by test and balance, maintained via VFD or ECM control.

I. Exhaust Fan Control:

1. Exhaust fan shall operate at a constant airflow setpoint as determined by test and balance, maintained via VFD or ECM control.

J. Energy Recovery Wheel:

1. Energy recovery wheel operation shall be based on enthalpy differential between outdoor and return air, subject to supply air dew point protection limits.

2. When the unit is in occupied mode, the controller shall run the energy recovery wheel for energy recovery as follows.

3. Cooling Mode:

a. The energy recovery wheel shall run for full cool recovery (hot humid days) whenever:

1) The outside air enthalpy is greater than the return air enthalpy.

2) AND the supply air fan is on.

b. The energy recovery wheel shall run for partial cool recovery (hot dry days) whenever:

1) The outside air humidity ratio is less than the return air humidity ratio

2) AND the outside air dry-bulb temperature is greater than the return air dry-bulb temperature

3) AND the unit supply air dry-bulb does not drop below the energy recovery wheel supply air dewpoint

4) AND the supply air fan is on

4. Heating Mode:

a. The energy recovery wheel shall run for full heat recovery whenever:

1) Outside air enthalpy is less than return air enthalpy

2) AND the outside air temperature is less than the return air temperature

3) AND the supply air fan is on.

b. Periodic Self-Cleaning:

1) The energy recovery wheel shall run for 10sec every 4hr the unit runs.

c. Defrost Control:

1) When differential pressure across the energy recovery wheel exceeds the manufacturer's recommended limit, the wheel shall be disabled and placed into defrost mode.

2) During defrost mode, outdoor air and exhaust air bypass dampers shall fully open to maintain ventilation airflow.

3) The wheel shall intermittently rotate ("jog mode") to remove frost accumulation.

4) Defrost mode shall continue until differential pressure returns to normal operating range, at which point normal operation shall resume automatically.

K. Dehumidification Control:

1. Dehumidification mode shall have highest HVAC operational priority after safety interlocks.

2. When discharge dew point temperature rises above setpoint, dehumidification mode shall be enabled and shall override cooling and heating control sequences.

3. During dehumidification, DX compressors shall operate as required to maintain latent capacity.

4. Hot gas reheat shall modulate to maintain discharge air temperature setpoint while compressors maintain dehumidification demand.

5. Normal cooling and heating sequences shall be suspended during active dehumidification mode.

L. Minimum Outside Air Ventilation:

1. During occupied mode, the unit shall operate as a dedicated outdoor air system (DOAS) and shall deliver 100% outdoor air at design airflow. Recirculation air dampers shall remain fully closed and shall not be enabled during occupied operation.

M. Unoccupied Mode:

1. Fan Control:

a. The supply and exhaust fans will be off unless one of the associated zones calls for dehumidification.

b. If the zone is set into Occupied mode by an Override, then the fans will operate as in "Occupied" mode.

c. To avoid fan on-off short cycling, the fan shall remain off for a predetermined time period.

2. Outside air damper shall be fully closed.
3. Exhaust air damper shall be fully closed.
4. Recirculation damper shall be fully open.
5. Supply air energy recovery wheel bypass damper shall be fully open.
6. Exhaust air energy recovery wheel bypass damper shall be fully open.
7. Energy recovery wheel shall be off.
8. During unoccupied dehumidification mode:
    a. The supply fan shall cycle ON as required to maintain space dew point setpoint.
    b. Outdoor air and exhaust air dampers shall remain fully closed, and the unit shall operate in a closed-loop recirculation mode.
    c. The energy recovery wheel shall remain OFF during unoccupied operation.
    d. DX compressors and hot gas reheat shall modulate to maintain a discharge air temperature setpoint of 68°F while maintaining humidity control.

N. Occupied Mode:

1. The supply and exhaust air fans shall operate continuously at design airflow rates as determined by test and balance.
2. The unit shall operate as a dedicated outdoor air system (DOAS) and shall deliver 100% outdoor air. Outdoor air dampers and exhaust air dampers shall be fully open. Recirculation dampers shall remain fully closed.
3. The energy recovery wheel shall operate continuously unless disabled by frost protection, defrost mode, or fault condition.
4. The DOAS unit shall condition outdoor air to maintain the discharge air temperature setpoint prior to delivery to the space. The unit shall not respond to zone heating or cooling requests.

O. Outdoor Air Temperature:

1. The controller shall monitor the outdoor air temperature and use as required for discharge air temperature setpoint reset, and energy recovery wheel control.

P. Outdoor Air Humidity:

1. The controller shall monitor the outdoor air humidity and use as required for energy recovery wheel control.

Q. Return Air Temperature:

1. The controller shall monitor the return air temperature and use as required for energy recovery wheel control.

R. Return Air Humidity:

1. The controller shall monitor the return air humidity and use as required for energy recovery wheel control, and dehumidification control.

S. Discharge Air Temperature:

1. The controller shall monitor the discharge air temperature.

T. Filter Differential Pressure Monitor:

1. The controller shall monitor the differential pressure across the filter.

U. Freeze Protection:

1. The unit shall monitor the freezestat status.

2. If a freezestat trips, the hot water valve at the respective unit shall be fully open, fans shall stop, outside air damper shall be fully closed, recirculation damper shall be fully open. The energy recovery wheel shall stop. Outdoor air and exhaust air wheel bypass dampers shall open fully and an alarm shall be activated at the Operator Workstation.

V. Alarm Conditions

1. Alarms shall be provided at the operator workstation as follows:

a. DX Cooling Failure: Discharge air temperature after the DX coil does not match setpoint.

b. Compressor Failure: Compressor operating status does not match command. An alarm shall be issued to operating work station and mechanical cooling shall be locked out.

c. Supply Air Fan Failure: Fan has been signaled to start and feedback from respective relay or VFD or ECM does not indicate the fan has started after 30 seconds.

d. Supply Air Fan VFD or ECM Fault.

e. Supply Air Fan in Hand: Fan status is detected while the fan is turned off.

f. Exhaust Fan Failure: Fan has been signaled to start and feedback from respective relay or VFD or ECM does not indicate the fan has started after 30 seconds.

g. Exhaust Fan in Hand: Fan status is detected while the fan is turned off.

h. Exhaust Fan VFD or ECM Fault.

i. Recirculation damper Failure: The damper is not in its commanded position by +/- 20%.

j. Outdoor Air Damper Failure: The damper is not in its commanded position by +/- 20%.

k. Exhaust Air Damper Failure: The damper is not in its commanded position by +/- 20%.

l. Energy Recovery Wheel Failure: Wheel rotation status does not match commanded status for more than 60 seconds.

m. Energy Recovery Wheel Performance Fault: Enthalpy effectiveness remains below acceptable threshold for more than 30 minutes of operation.

n. Outdoor Air Enthalpy Sensor Failure: Sensor reading is invalid or out of range for more than 5 minutes.

o. Supply Air Wheel Bypass Damper Failure: The damper is not in its commanded position by +/- 20%.

p. Exhaust Air Wheel Bypass Damper Failure: The damper is not in its commanded position by +/- 20%.

q. High Discharge Dew Point: If the discharge air dew point temperature remains above setpoint for more than 15 minutes while dehumidification is active.

r. High Discharge Air Temperature: The discharge air temperature remains higher than 120°F with a hysteresis of 5°F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

s. Low Discharge Air Temperature: Discharge air temperature remains lower than 45°F with a hysteresis of 5°F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

t. High Return Air Temp: If the return air temperature is greater than 90°F.

u. Low Return Air Temp: If the return air temperature is less than 45°F.

v. High Return Air Humidity: If the return air humidity is greater than 70%.

w. Filter Change Required: Filter differential pressure exceeds 1 in. W.C.

3.10 SINGLE ZONE VARIABLE VOLUME ROOFTOP UNIT WITH PERIMETER RADIATION

A. This sequence applies to the following rooftop air handling units:

1. RTU-1

2. RTU-2

B. General:

1. BAS shall command zone into morning warmup mode, unoccupied mode, occupied mode and demand control ventilation mode if any of the following devices are not activated.

a. Internal safety devices.

b. Fire Alarm Control Panel.

c. Low temperature limit.

2. Zone consists of the following:

a. Roof top air handling unit control.

b. Perimeter heat control. (RTU-2 only).

c. Demand control ventilation.

3. The packaged rooftop unit will be furnished without DDC controls. The BAS contractor shall be responsible for providing all DDC controls on the rooftop air handling unit. The BAS contractor shall provide and field mount all controllers and end-devices unless otherwise noted.

a. Control dampers and actuators are provided with unit. BAS contractor to wire actuators.

b. Airflow station provided by BAS contractor. Airflow reading monitored at operation's work station.

4. The unit shall run according to a user definable time schedule in the following modes:

a. Occupied Mode: The unit shall maintain:

1) A 75°F cooling setpoint

2) A 70°F heating setpoint.

b. Unoccupied Mode (night setback): The unit shall maintain:

1) An 85°F cooling setpoint.

2) A 55°F heating setpoint.

5. The BAS shall prioritize unit operating modes in the following order:

a. Safety Shutdown → Dehumidification → Occupied → Unoccupied.

6. Ventilation control, demand control ventilation, economizer operation, supply fan reset, and relief fan control may operate simultaneously as required to maintain space conditions.

C. Emergency Generator Cooling Lockout:

1. The RTU shall be furnished with an integral relay to lock out the DX cooling system, including all condenser fans and compressors, upon activation.

2. The controller shall monitor the transfer switch status and disable DX cooling upon transfer of the building to generator power.

D. Zone Setpoint Adjust:

1. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.

E. Zone Optimal Start:

1. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

F. Zone Unoccupied Override:

1. A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.

G. Return Air Smoke Detection:

1. When a return air duct smoke detector is in alarm mode, the fire alarm system shall be notified, the unit shall shutdown, the respective fans shall be de-energized, and an alarm shall be activated at the Operator Workstation.

H. Supply Air Smoke Detection:

1. When a supply air duct smoke detector is in alarm mode, the fire alarm system shall be notified, the unit shall shutdown, the respective fans shall be de-energized, and an alarm shall be activated at the Operator Workstation.

I. Single Zone VAV Control:

1. In zones with multiple sensors, the user will be able to select an individual sensor or highest/lowest/average to control the zone. By default, the zone shall be controlled by an average of the sensors if a selection is not made.

2. Whenever heating mode is enabled and the zone temperature is below setpoint:

a. The supply fan shall operate continuously.

b. The DX heat pump will be used as the first stage of heating.

1) Initiate DX compressor(s) and reversing valve.

2) Modulating compressors shall operate as the first heating stage.

3) If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint.

4) Compressors, once enabled will be on until the minimum run time has elapsed.

5) Compressor shall not operate if supply fan current relay is not activated or low temperature lockout is activated or compressor high pressure is activated.

6) Roof top equipment manufacture shall take control of the condenser fan operation.

c. The hot water heating coil will be used as the second stage of heating. The coil valve shall modulate to maintain discharge air temperature setpoint.

d. The DX heat pump shall be allowed to operate simultaneously with the heating coil. During simultaneous operation, the heat pump shall operate at full capacity, and the hot water heating coil valve shall modulate to maintain the discharge air temperature setpoint.

e. A heating PID loop will first reset the supply air setpoint. Once the setpoint has reached its highest limit, then the supply fans speed will be reset from its minimum to its maximum speed as determined by the balancer.

1) The reset values will be 65-85 degrees for heating.

2) All reset schedules will be fully adjustable.

3. Whenever cooling mode is enabled and zone temperature is above cooling setpoint:

a. The supply fan shall operate continuously.

b. Economizer will be used as the first stage of cooling if available. In economizer mode if the outside air dampers are at 100% open, then the DX cooling will be enabled to modulate, and the dampers will remain at 100% until the DX cooling is off.

c. DX cooling will be used as the second stage of cooling.

1) Initiate DX compressor(s).

2) Modulating compressors shall operate as the first cooling stage.

3) If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint.

4) Compressors, once enabled will be on until the minimum run time has elapsed.

5) Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated.

6) Enabled compressors will not be allowed to deactivate until the minimum run time has elapsed.

7) Roof top equipment manufacture shall take control of the condenser fan operation.

d. A cooling PID loop will first reset the air handlers supply air setpoint. Once the setpoint has reached its lowest limit, then the supply fan speed will be reset from its minimum to its maximum speed as determined by the balancer.

1) The reset values for cooling will be 55-65 degrees.

2) All reset schedules will be fully adjustable.

4. The DX cooling, DX heat pump, hot water valve and economizer dampers will modulate without overlap to maintain the supply air setpoint.

J. Relief Fan Building Static Pressure Control:

1. The relief fan shall be enabled when all the following conditions are met, and disabled otherwise:

a. Building static pressure is above setpoint.

b. AND the supply fan is proven on.

c. AND the relief damper has proven open.

d. AND the outdoor air damper has proven open.

2. The relief fan speed shall modulate to maintain the building static pressure setpoint of 0.05 in W.C. As the building static pressure increases, the controller will command the fan VFD or ECM to increase its output. As the building static pressure decreases, the controller will command the fan VFD or ECM to decrease its output. VFD or ECM output will be monitored by the BAS. The fan speed shall increase as static pressure rises above setpoint. The fan speed shall not drop below 30%.

K. Unoccupied and Morning Warm-up Control:

1. Unoccupied damper actuator control:

a. Outside air damper shall be fully closed.

b. Relief air damper shall be fully closed.

c. Mixed air damper shall be fully opened.

d. Supply fan shall be off unless unoccupied heating mode or unoccupied cooling mode is activated.

e. Relief fan shall be off.

2. Unoccupied Heating Mode Control:

a. BAS shall enable unoccupied heating mode when the unit is scheduled accordingly.

b. When zone temperature decreases below setpoint, BAS shall command the following control sequence.

1) Stage 1 Heating:

(a) Cycle perimeter heat valve to maintain zone temperature set point.

2) Stage 2 Heating:

(a) Supply fan speed shall be set to the minimum speed as determined by the balancer.

(b) The supply fan speed, DX heat pump, and hot water heating coil valve shall modulate in accordance with the Single Zone VAV Control to maintain the discharge air temperature setpoint.

3. Morning Warm-Up Mode Control:

a. BAS shall enable morning warm-up heating mode when the unit is scheduled accordingly.

b. When zone temperature decreases below setpoint, BAS shall command the following control sequence.

1) Stage 1

(a) Cycle perimeter heat valve open to maintain zone temperature set point.

2) Stage 2

(a) Supply fan speed shall be set to the maximum speed as determined by the balancer.

(b) The DX heat pump and hot water heating coil valve shall modulate in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

4. Unoccupied Cooling Mode Control:

a. BAS shall enable unoccupied cooling mode when the unit is scheduled accordingly, and DX cooling is enabled or outdoor air temperature is consistent with economizer operations.

b. When zone temperature increases above setpoint, BAS shall command the following control sequence.

1) Supply fan shall start.

2) DX cooling and supply fan speed shall modulate in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

L. Occupied Control:

1. Occupied damper actuator control:

a. Outside air damper and mixed air damper shall modulate to maintain the minimum outdoor airflow rate, as calculated by the outdoor airflow measuring station.

b. Relief air damper shall fully open.

2. Occupied Fan Control:

a. Supply fan speed shall modulate the supply fan between minimum and maximum predetermined setpoints in accordance with the Single Zone VAV Control sequence to maintain zone temperature set point.

b. Relief fan speed shall modulate to the predetermined speed setpoint. Reset fan speed as required to maintain the building static pressure setpoint.

c. Predetermined fan speed shall be determined by TAB contractor.

3. Occupied Heating Mode Control:

a. BAS shall enable occupied heating mode when the unit is scheduled accordingly and DX heating is available, or the heating plant is enabled.

b. When zone temperature decreases below setpoint,

1) Cycle perimeter heat valve open to maintain zone temperature set point.

2) The supply fan speed, DX heat pump, and hot water heating coil valve will modulate in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

4. Occupied Cooling Mode Control:

a. BAS shall enable occupied cooling mode when the unit is scheduled accordingly and the DX cooling is available.

b. When zone temperature increases above setpoint, the BAS shall command the following control sequence.

1) Economizer cooling mode: When all of the outdoor air conditions are true as stated in the economizer cooling description section, Economizer cooling shall be enabled.

2) When zone temperature increases above setpoint and economizer mode is enabled, BAS shall command the following control sequence.

(a) Modulate supply fan speed and reset discharge air temperature in accordance with the Single Zone VAV Control sequence.

(b) Relief air damper shall fully open.

(c) Modulate outdoor air damper and mixed air damper as required to maintain discharge air temperature set point.

(d) Modulate relief fan to maintain the building static pressure setpoint.

3) Mechanical cooling mode: When any of the outdoor air conditions are not true as stated in the economizer cooling description section, Mechanical cooling shall be enabled.

4) When zone temperature increases above setpoint and mechanical mode is enabled, BAS shall command the following control sequence.

(a) Reset air dampers to normal operating mode.

(b) Modulate supply fan speed and DX cooling in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

5. Occupied Dehumidification Mode Control:

a. BAS shall enable occupied dehumidification mode when all of the following are true:

1) DX cooling is available.

2) Cooling control sequence is not enabled.

3) When zone relative humidity increases above setpoint,

b. When dehumidification mode is enabled and outdoor dewpoint is less than zone dewpoint setpoint, BAS shall command the following control sequence.

1) The supply fan speed shall be set to the minimum airflow rate setpoint.

2) Relief air damper shall fully open.

3) Modulate outdoor air damper and mixed air damper as required to maintain discharge air dewpoint temperature set point located after the cooling coil.

4) DX cooling and hot gas reheat control valve shall modulate as required to maintain discharge air temperature setpoint.

c. When dehumidification mode is enabled and outdoor dewpoint is greater than zone dewpoint setpoint, the BAS shall command the following control sequence.

1) The supply fan speed shall be set to the minimum airflow rate setpoint.

2) Command relief air damper, OA damper and mixed air damper to operate at minimum ventilation airflow rate.

3) Modulate DX cooling as required to maintain discharge air dewpoint temperature set point located after the cooling coil.

4) DX cooling and hot gas reheat valve shall modulate as required to maintain discharge air temperature setpoint.

6. Economizer Control:

a. The economizer sequence shall be enabled whenever all of the following conditions are true:

1) The unit is operating in occupied cooling mode.

2) Outdoor air temperature is less than return air temperature.

3) Outdoor air temperature is less than the adjustable economizer high limit setpoint, initially set to 65°F adjustable.

4) The freezestat is normal.

5) Outdoor air humidity is below the adjustable high humidity or dewpoint limit if applicable.

b. When economizer mode is enabled, the outdoor air damper and mixed air damper shall modulate to maintain the discharge air temperature setpoint.

c. The outdoor air damper shall modulate between minimum outdoor airflow position and 100% open as required to maintain the discharge air temperature setpoint.

d. If the outdoor air damper reaches 100% open position and the discharge air temperature remains above setpoint, mechanical cooling shall be enabled and modulated as required to maintain the discharge air temperature setpoint.

e. When economizer mode is disabled, the outdoor air damper shall return to the minimum ventilation position required to maintain the minimum outdoor airflow setpoint.

f. The relief fan shall modulate as required to maintain building static pressure during economizer operation.

g. All economizer enable limits and lockout setpoints shall be fully adjustable through the BAS.

7. Demand Control Ventilation

a. BAS shall enable demand control ventilation (DCV) during occupied mode. DCV shall be locked out from operating when economizer cooling is enabled or the monitored exhaust fan is on. DCV shall be allowed to operate simultaneously with cooling and heating control sequence.

b. When zone CO2 level increases above setpoint, BAS shall command the following control sequence:

1) Relief air damper shall fully open.

2) Modulate outdoor air damper and mixed air damper as required to maintain zone CO2 setpoint. The outdoor airflow rate shall not drop below the design DCV minimum outdoor airflow rate.

3) Modulate relief fan to maintain the building static pressure setpoint.

M. Mixed Air Temperature:

1. The controller shall monitor the mixed air temperature and use as required for economizer control.

N. Return Air Humidity:

1. The controller shall monitor the return air humidity and use as required for economizer control or humidity control.

O. Return Air Temperature:

1. The controller shall monitor the return air temperature and use as required for economizer control.

P. Discharge Air Temperature:

1. The controller shall monitor the supply air temperature.

Q. Filter Differential Pressure Monitor:

1. The controller shall monitor the differential pressure across the filter.

R. Freeze Protection:

1. The unit shall monitor the freezestat status.

2. If a freezestat trips, the hot water valve at the respective unit shall be fully open, fans shall stop, outside air damper shall be fully closed and an alarm shall be activated at the Operator Workstation.

S. Alarm Conditions

1. Alarms shall be provided at the operator workstation as follows:

a. DX Cooling Failure: Discharge air temperature after the DX coil does not match setpoint.

b. Compressor Failure: Compressor operating status does not match command. An alarm shall be issued to operating work station and mechanical cooling shall be locked out.

c. High static pressure: High pressure limit switch is enabled. An alarm shall be issued to operating work station and the supply fan shall not operate.

d. Supply Fan Failure: Fan has been signaled to start and feedback from respective relay or VFD or ECM does not indicate the fan has started after 30 seconds.

e. Supply Fan VFD or ECM Fault.

f. Supply Fan in Hand: Fan status is detected while the fan is turned off.

g. Relief Fan Failure: Fan has been signaled to start and feedback from respective relay or VFD or ECM does not indicate the fan has started after 30 seconds.

h. Relief Fan in Hand: Fan status is detected while the fan is turned off.

i. Relief Fan VFD or ECM Fault.

j. Mixed air damper Failure: The damper is not in its commanded position by +/- 20%.

k. Outdoor Air Damper Failure: The damper is not in its commanded position by +/- 20%.

l. Relief Air Damper Failure: The damper is not in its commanded position by +/- 20%.

m. High Zone Temperature: Zone temperature remains 4°F higher than its cooling setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

n. Low Zone Temperature: Zone temperature remains 4°F lower than its heating setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

o. High Discharge Air Temperature: The discharge air temperature remains higher than 120°F with a hysteresis of 5°F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

p. Low Discharge Air Temperature: Discharge air temperature remains lower than 45°F with a hysteresis of 5°F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

q. High Building Static Pressure: If the building static pressure is greater than 0.10 in. W.C.

r. Low Building Static Pressure: If the building static pressure is less than 0.02 in. W.C.

s. High Supply Air Temp: If the supply air temperature is greater than 120°F.

t. Low Supply Air Temp: If the supply air temperature is less than 45°F.

u. High Return Air Temp: If the return air temperature is greater than 90°F.

v. Low Return Air Temp: If the return air temperature is less than 45°F.

w. High Return Air Humidity: If the return air humidity is greater than 70%.

x. Filter Change Required: Filter differential pressure exceeds 1 in. W.C.

3.11 SINGLE ZONE VARIABLE VOLUME ROOFTOP UNIT WITH EXHAUST FAN INTERLOCK

A. This sequence applies to the following rooftop air handling units:

1. RTU-3

B. General:

1. BAS shall command zone into morning warmup mode, unoccupied mode, occupied mode and demand control ventilation mode if any of the following devices are not activated.
    a. Internal safety devices.
    b. Fire Alarm Control Panel.
    c. Low temperature limit.
2. Zone consists of the following:
    a. Roof top air handling unit control.
    b. Demand control ventilation.
3. The packaged rooftop unit will be furnished without DDC controls. The BAS contractor shall be responsible for providing all DDC controls on the rooftop air handling unit. The BAS contractor shall provide and field mount all controllers and end-devices unless otherwise noted.
    a. Control dampers and actuators are provided with unit. BAS contractor to wire actuators.
    b. Airflow station provided by BAS contractor. Airflow reading monitored at operation's work station.
4. The unit shall run according to a user definable time schedule in the following modes:
    a. Occupied Mode: The unit shall maintain:
        1) A 75°F cooling setpoint
        2) A 70°F heating setpoint.
    b. Unoccupied Mode (night setback): The unit shall maintain:
        1) An 85°F cooling setpoint.
        2) A 55°F heating setpoint.
5. The BAS shall prioritize unit operating modes in the following order:
    a. Safety Shutdown → Kitchen Exhaust Mode → Dehumidification → Occupied → Unoccupied.
6. Ventilation control, demand control ventilation, economizer operation, and supply fan reset may operate simultaneously as required to maintain space conditions.

C. Emergency Generator Cooling Lockout:

1. The RTU shall be furnished with an integral relay to lock out the DX cooling system, including all condenser fans and compressors, upon activation.

2. The controller shall monitor the transfer switch status and disable DX cooling upon transfer of the building to generator power.

D. Zone Setpoint Adjust:

1. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.

E. Zone Optimal Start:

1. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

F. Zone Unoccupied Override:

1. A timed local override control shall allow an occupant to override the schedule and place the unit into an occupied mode for an adjustable period of time. At the expiration of this time, control of the unit shall automatically return to the schedule.

G. Return Air Smoke Detection:

1. When a return air duct smoke detector is in alarm mode, the fire alarm system shall be notified, the unit shall shutdown, the respective fans shall be de-energized, and an alarm shall be activated at the Operator Workstation.

H. Supply Air Smoke Detection:

1. When a supply air duct smoke detector is in alarm mode, the fire alarm system shall be notified, the unit shall shutdown, the respective fans shall be de-energized, and an alarm shall be activated at the Operator Workstation.

I. Exhaust Fan Interlock:

1. The BAS shall monitor the status of the exhausts fan associated with the RTU:

   a. Kitchen Exhaust Fan KEF-1 is associated with RTU-3.

2. The following sequence shall occur whenever the exhaust fan is activated:

   a. If the RTU is in unoccupied or warmup mode, it shall be indexed to occupied mode.

   b. Demand control ventilation shall be disabled.

   c. Economizer operation shall be disabled.

d. During Kitchen Exhaust Interlock Mode, supply fan airflow control shall override normal supply fan temperature reset control sequences. Supply fan speed shall modulate to maintain the outdoor airflow setpoint as measured by the outdoor airflow statoin. Initial make-up airflow tracking shall be set to 90% of exhaust fan speed and shall be adjustable through the BAS. The make-up airflow tracking setpoint shall be adjusted to maintain the kitchen and associated spaces at a slight negative pressure relative to adjacent spaces.

J. Single Zone VAV Control:

1. In zones with multiple sensors, the user will be able to select an individual sensor or highest/lowest/average to control the zone. By default, the zone shall be controlled by an average of the sensors if a selection is not made.

2. Whenever heating mode is enabled and the zone temperature is below setpoint:

a. The supply fan shall operate continuously.

b. The DX heat pump will be used as the first stage of heating.

1) Initiate DX compressor(s) and reversing valve.

2) Modulating compressors shall operate as the first heating stage.

3) If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint.

4) Compressors, once enabled will be on until the minimum run time has elapsed.

5) Compressor shall not operate if supply fan current relay is not activated or low temperature lockout is activated or compressor high pressure is activated.

6) Roof top equipment manufacture shall take control of the condenser fan operation.

c. The hot water heating coil will be used as the second stage of heating. The coil valve shall modulate to maintain discharge air temperature setpoint.

d. The DX heat pump shall be allowed to operate simultaneously with the heating coil. During simultaneous operation, the heat pump shall operate at full capacity, and the hot water heating coil valve shall modulate to maintain the discharge air temperature setpoint.

e. A heating PID loop will first reset the supply air setpoint. Once the setpoint has reached its highest limit, then the supply fans speed will be reset from its minimum to its maximum speed as determined by the balancer.

1) The reset values will be 65-85 degrees for heating.

2) All reset schedules will be fully adjustable.

3. Whenever cooling mode is enabled and zone temperature is above cooling setpoint:

    a. The supply fan shall operate continuously.

    b. Economizer will be used as the first stage of cooling if available. In economizer mode if the outside air dampers are at 100% open, then the DX cooling will be enabled to modulate, and the dampers will remain at 100% until the DX cooling is off.

    c. DX cooling will be used as the second stage of cooling.

        1) Initiate DX compressor(s).

        2) Modulating compressors shall operate as the first cooling stage.

        3) If the modulating compressor cannot maintain the discharge air temperature setpoint, the second modulating compressor will be enabled and modulated to maintain the discharge air temperature setpoint.

        4) Compressors, once enabled will be on until the minimum run time has elapsed.

        5) Compressor shall not operate if supply fan current relay is not activated or condensate pan water detection is activated or compressor high pressure is activated.

        6) Enabled compressors will not be allowed to deactivate until the minimum run time has elapsed.

        7) Roof top equipment manufacture shall take control of the condenser fan operation.

    d. A cooling PID loop will first reset the air handlers supply air setpoint. Once the setpoint has reached its lowest limit, then the supply fan speed will be reset from its minimum to its maximum speed as determined by the balancer.

        1) The reset values for cooling will be 55-65 degrees.

        2) All reset schedules will be fully adjustable.

4. The DX cooling, DX heat pump, hot water valve and economizer dampers will modulate without overlap to maintain the supply air setpoint.

K. Unoccupied and Morning Warm-Up Control:

1. Unoccupied damper actuator control:

    a. Outside air damper shall be fully closed.

    b. Mixed air damper shall be fully opened.

2. Supply fan shall be off unless unoccupied heating mode or unoccupied cooling mode is activated.

3. Unoccupied Heating Mode Control:

a. BAS shall enable unoccupied heating mode when the unit is scheduled accordingly.

b. When zone temperature decreases below setpoint, BAS shall command the following control sequence.

1) Stage 1 Heating:

(a) Supply fan speed shall be set to the minimum speed as determined by the balancer.

(b) The supply fan speed, DX heat pump, and hot water heating coil valve shall modulate in accordance with the Single Zone VAV Control to maintain the discharge air temperature setpoint.

4. Morning Warm-Up Mode Control:

a. BAS shall enable morning warm-up heating mode when the unit is scheduled accordingly.

b. When zone temperature decreases below setpoint, BAS shall command the following control sequence.

1) Stage 1

(a) Supply fan speed shall be set to the maximum speed as determined by the balancer.

(b) The DX heat pump and hot water heating coil valve shall modulate in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

5. Unoccupied Cooling Mode Control:

a. BAS shall enable unoccupied cooling mode when the unit is scheduled accordingly, and DX cooling is enabled or outdoor air temperature is consistent with economizer operations.

b. When zone temperature increases above setpoint, BAS shall command the following control sequence.

1) Supply fan shall start.

2) DX cooling and supply fan speed shall modulate in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

L. Occupied Control:

1. Occupied damper actuator control:

a. Outside air damper and mixed air damper shall modulate to maintain the minimum outdoor airflow rate, as calculated by the outdoor airflow measuring station.

2. Occupied Fan Control:

a. Supply fan speed shall modulate the supply fan between minimum and maximum predetermined setpoints in accordance with the Single Zone VAV Control sequence to maintain zone temperature set point.

b. Predetermined fan speed shall be determined by TAB contractor.

3. Occupied Heating Mode Control:

a. BAS shall enable occupied heating mode when the unit is scheduled accordingly and DX heating is available, or the heating plant is enabled.

b. When zone temperature decreases below setpoint,

1) The supply fan speed, DX heat pump, and hot water heating coil valve will modulate in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

4. Occupied Cooling Mode Control:

a. BAS shall enable occupied cooling mode when the unit is scheduled accordingly and the DX cooling is available.

b. When zone temperature increases above setpoint, the BAS shall command the following control sequence.

1) Economizer cooling mode: When all of the outdoor air conditions are true as stated in the economizer cooling description section, Economizer cooling shall be enabled.

2) When zone temperature increases above setpoint and economizer mode is enabled, BAS shall command the following control sequence.

(a) Modulate supply fan speed and reset discharge air temperature in accordance with the Single Zone VAV Control sequence.

(b) Modulate outdoor air damper and mixed air damper as required to maintain discharge air temperature set point.

3) Mechanical cooling mode: When any of the outdoor air conditions are not true as stated in the economizer cooling description section, Mechanical cooling shall be enabled.

4) When zone temperature increases above setpoint and mechanical mode is enabled, BAS shall command the following control sequence.

(a) Reset air dampers to normal operating mode.

(b) Modulate supply fan speed and DX cooling in accordance with the Single Zone VAV Control sequence to maintain the discharge air temperature setpoint.

5. Occupied Dehumidification Mode Control:

a. BAS shall enable occupied dehumidification mode when all of the following are true:

1) DX cooling is available.

2) Cooling control sequence is not enabled.

3) When zone relative humidity increases above setpoint,

b. When dehumidification mode is enabled and outdoor dewpoint is less than zone dewpoint setpoint, BAS shall command the following control sequence.

1) The supply fan speed shall be set to the minimum airflow rate setpoint.

2) Modulate outdoor air damper and mixed air damper as required to maintain discharge air dewpoint temperature set point located after the cooling coil.

3) DX cooling and hot gas reheat control valve shall modulate as required to maintain discharge air temperature setpoint.

c. When dehumidification mode is enabled and outdoor dewpoint is greater than zone dewpoint setpoint, the BAS shall command the following control sequence.

1) The supply fan speed shall be set to the minimum airflow rate setpoint.

2) Modulate DX cooling as required to maintain discharge air dewpoint temperature set point located after the cooling coil.

3) DX cooling and hot gas reheat valve shall modulate as required to maintain discharge air temperature setpoint.

6. Economizer Control:

a. The economizer sequence shall be enabled whenever all of the following conditions are true:

1) Kitchen Exhaust Interlock Mode is not enabled.

2) The unit is operating in occupied cooling mode.

3) Outdoor air temperature is less than return air temperature.

4) Outdoor air temperature is less than the adjustable economizer high limit setpoint, initially set to 65°F adjustable.

5) The freezestat is normal.

6) Outdoor air humidity is below the adjustable high humidity or dewpoint limit if applicable.

b. When economizer mode is enabled, the outdoor air damper and mixed air damper shall modulate to maintain the discharge air temperature setpoint.

c. The outdoor air damper shall modulate between minimum outdoor airflow position and 100% open as required to maintain the discharge air temperature setpoint.

d. If the outdoor air damper reaches 100% open position and the discharge air temperature remains above setpoint, mechanical cooling shall be enabled and modulated as required to maintain the discharge air temperature setpoint.

e. When economizer mode is disabled, the outdoor air damper shall return to the minimum ventilation position required to maintain the minimum outdoor airflow setpoint.

f. All economizer enable limits and lockout setpoints shall be fully adjustable through the BAS.

7. Demand Control Ventilation

a. BAS shall enable demand control ventilation (DCV) during occupied mode. DCV shall be locked out from operating when economizer cooling is enabled or the monitored exhaust fan is on. DCV shall be allowed to operate simultaneously with cooling and heating control sequence.

b. When zone CO2 level increases above setpoint, BAS shall command the following control sequence:

1) Modulate outdoor air damper and mixed air damper as required to maintain zone CO2 setpoint. The outdoor airflow rate shall not drop below the design DCV minimum outdoor airflow rate.

M. Mixed Air Temperature:

1. The controller shall monitor the mixed air temperature and use as required for economizer control.

N. Return Air Humidity:

1. The controller shall monitor the return air humidity and use as required for economizer control or humidity control.

O. Return Air Temperature:

1. The controller shall monitor the return air temperature and use as required for economizer control.

P. Discharge Air Temperature:

1. The controller shall monitor the supply air temperature.

Q. Filter Differential Pressure Monitor:

1. The controller shall monitor the differential pressure across the filter.

R. Freeze Protection:

1. The unit shall monitor the freezestat status.

2. If a freezestat trips, the hot water valve at the respective unit shall be fully open, fans shall stop, outside air damper shall be fully closed and an alarm shall be activated at the Operator Workstation.

S. Alarm Conditions

1. Alarms shall be provided at the operator workstation as follows:

   a. DX Cooling Failure: Discharge air temperature after the DX coil does not match setpoint.

   b. Compressor Failure: Compressor operating status does not match command. An alarm shall be issued to operating work station and mechanical cooling shall be locked out.

   c. High static pressure: High pressure limit switch is enabled. An alarm shall be issued to operating work station and the supply fan shall not operate.

   d. Supply Fan Failure: Fan has been signaled to start and feedback from respective relay or VFD or ECM does not indicate the fan has started after 30 seconds.

   e. Supply Fan VFD or ECM Fault.

   f. Supply Fan in Hand: Fan status is detected while the fan is turned off.

   g. Mixed air damper Failure: The damper is not in its commanded position by +/- 20%.

   h. Outdoor Air Damper Failure: The damper is not in its commanded position by +/- 20%.

   i. High Zone Temperature: Zone temperature remains 4°F higher than its cooling setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

   j. Low Zone Temperature: Zone temperature remains 4°F lower than its heating setpoint for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

   k. High Discharge Air Temperature: The discharge air temperature remains higher than 120°F with a hysteresis of 5°F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

   l. Low Discharge Air Temperature: Discharge air temperature remains lower than 45°F with a hysteresis of 5°F for 5 minutes. This alarm will not be enabled until the zone has been running for 30 minutes.

   m. High Building Static Pressure: If the building static pressure is greater than 0.10 in. W.C.

   n. Low Building Static Pressure: If the building static pressure is less than 0.02 in. W.C.

o. High Supply Air Temp: If the supply air temperature is greater than 120°F.

p. Low Supply Air Temp: If the supply air temperature is less than 45°F.

q. High Return Air Temp: If the return air temperature is greater than 90°F.

r. Low Return Air Temp: If the return air temperature is less than 45°F.

s. High Return Air Humidity: If the return air humidity is greater than 70%.

t. Filter Change Required: Filter differential pressure exceeds 1 in. W.C.

3.12 SPLIT SYSTEM HEAT PUMP UNITS

A. This sequence applies to the following heat pump units:

1. HP-7

2. HP-12

B. General:

1. The split system heat pump units shall be furnished with factory-installed, standalone microprocessor-based controllers. All primary unit control (compressor staging, heating/cooling operation, safeties, and internal logic) shall be performed by the unit manufacturer’s controller.

2. The BAS contractor shall provide all necessary power, interlock wiring, and BACnet MS/TP communication wiring. Each unit shall be equipped with a BACnet communication interface to allow monitoring of operational status, alarms, and space conditions at the Building Automation System.

3. The BAS shall not be responsible for direct control of compressor or heating/cooling operation, but shall monitor all available points and generate alarms as required.

4. A space temperature sensor shall be provided for each data room and shall be connected to the unit controller for primary control and to the BAS for monitoring.

C. Temperature Control:

1. Each heat pump unit shall maintain space temperature continuously to the following setpoints:

a. A 75°F cooling setpoint

b. A 65°F heating setpoint

c. A 60% dehumidification setpoint.

2. The unit controller shall automatically provide heating or cooling as required to maintain space temperature within these limits.

3. No occupancy-based scheduling shall be used. The units shall operate continuously 24/7/365 to maintain space conditions suitable for IT equipment loads.

4. A control deadband shall be maintained by the factory controller to prevent simultaneous heating and cooling operation.

D. Limits and Alarms:

1. If space temperature does not match setpoint for a predetermined time period, an alarm shall be generated at the Operator Workstation.

2. Unit alarm/fault status from manufacturer controller.

3.13 VARIABLE REFRIGERANT FLOW HEAT PUMP UNITS WITH PERIMETER RADIATION

A. This sequence applies to the following heat pump units:

1. HP-1 through HP-6

2. HP-8 through HP-11

3. HP-13 through HP-16

B. General:

1. The variable refrigerant flow heat pump units shall be furnished with factory-installed, standalone microprocessor-based controllers. All primary unit control (compressor staging, heating/cooling operation, safeties, and internal logic) shall be performed by the unit manufacturer’s controller.

2. The BAS contractor shall provide all necessary power, interlock wiring, and BACnet MS/TP communication wiring. Each unit shall be equipped with a BACnet communication interface to allow monitoring of operational status, alarms, and space conditions at the Building Automation System.

3. The BAS shall not be responsible for direct control of compressor or heating/cooling operation, but shall monitor all available points and generate alarms as required.

4. A control deadband shall be maintained by the factory controller to prevent simultaneous heating and cooling operation

C. Heating and Cooling Coordination:

1. The Variable Refrigerant Flow (VRF) heat pump systems, Dedicated Outdoor Air System (DOAS), and perimeter radiation heating systems shall be coordinated to prevent simultaneous heating and cooling operation within the same zone.

a. The DOAS shall provide ventilation air only and shall not be used for primary space temperature control.

b. DOAS discharge air temperature shall be reset based on outdoor air conditions and system strategy and shall not directly influence VRF or perimeter radiation heating operation.

2. Cooling operation shall be provided by the VRF system only. No perimeter radiation heating shall operate during active VRF cooling mode.

3. Heating operation may be provided by VRF systems and perimeter radiation systems concurrently, provided both systems operate in heating mode and are not in opposing modes. Perimeter radiation shall be the preferred heating source during low ambient conditions as defined below.

4. VRF heating shall be modulated or staged back under low ambient conditions to optimize operating cost and prevent unnecessary heat pump operation when perimeter heating capacity is sufficient.

5. Perimeter radiation and VRF heating systems are permitted to operate simultaneously in heating mode where required to maintain space temperature and/or improve heating efficiency.

D. Zone Setpoints:

1. The factory furnished controllers shall be configured to run according to a user definable time schedule in the following modes:

a. Occupied Mode:

1) The unit shall maintain:

(a) A 75°F cooling setpoint

(b) A 70°F heating setpoint.

(c) A 60% dehumidification setpoint.

b. Unoccupied Mode (night setback):

1) The unit shall maintain:

(a) A 85°F cooling setpoint.

(b) A 55°F heating setpoint.

(c) A 60% dehumidification setpoint.

E. Perimeter Radiation:

1. Each indoor unit shall control its associated perimeter radiation (fin tube) heating system.

2. Perimeter radiation shall be the primary heating source under low ambient conditions to offset building heat loss.

3. Heating system operation shall follow the intent below:

a. At outdoor air temperatures above approximately 30°F (adj), VRF systems shall be the primary heating source.

b. At outdoor air temperatures at or below approximately 30°F (adj), perimeter radiation shall be the preferred heating source and shall be capable of maintaining the full heating load.

c. A control deadband of approximately ±2–3°F shall be implemented to prevent rapid switchover between heating sources.

d. VRF heating shall be sequenced as a secondary heating source under low ambient conditions where perimeter radiation capacity is sufficient to maintain space temperature, in order to optimize energy consumption.

4. The contractor shall provide all control valve actuators, control wiring, and outdoor air temperature input required to enable heating switchover logic.

5. Perimeter heating shall be enabled only when space temperature is below heating setpoint and outdoor air temperature is below the heating switchover threshold.

6. Perimeter heating shall be locked out during active VRF cooling operation.

F. Limits and Alarms:

1. If space temperature does not match setpoint for a predetermined time period, an alarm shall be generated at the Operator Workstation.

2. Unit alarm/fault status from manufacturer controller.

3.14 UNIT HEATERS AND CABINET UNIT HEATERS

A. General:

1. The unit shall run according to a user definable time schedule in the following modes:

a. Morning Warmup and Occupied Mode: The unit shall maintain a heating setpoint of 70°F (adj.).

b. Unoccupied Mode (night setback): The unit shall maintain a heating setpoint of 65°F (adj.).

B. Zone Optimal Start:

1. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

C. Simultaneous Heating and Cooling Prevention:

1. The controller shall monitor the operating mode of any cooling equipment serving the same zone to prevent simultaneous heating and cooling.

2. The unit shall be disabled if any equipment serving the zone is in cooling mode.

D. Shared Temperature Sensors

1. Where units are installed in a zone served by mutilple pieces heating or cooling equipment or terminal units, a single temperature sensor shall be used to control all units associated with the zone.

E. Fan:

1. The fan shall run anytime the zone temperature is below heating setpoint unless shutdown on safeties.

F. Warmup Mode:

1. The controller shall measure the zone temperature and fully open the heating coil valve to maintain the zone heating setpoint.

2. The heating shall be enabled whenever:

a. Outside air temperature is less than 65°F (adj.).

b. AND the zone temperature is below the heating setpoint.

c. AND the fan is on.

d. AND any other equipment serving the same zone is not in cooling mode.

G. Occupied Heating Mode:

1. The controller shall measure the zone temperature and modulate the heating coil valve to maintain the zone heating setpoint. The valve shall modulate open as zone temperature decreases below setpoint. On increasing zone temperatures, the opposite shall occur.

2. The heating shall be enabled whenever:

a. Outside air temperature is less than 65°F (adj.).

b. AND the zone temperature is below the heating setpoint.

c. AND the fan is on.

d. AND any other equipment serving the same zone is not in cooling mode.

H. Fan Status:

1. The controller shall monitor the fan status.

I. Limits and Alarms:

1. Alarms shall be provided at the operator workstation as follows:

a. Low Zone Temp: If zone temperature does not match setpoint for a predetermined time period.

b. Fan Failure: Commanded on, but the status is off.

c. Fan in Hand: Commanded off, but the status is on.

d. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

3.15 FIN TUBE RADIATION

A. General:

1. Fin tube radiation will be controlled by the building automation system (BAS). BAS unit controller to operate in morning warmup, occupied, and unoccupied modes:

a. Morning Warmup and Occupied Modes: The unit shall maintain a heating setpoint of 70°F.

b. Unoccupied Mode (night setback): The unit shall maintain a heating setpoint of 65°F.

B. Simultaneous Heating and Cooling Lockout:

1. The controller shall monitor the operating mode of any cooling equipment serving within the same zone to prevent simultaneous heating and cooling.

2. The unit shall be disabled if any equipment serving the zone is in cooling mode.

C. Shared Temperature Sensors

1. Where units are installed in a zone served by mutilple pieces heating or cooling equipment or terminal units, a single temperature sensor shall be used to control all units associated with the zone.

D. Morning warm mode:

1. When the zone temperature is less than the heating set point, and any cooling equipment serving the same zone is not in cooling mode, the hot water valve shall fully open to maintain zone temperature setpoint.

E. Unoccupied mode:

1. When the zone temperature is less than the heating set point, and any cooling equipment serving the same zone is not in cooling mode, the hot water valve shall fully open to maintain zone temperature setpoint.

F. Occupied mode:

1. When the zone temperature is less than the heating set point, and any cooling equipment serving the same zone is not in cooling mode, the hot water valve shall fully open to maintain zone temperature setpoint.

G. Limits and Alarms:

1. Zone Temperature: If zone temperature does not match setpoint for a predetermined time period, an alarm shall be generated at the Operator Workstation.

3.16 ENERGY METERS

A. General:

1. Energy meters will be provided by others. Refer to electrical sheets and specifications for meter locations and quantities.

2. Each meter will be furnished with a BACnet (MS/TP) integration board. The BAS will monitor the meter via BACnet communication.

B. The interface shall monitor and trend the following points for each meter at minimum:

1. Apparent Power

2. Apparent Power – kVA

3. Current Neutral

4. Current Phase A

5. Current Phase B

6. Current Phase C

7. Frequency

8. Power Factor

9. Real Energy - kWh

10. Real Power - kW

11. Voltage A-B

12. Voltage A-N

13. Voltage B-C

14. Voltage B-N

15. Voltage C-A

16. Voltage C-N

3.17 GENERATOR AND TRANSFER SWITCH

A. General:

1. The Generator will be monitored for run status and alarm status.

2. The Transfer Switch will be monitored for “Normal” position status and “Emergency Power” status.

END OF SECTION 230993

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SECTION 232113 - HYDRONIC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Hydronic system requirements.

B. Heating water piping, buried.

C. Heating water piping, above grade.

D. Heating water and glycol piping, above grade.

E. Equipment drains and overflows.

F. Pipe hangers and supports.

G. Unions, flanges, mechanical couplings, and dielectric connections.

1.3 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083100 - Access Doors and Panels.

C. Section 230516 - Expansion Fittings and Loops for HVAC Piping.

D. Section 230523 - General-Duty Valves for HVAC Piping.

E. Section 230548 - Vibration and Seismic Controls for HVAC.

F. Section 230553 - Identification for HVAC Piping and Equipment.

G. Section 230719 - HVAC Piping Insulation.

H. Section 232114 - Hydronic Specialties.

I. Section 232500 - HVAC Water Treatment: Pipe cleaning.

1.4 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

D. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings.

E. ASME B31.9 - Building Services Piping.

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.

D. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts.

E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

F. ASTM A536 - Standard Specification for Ductile Iron Castings.

G. ASTM B32 - Standard Specification for Solder Metal.

H. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).

J. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

K. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.

L. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems.

M. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.

N. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing.

O. ASTM F3226/F3226M - Standard Specification for Metallic Press-Connect Fittings for Piping and Tubing Systems.

P. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

Q. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

R. AWWA C606 - Grooved and Shouldered Joints.

S. DIN 4726 - Warm Water Surface Heating Systems and Radiator Connections - Plastics and Multilayer Piping Systems.

T. IAPMO (UMC) - Uniform Mechanical Code.

U. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections.

V. ICC (IMC) - International Mechanical Code.

W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.

C. Product Data:

1. Include data on pipe materials, pipe fittings, valves, and accessories.

2. Provide manufacturers catalog information.

3. Indicate valve data and ratings.

4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum 10 years of experience.

C. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

D. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

E. Coupling Manufacturer:

1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.

2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.

3. A distributor's representative is not considered qualified to perform the training.

F. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.

2. Use non-conducting dielectric connections whenever jointing dissimilar metals.

3. Grooved mechanical joints may be used in accessible locations only.

a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Engineer.

b. Grooved mechanical connections and joints comply with AWWA C606.

1) Ductile Iron: Comply with ASTM A536, Grade 65-45-12.

2) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.

c. Use rigid joints unless otherwise indicated.

4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.

2. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.

3. For throttling, bypass, or manual flow control services, use globe valves.

4. In heating water systems, butterfly valves may be used interchangeably with gate and globe valves.

5. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.2 HEATING WATER PIPING, BURIED

A. Insulated Cross-Linked Polyethylene (PEX-A) Pipe: ASTM F876 or ASTM F877.

1. Manufacturers:

a. Rovanco Rhinoflex.

b. Substitutions: See Section 016000 - Product Requirements.

2. Oxygen Barrier: Limit oxygen diffusion through the tube to maximum 0.000044 grains per cu ft/day at 104 degrees F in accordance with DIN 4726.

3. Fittings: Brass and copper.

4. Joints: Mechanical compression fittings.

5. Joints: ASTM F1960, cold-expansion fittings.

6. Casing: Flexible closed cell urethane foam with polyethylene outer jacket.

2.3 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D10.12M/D10.12 welded.

2. Threaded Joints: ASME B16.3, malleable iron fittings.

3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

4. Mechanical Press Sealed Fittings: ASTM F3226/F3226M, ICC (IMC), and IAPMO (UMC) approved, with EPDM seals.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.

a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IMC), and IAPMO (UMC) approved, with EPDM seals.

a. Manufacturers:

1) Viega; ProPress.

2) Substitutions: See Section 016000 - Product Requirements.

2.4 EQUIPMENT/CONDENSATE DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:

1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.

2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.5 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.

3. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 6 Inches and Greater: Adjustable steel yoke, cast iron roll, double hanger.

5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.

7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

8. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.

9. Wall Support for Hot Pipe Sizes 6 Inches and Greater: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

10. Vertical Support: Steel riser clamp.

11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

12. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

13. Floor Support for Hot Pipe Sizes 6 Inches and Greater: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

14. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

15. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

16. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches and Less:

1. Ferrous Piping: 150 psi brass or malleable iron, threaded.

2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.

2. Copper Piping: Bronze.

3. Gaskets: 1/16 inch thick, preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.

2. Mechanical Couplings: Comply with ASTM F1476.

3. Housing Material: Ductile iron, galvanized complying with ASTM A536.

4. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.

5. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.

6. When pipe is field grooved, provide coupling manufacturer's grooving tools.

7. Manufacturers:

a. Victaulic Company: www.victaulic.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

D. Dielectric Connections:

1. Waterways:

a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.

b. Dry insulation barrier able to withstand 600-volt breakdown test.

c. Construct of galvanized steel with threaded end connections to match connecting piping.

d. Suitable for the required operating pressures and temperatures.

2. Flanges:

a. Dielectric flanges with same pressure ratings as standard flanges.

b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.

c. Dry insulation barrier able to withstand 600-volt breakdown test.

d. Construct of galvanized steel with threaded end connections to match connecting piping.

e. Suitable for the required operating pressures and temperatures.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. See Section 232500 for additional requirements.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9 requirements.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interference with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls, and floors.

G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

H. Slope piping and arrange to drain at low points.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 230516.

1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.

2. Use flexible couplings in expansion loops.

J. Grooved Joints:

1. Install in accordance with the manufacturer's latest published installation instructions.
2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

K. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

L. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.

M. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 230719.

N. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083100 .

O. Use eccentric reducers to maintain top of pipe level.

P. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

Q. Install valves with stems upright or horizontal, not inverted.

3.3 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 Inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
4. 2-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
5. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. 4 Inches: Maximum span, 12 feet; minimum rod size, 1/2 inch.
7. 6 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.

B. Hanger Spacing for Steel Piping.

1. 1/2 Inch, 3/4 Inch, and 1 Inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 Inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 Inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
7. 4 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
8. 6 Inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.

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SECTION 232114 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air eliminator, dirt separator, hydraulic separator and low loss header

D. Hydraulic separators.

E. Strainers.

F. Suction diffusers.

G. Pump connectors.

H. Balancing valves.

I. Automatic flow control valves.

J. Combination fittings.

K. Relief valves.

L. Glycol system.

1.3 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

B. Section 232500 - HVAC Water Treatment: Pipe cleaning.

1.4 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels.

1.5 SUBMITTALS

A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

B. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

D. Manufacturer's qualification statement.

E. Project Record Documents: Record actual locations of flow controls.

F. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 EXPANSION TANKS

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com/#sle.

2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.

3. Wessels.

4. Substitutions: See Section 016000 - Product Requirements.

B. Maximum Rated Working Pressure: 125 psi.

C. Maximum Allowable Service Temperature: 240 degrees F.

D. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, adjustable flexible EPDM diaphragm or bladder seal factory precharged to 12 psi, and steel support stand.

E. Accessories: Provide air-charging fitting, bulls eye sight glass, pressure gauge, seismic-mounting clips, and tank drain ball valve.

2.2 AIR VENTS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com/#sle.
2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
3. Taco, Inc: www.taco-hvac.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Air Vent:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

D. Maximum Fluid Pressure: 150 psi.

E. Maximum Fluid Temperature: 250 degrees F.

2.3 HYDRAULIC SEPARATORS

A. Coalescing Hydraulic, Magnetic, Dirt, and Air Separators:

1. Manufacturers:

a. Spirotherm.

b. Substitutions: See Section 016000 - Product Requirements.

2. Units shall be fabricated steel, rated for 150 psig working pressure, stamped and registered in accordance with ASME Section VIII, Division 1 for unfired pressure vessels, and include three performance chambers within the vessel. One chamber above the higher nozzles set for air elimination, one below the lower nozzles set for dirt separation and one between the nozzles for hydraulic separation.

3. An internal tube bundle shall fill the entire vessel to supress turbulence and provide high efficency air elimination. The bundle shall consist of copper core tube with continuously wound copper medium permanently affixed to the core. A separate copper medium shall be wound completely around and premanently affixed to the internal element.

4. Each eliminator shall have a separate venting chamber to prevent system contaminants from harming the float and venting valve operation. At the top of the venting chamber shall be an integral full port float actuated brass venting mechanism.

5. Air Eliminators shall be capable of removing 100% of the free and entrained air and up to 99.6% of the dissovled air in the system fluid. Dirt separation shall be at least 80% of all particles 30 micon and larger within 100 passes.

6. Unit shall be manufactured with internal magnet(s):

a. Magnet(s) shall be positioned at the centerline of the bottom inlet and bottom outlet nozzles for maximum effectiveness during normal operation.

1) Units sized 2” through 6” shall have a minimum of one magnet.

2) Units with 8” though 12” shall have a minimum of two magnets

b. Magnet(s) shall be removable from the vessel.

c. Magnet(s) shall be made of high-strength Neodymium alloy.

d. Magnet(s) shall be disengaged for dirt blowdown by means of a spring-loaded pull, without requiring removal of the magnet from the vessel or isolating the unit from the system.

e. Provide with 360° rotatable blow down valve.

2.4 STRAINERS

A. Manufacturers:

1. Nexus Valve, Inc: www.nexusvalve.com/#sle.

2. The Metraflex Company; LPD Y Strainer: www.metraflex.com/#sle.

3. Keckley.

4. Substitutions: See Section 016000 - Product Requirements.

B. Size 2 inch and Under:

1. Provide threaded or sweat brass or iron body for up to 175 psi working pressure, Y-pattern strainer with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2 inch to 4 inch:

1. Provide flanged or grooved iron body for up to 175 psi working pressure, up to 250 degrees F working temperature, Y-pattern strainer with 1/16 inch or 3/64 inch stainless steel perforated screen.

2. Flanged iron body for 175 psi working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

D. Size 5 inch and Larger:

1. Provide flanged or grooved iron body for up to 175 psi working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2. Flanged iron body for 175 psi working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.5 SUCTION DIFFUSERS

A. Manufacturers:

1. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.

2. Armstrong Pumps: www.armstrongpumps.com

3. Victaulic Company of America: www.victaulic.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.

C. Class 125:

1. Horizontally or vertically mounted angle-pattern fitting with integral-cast vanes, fine particle mesh screen and magnetic drain plugs for particle removal without disassembly.

2. Maximum Operating Service: 175 psi and 300 degrees F.

3. Sizes, Material, and Connection:

a. 2 inch and Smaller: Cast iron body, threaded.

b. 2-1/2 to 12 inch: Ductile iron body, flanged.

D. Class 150, Size 1-1/2 to 4 inch:

1. Angle-pattern flanged carbon steel fitted with integral vanes, removable strainer, and magnetic drain plugs for particle removal without disassembly.

2. Maximum Operating Service:

a. Class 150: 150 psi at 450 degrees F.

E. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

F. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2.6 PUMP CONNECTORS

A. Manufacturers:

1. Anvil International; AnviFlex: www.anvilintl.com/#sle.

2. The Metraflex Company; Vane Flex: www.metraflex.com/#sle.

3. Substitutions: See Section 016000 - Product Requirements.

B. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.

1. Maximum Operating Service: 150 psi at 120 degrees F.

2. Accommodate the Following:

a. Axial Deflection in Compression and Expansion: _____ inch.

b. Lateral Movement: _____ inch.

c. Angular Rotation: 15 degrees.

d. Force developed by 1.5 times specified maximum allowable operating pressure.

3. End Connections: Same as specified for pipe jointing.

4. Provide pump connector with integral vanes to reduce turbulent flow.

5. Provide necessary accessories including, but not limited to, swivel joints.

2.7 BALANCING VALVES

A. Manufacturers:

1. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.

2. Hays Fluid Controls: www.haysfluidcontrols.com/#sle.

3. Nexus Valve, Inc: www.nexusvalve.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Size 2 inch and Smaller:

1. Provide ball or globe style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and NPT threaded or press connections.

2. Metal construction materials consist of bronze or brass.

3. Non-metal construction materials consist of Teflon or EPDM.

4. Maximum Service Operation: 300 psi at 250 degrees F.

C. Size 2-1/2 inch and Larger:

1. Provide ball, globe, or butterfly style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and flanged or grooved connections.

2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.

3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.

4. Maximum Service Operation: 175 psi at 250 degrees F.

2.8 AUTOMATIC FLOW CONTROL VALVES

A. Manufacturers:

1. Hays Fluid Controls; Mesurflo Balancing Valve: www.haysfluidcontrols.com/#sle.

2. Nexus Valve, Inc: www.nexusvalve.com/#sle.

3. IMI Flow Design.

4. Substitutions: See Section 016000 - Product Requirements.

B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi 2 psi.

C. Balancing valves shall include test ports, integral union, full-ported ball valves, and other accessories as required.

D. Flow control valves shall utilize a non clogging cartridge design. The flow cartridge shall feature no metal-to-metal contact or segmented ports and shall incorporate a flow nozzle and metering disc controlled by a pressure compensating spring fully isolated from the flow stream.

E. The flow cartridge shall be a single assembly, constructed with 100% stainless steel moving parts and shall be accessible without removing the valve from the piping.

F. The flow cartridge shall be factory calibrated to maintain an accuracy of +/- 5%. The accuracy shall be maintained over an operating range of 2-45 psi differential. A lifetime factory warranty on the cartridge shall be included.

G. Valves 2" and smaller:

1. Shall be forged brass, Y-pattern body with integral full-ported ball valve, blowout-proof stem with dual Viton O-ring seals, interchangable union end with Viton O-ring seal hard chrome plated ball with Teflon seats and rated for 600 psi working pressure @ 275 degrees F. Design based on Nexus UltraMatic valve.

H. Valves 2-1/2" and larger:

1. Shall be wafer-style ductile iron design to fit between standard 125/150 ANSI flanges. Valves shall include pressure test plugs across the flow cartridge , a tag indicating the model, flow rate and operating control range. Valves shall be able to incorporate drains and vents as required and be rated for 500 psi working pressure @ 350 degrees F. Design based on Nexus UltraMatic valve.

I. "Y" strainers with 20 mesh stainless steel elements and ball-type blowdown valves with caps/straps must be included on the inlet side of each water coil requiring a balancing device.

J. Valves shall be provided with P/T test plugs and tags identifying the valve, the equipment served and the rated flow.

K. Valve size shall be determined by the velocity limit of the flow cartridge. Maximum fluid velocities of 4 feet per second shall not be exceeded per ASHRAE standards. Contractor shall provide a complete project valve list including item number, quantity, vendor model number, size design flowrate, psig and location tag to the engineer and the balancing contractor for completion and submission with final balancing report.

L. Size: Match system flow capacity.

M. Accessories: Provide hanging tag, inlet in-line strainer, outlet ball valve, and PT test plug extension.

2.9 RELIEF VALVES

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com/#sle.

2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.

3. Conbraco Industries: www.apollovalves.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.10 GLYCOL

A. Industrial inhibited propylene glycol, dyed yellow to facilitate leak detection.

B. Water-based solution mix containing 30 percent propylene glycol by volume required for cooling or heating system operating temperature range.

C. Cooling or heating System Operating Temperature Range: Between freezing and boiling points of 3 and 220 degees F at 14.7 psia.

D. Equal to Dowfrost HD.

2.11 GLYCOL SYSTEM

A. Manufacturers:

1. Wessels Company.

2. Armstrong Fluid Technology.

3. Xylem Bell & Gossett.

4. Substitutions: See Section 016000 - Product Requirements.

B. Refer to the schedule on the contract documents for glycol pump package requirements.

C. Packaged system including tank, pumping assembly, support frame, valves, pump controller, controls and alarms.

D. Solution Container:

1. Heavy duty molded polypropylene with hinged lid, volume scale etched on the side of the tank, controls facia, air gap overflow and pump/controls access panel.

2. Two (2) stainless steel fill ball valves (glycol and water supply).

3. Powered agitator with timed auto-mix cycle.

4. Low fluid level warning and high fluid level alarm with remote annunciation contacts for interface with DDC system.

E. Pumping Assembly:

1. All bronze close coupled centrifugal pump, with stainless steel motor shaft, ceramic and graphite seal, high efficiency asynchronous enclosed externally vented single phase induction motor with thermal cut-off relay.

2. Pump suction strainer.

3. Bronze isolation valves.

4. Bronze check valve.

5. Pressure gauge.

6. 1/2" system connection.

F. Controls:

1. Low water cut-off float switch wired to shut down pump on low level.

2. Pump running, low fluid level warning and high fluid level alarms with remote annunciation contacts for interface with DDC system.

3. Fused single-point system connection rated at 115 to 120 VAC, single phase.

4. Interface: Hand switches with indicating lights for ON, FAULT, and LOW LEVEL.

5. Pressure Switch: Panel-mounted and prewired for 10 psi cut-in and 40 psi cut-out, adjustable.

6. High Level Cut-Off Float Switch: Prewired to shut-down unit upon activation. Tank-side mounted.

7. Auxiliary Dry Contacts: Low level, high level, and fault/alarm for remote monitoring.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties and equipment in accordance with manufacturer's instructions.

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved drain and hose connection on strainer blowdown connection.

G. Provide pump suction fitting on suction side of base-mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.

H. Provide automatic balancing valves on water outlet from air handling equipment, radiation, unit heaters, etc. as indicated on the equipment schedules and piping diagrams.

I. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

K. Pipe relief valve outlet to nearest floor drain.

L. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

M. Clean and flush glycol system before adding glycol solution, see Section 232500.

N. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.

END OF SECTION 232114

SECTION 232123 - HYDRONIC PUMPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Wet rotor circulators

B. In-line pumps.

1.3 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 230513 - Common Motor Requirements for HVAC Equipment.

C. Section 230548 - Vibration and Seismic Controls for HVAC.

D. Section 230923 - Direct-Digital Control System for HVAC.

E. Section 230934 - Variable-Frequency Motor Controllers.

F. Section 232113 - Hydronic Piping.

G. Section 232114 - Hydronic Specialties.

1.4 REFERENCE STANDARDS

A. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks.

B. NEMA MG 00001 - Motors and Generators.

C. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

D. NFPA 70 - National Electrical Code.

E. UL 778 - Standard for Motor-Operated Water Pumps.

1.5 PERFORMANCE REQUIREMENTS

A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.6 SUBMITTALS

A. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

C. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

B. The pumps shall be factory performance and hydrostatic tested as a complete unit prior to shipment. The testing shall be done in accordance with ISO 9906 Annex A. No test certificate is required.

1.8 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL 778 as suitable for the purpose specified and indicated.

1.9 WARRANTY

A. The warranty period shall be a non-prorated period of 24 months from date of installation, not to exceed 30 months from date of manufacture. Warranty shall cover pump, motor and add-on modules as complete unit.

1.10 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.

B. Complete installation, startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the start up procedure.

D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

F. Contractor shall replace all damaged components and components that failed the inspections at no additional charge.

G. Inspections by the Commissioning Agent shall be on “spot check basis”. Commissioning process does not reduce responsibility of installing contractors to provide a finished and fully functioning product.

H. This section shall in no way diminish the responsibility of the Contractors, Sub-contractors and Suppliers in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this section are in addition to requirements outlined in related specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Grundfos: www.grundfos.us

B. Substitutions: See Section 016000 - Product Requirements.

2.2 GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Minimum Quality Standard: UL 778.

C. Electrical Requirements:

1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2. Variable Frequency Drives (VFDs): Provide in accordance with Section 230934, except for integral-VFDs.

3. Enclosures: Provide unspecified product(s) required to fit motor:

2.3 WET ROTOR CIRCULATOR PUMPS

A. General: The pump shall be a standard product of a single pump manufacturer. The pump and motor shall be designed and built by the same manufacturer.

1. The wet rotor circulator pump shall be certified and listed by UL (1Z28 Water circulating pump) and/or CSA (Water Circulating Pump) for conformance to U.S. and Canadian Standards to operate at 230 degrees F maximum and 35 degrees F minimum.

2. The pumps shall be of the quiet wet rotor in-line design. Maximum noise level of the pump and motor shall be 54dB(A).

3. The pumps shall be capable of operating continuously at 203 degrees F.

4. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region.

B. Construction: The pumps shall have the following features.

1. The pump housing shall be of the in-line type and have a stainless steel neck ring to minimize recirculation and increase pump efficiency.

2. The impellers shall be of the radial type with curved blades. The impeller shall be secured to the shaft by a split cone and nut.

3. The suction and discharge flanges shall be tapped and drilled to allow gauge installation on the pump.

4. Pump Construction.

    a. Pump housing:Cast iron EN-JGL-250 with Cataphorese surface treatment

    b. Impellers: Composite PES 30% GF

    c. Rotor can: PPS reinforced with carbon fiber

    d. Rotor cladding: 316 Stainless Steel

    e. Shaft: 316L Stainless Steel

    f. Thrust Bearing: Tungsten Carbide

    g. Axial thrust bearing: Carbon MY106

    h. Journal: Tungsten Carbide

    i. O-rings: EPDM

    j. Bearing plate: 304 Stainless Steel

C. INTEGRATED VARIABLE FREQUENCY DRIVE MOTORS

1. Each motor shall be 4- or 8-pole, synchronous, permanent-magnet (PM motor) and tested with the pump as one unit by the same manufacturer.

2. Each motor shall be of the Integrated Variable Frequency Drive design consisting of a motor and a Variable Frequency Drive (VFD) built and tested as one unit by the same manufacturer.

3. The stator housing shall be made of pressure die cast aluminum. The stator housing shall have 12 drain holes to enable condensed water to escape.

4. The motor shall be cooled by the pumped fluid.

5. Motor shall be self ventilating. The stator housing shall have nickel plated brass inspection screw.

6. Minimum insulation class for the motors shall be Class F.

7. The integrated VFD control shall utilize an energy optimization algorithm to minimize energy consumption by reducing the factory-set setpoint and adjust to actual system characteristics. This shall be accomplished without the need of any external sensors or input.

D. TERMINAL BOX

1. The terminal box shall be made of black composite material. Enclosure class shall be IP44. Aluminum terminal boxes shall not be acceptable.

2. The terminal box shall be able to connect directly to the mains with out the need of an external contactor.

3. The terminal box shall be suitable to accept add-on modules.

4. The circulator shall be supplied with an integrated VFD and shall not be used with any external VFDs.

2.4 IN-LINE PUMPS

A. Split-Coupled, Single-Stage Pump: Vertical pump with radially- or horizontally-split casing; rated for discharge pressures up to 175 psi.

B. Casing: Cast iron with seal flush connection, threaded suction, and discharge ports with gauge port and drain plug.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Mechanical seal, 225 degrees F maximum continuous duty temperature.

F. Performance:

1. Refer to the schedule on the plans.

G. Electrical:

1. Refer to the schedule on the plans.

2. Motor: 1,750 rpm, open drip-proof (ODP); see Section 230513.

3. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

4. Integral Controls:

a. Variable Frequency Drive (VFD): Factory-fitted and tested with dedicated terminal box for power, instrumentation and related control wiring.

b. DDC Controller: VFD-integrated controller module with visual-tactile interface and minimum of 2 analog inputs, 2 digital inputs, and real-time clock.

c. BAS, SCADA, or Other Integrated Automation Link: BACnet MS/TP in accordance with ASHRAE Std 135.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

1. See Section 230548.

D. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

E. Install close-coupled and base-mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. See Section 033000.

F. Controls: Interface each pump starter or VFD with HVAC controller; see Section 230923.

G. Controls Human-Machine Interface (HMI): HVAC control system; see Section 230923.

3.3 START-UP / TRAINING

A. Engage a factory-authorized service representative to conduct start-up and train Owner’s maintenance personnel for a minimum of 4 hours in the operation, adjustment and maintenance of all equipment furnished.

END OF SECTION 232123

SECTION 232300 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Filter-driers.

F. Flexible connections.

1.3 RELATED REQUIREMENTS

A. Section 230719 - HVAC Piping Insulation.

B. Section 230993 - Sequence of Operations for HVAC Controls.

1.4 REFERENCE STANDARDS

A. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

C. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

F. ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

G. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators.

H. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).

J. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

L. IAPMO (UMC) - Uniform Mechanical Code.

M. ICC (IMC) - International Mechanical Code.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

O. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Test Reports: Indicate results of leak test, acid test.

F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

G. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

B. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.

C. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

D. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2. Use a filter-drier on suction line just ahead of compressor.

3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.

4. Use sealed filter-driers in systems utilizing hermetic compressors.

5. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.

6. Use replaceable core liquid-line filter-driers in systems utilizing receivers.

E. Receivers:

1. Use on systems with long piping runs.

F. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

2.2 REGULATORY REQUIREMENTS

A. Comply with ASME B31.5 for installation of piping system.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.3 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

3. Mechanical Press Fittings: UL 207 listed, ICC (IMC) and IAPMO (UMC) approved, with HNBR seals.

a. Manufacturers:

1) RLS, LLC; RLS Cu (Copper): www.rlspressfittings.com/#sle.

2) Parker Hannifin - Sporlan Division; ZoomLock MAX: www.parker.com/#sle.

3) Substitutions: Not permitted.

B. Copper Tube to 7/8-inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.

1. Fittings: ASME B16.26 cast copper.

2. Joints: Flared.

3. Mechanical Press Sealed Fittings: UL 207 listed, ICC (IMC) and IAPMO (UMC) approved, with HNBR seals.

a. Manufacturers:

1) RLS, LLC; RLS Cu (Copper): www.rlspressfittings.com/#sle.

2) Parker Hannifin - Sporlan Division; ZoomLock MAX: www.parker.com/#sle.

3) Substitutions: Not permitted.

C. Pipe Supports and Anchors:

1. Provide hangers and supports complying with MSS SP-58.

a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.

3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

5. Vertical Support: Steel riser clamp.

6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

10. Rooftop supports: Provide pipe portals at all roof penetrations and piping pedestals at all support locations. Refer to 230529 - Hangers and Supports for HVAC Piping and Equipment for requirements.

2.4 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

B. Refrigerant: R-410A as defined in ASHRAE Std 34.

2.5 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:

1. Parker Hannifin - Sporlan Division; See-All: www.parker.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

B. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.6 VALVES

A. Manufacturers:

1. Parker Hannifin - Sporlan Division: www.parker.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

B. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, flared or solder ends, for maximum pressure of 500 psi.

2.7 FILTER-DRIERS

A. Manufacturers:

1. Parker Hannifin - Sporlan Division; Catch-All: www.parker.com/#sle.

2. Substitutions: See Section 016000 - Product Requirements.

B. Performance:

1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.

2. Flow Capacity - Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730 (I-P).

3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.

4. Design Working Pressure: 350 psi, minimum.

C. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

D. Construction: UL listed.

1. Replaceable Core Type: Steel shell with removable cap.

2. Sealed Type: Copper shell.

3. Connections: As specified for applicable pipe type.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Flexicraft Industries: www.flexicraft.com/#sle.

B. Corrugated bronze hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5 and Section 230529 - Hangers and Supports for HVAC Piping and Equipment.

2. Support horizontal piping as indicated.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.

G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

H. Flood piping system with nitrogen when brazing.

I. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

J. Insulate piping; refer to Section and Section 230716.

K. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

L. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

M. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

N. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

O. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

P. Fully charge completed system with refrigerant after testing.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

3.4 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.

2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.

3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.

4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION 23 23 00 232300

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SECTION 232500 - HVAC WATER TREATMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Materials.

1. System cleaner.

2. Closed system treatment (water).

B. By-pass (pot) feeder.

C. Cleaning of piping systems.

1.3 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

1.4 SUBMITTALS

A. See Section 01 33 00 - Submittial Procedures, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Certificate: Submit certificate of compliance from Authority Having Jurisdiction indicating approval of chemicals and their proposed disposal.

D. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.

E. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section,with minimum ten years of experience and approved by manufacturer.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

1.7 MAINTENANCE MATERIALS

A. See Section 016000 - Product Requirements, for additional provisions.

B. Supply sufficient chemicals for treatment and testing during warranty period.

PART 2 PRODUCTS

2.1 MATERIALS

A. System Cleaner:

1. Manufacturers:

a. Nalco, an Ecolab Company: www.nalco.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.

3. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite or microbiocides such as quarternary ammonia compounds, tributyltin oxide, methylene bis (thiocyanate).

B. Closed System Treatment (Water):

1. Manufacturers:

a. Nalco, an Ecolab Company: www.nalco.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

2. Sequestering agent to reduce deposits and adjust pH; polyphosphate.

3. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

4. Conductivity enhancers; phosphates or phosphonates.

2.2 BY-PASS (POT) FEEDER

A. Manufacturers:

1. J. L. Wingert Company: www.jlwingert.com/#sle.

2. Neptune, a brand of the Dover Company; ____: www.neptune1.com/#sle.

3. Substitutions: See Section 016000 - Product Requirements.

B. 1.8 gal quick opening cap for working pressure of 175 psi.

PART 3 EXECUTION

3.1 PREPARATION

A. Contractor shall provide testing of potable water supply to determine water quality (i.e. PH, chloride content, total hardness, etc.) as it relates to the proposed new equipment. Contractor shall submit test report to Engineer and shall identify if there are any water quality issues with the proposed new equipment along with a proposed treatment program.

B. This will be a phased construction project. Contractor shall clean and flush systems, or portions there of, in accordance with project phasing. Should system not be fully operational, contractor shall provide temporary methods and means to execute the cleaning and flushing process. Use water meter to record capacity in each system.

C. Place terminal control valves in open position during cleaning.

3.2 CLEANING SEQUENCE

A. Concentration:

1. As recommended by manufacturer.

B. Hot Water Heating Systems:

1. Confirm system cleaner is compatible with connected equipment.

2. Apply heat while circulating, slowly raising temperature to 160 degrees F or as recommended by boiler manufactuer, and maintain for 12 hours minimum.

3. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.

4. Circulate for 6 hours at design temperatures, then drain.

5. Refill with clean water and repeat until system cleaner is removed.

C. Use neutralizer agents on recommendation of system cleaner supplier.

D. Remove, clean, and replace strainer screens.

E. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

END OF SECTION 232500

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Ducts for kitchen exhaust applications.

1.3 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 099113 - Exterior Painting: Weld priming, weather resistant, paint or coating.

C. Section 099123 - Interior Painting: Weld priming, paint or coating.

D. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

E. Section 230713 - Duct Insulation: External insulation and duct liner.

F. Section 233300 - Air Duct Accessories.

G. Section 233319 - Duct Silencers.

H. Section 233600 - Air Terminal Units.

I. Section 233700 - Air Outlets and Inlets: Fabric air distribution devices.

1.4 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

G. ASTM E2336 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.

H. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.

I. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.

J. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

K. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

L. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

M. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

N. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

O. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

P. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines.

Q. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

R. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

S. UL 1479 - Standard for Fire Tests of Penetration Firestops.

T. UL 1978 - Grease Ducts.

U. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for duct materials and duct connections.

C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, duct layout, and configuration prior to start of work for duct systems.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

E. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience.

1.7 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.

D. Duct Sealing and Leakage in accordance with Static Pressure Class:

1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:

a. Supply Air: ___ in-wc pressure class, galvanized steel.

b. Supply Air for Fan Coil Units: 1 in-wc pressure class, galvanized steel.

c. Outside Air Intake: 1 in-wc pressure class, galvanized steel.

d. Return and Relief Air: 1 in-wc pressure class, galvanized steel.

e. General Exhaust Air: 1 in-wc pressure class, galvanized steel.

f. Heating or Combustion Air: 1 in-wc pressure class, galvanized steel.

g. Transfer-air and Sound Booths: 1/2 in-wc pressure class, galvanized steel.

h. Kitchen Hood Exhaust: 2 in-wc pressure class, factory manufactured ductwork system.

2. Low Pressure Service: Up to 2 in-wc:

a. Seal: Class C, apply to seal off transverse joints.

b. Leakage:

1) Rectangular: Class 24 or 24 cfm/100 sq ft.

2) Round: Class 12 or 12 cfm/100 sq ft.

3. Low Pressure Service: From 2 in-wc to 3 in-wc:

   a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.

   b. Leakage:

      1) Rectangular: Class 12 or 12 cfm/100 sq ft.

      2) Round: Class 6 or 6 cfm/100 sq ft.

4. Medium and High Pressure Service: 3 in-wc or Above:

   a. Seal: Class A, apply sealing of transverse joints, longitudinal seams, and duct wall penetrations.

   b. Leakage:

      1) Rectangular: Class 6 or 6 cfm/100 sq ft.

      2) Round: Class 3 or 3 cfm/100 sq ft.

E. Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.

2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.

3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.

4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.

7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.2 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

2. Aluminum: ASTM B209/B209M, aluminum sheet, alloy 3003-H14.

3. Aluminum Connectors and Bar Stock: Alloy 6061-T651 or of equivalent strength.

B. Flat-Oval Metal Ducts:

1. Flat-Oval Single Wall Duct: Machine made from a round spiral lock seam duct.

a. Fittings: Manufacture at least two gauges heavier metal than the duct.

b. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

c. Manufacturers:

1) EHG, a DMI Company: www.ehgduct.com/#sle.

2) Linx Industries, Inc a DMI Company: www.li-hvac.com/#sle.

3) McGill Airflow.

4) Substitutions: See Section 016000 - Product Requirements.

C. Round Metal Ducts:

1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.

a. Manufacturers:

1) Linx Industries, Inc, a DMI Company: www.li-hvac.com/#sle.

2) Nordfab Ducting: www.nordfab.com/#sle.

3) McGill Airflow.

4) Substitutions: See Section 016000 - Product Requirements.

2. Round Double Wall Insulated Duct: Round spiral lock seam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with the solid inner wall.

a. Insulation:

1) Thickness: 1 inch.

2) Material: Fiberglass.

b. Manufacturers:

1) McGill Airflow.

2) Semco.

3) Substitutions: See Section 016000 - Product Requirements.

3. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

    a. Manufacturers:

        1) Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.

        2) Substitutions: See Section 016000 - Product Requirements.

D. Round Spiral Duct:

1. Round spiral lock seam duct with galvanized steel outer wall.

2. Manufacturers:

    a. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.

    b. Linx Industries, Inc, a DMI Company: www.li-hvac.com/#sle.

    c. McGill Airflow.

    d. Substitutions: See Section 016000 - Product Requirements.

E. Connectors, Fittings, Sealants, and Miscellaneous:

1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.

2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

    a. Manufacturers:

        1) Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.

        2) Substitutions: See Section 016000 - Product Requirements.

3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

    a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

    b. VOC Content: Not more than 250 g/L, excluding water.

    c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

    d. For Use with Flexible Ducts: UL labeled.

    e. Manufacturers:

        1) Design Polymerics; DP 1010 Water Based Smooth Duct Sealant, Premium Quality: www.designpoly.com/#sle.

2) Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.

3) Substitutions: See Section 016000 - Product Requirements.

4. Gasket Tape:

a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.

b. Manufacturers:

1) Design Polymerics; DP 1040 100 Percent Solids, High Pressure/High-Velocity Butyl Gasket Tape: www.designpoly.com/#sle.

2) Elgen Manufacturing Company, Inc; 440 Butyl Gasket Tape: www.elgenmfg.com/#sle.

3) Substitutions: See Section 016000 - Product Requirements.

5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:

a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

b. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

c. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

d. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

e. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

f. Other Types: As required.

g. Manufacturers:

1) Powers Fasteners, Inc: www.powers.com/#sle.

2) Substitutions: See Section 016000 - Product Requirements.

2.3 FLEXIBLE DUCTS

A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.

1. Insulation: R6 insulation with polyethylene vapor barrier film.

2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.

3. Maximum Velocity: 5500 fpm.

4. Temperature Range: Minus 20 degrees F to 250 degrees F.

5. Manufacturers:

   a. Flexmaster USA, a brand of Masterduct, Inc; Type 1: www.flexmasterusa.com/#sle.

   b. Substitutions: See Section 016000 - Product Requirements.

2.4 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances in accordance with NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.

C. Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.

D. Design, fabricate, and install liquidtight preventing exhaust leakage into building.

E. Kitchen Hood and Grease Exhaust Duct:

1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.

2. Zero Clearance, 2-Hour Fire-Rated, Round, Double-Wall, Premanufactured Grease Duct:

   a. UL Listed and labeled to UL 1978 and UL 2221.

   b. Nominal 3 inches thick, high density body soluble fiber insulation between 20-gauge, 0.035-inch Type 304 stainless steel liner, and 24-gauge, 0.0239-inch aluminized steel sheet outer jacket.

   c. Seal joints during installation with factory-supplied overlapping V-bands and sealant.

   d. Through-penetration firestop listed to UL 1479 or ASTM E814.

   e. Minimum horizontal slope of 1/16 inch per foot per manufacturers listing to UL 1978.

   f. Manufacturers:

      1) Metal-Fab.

      2) Van-Packer.

      3) Duravent.

      4) Substitutions: See Section 016000 - Product Requirements.

3. Zero Clearance, 2-Hour Fire-Rated, Rectangular, Double-Wall, Premanufactured Grease Duct:

   a. Listed when tested in accordance with UL 1978 and ASTM E2336.

b. Construct of 16-gauge, 0.059-inch sheet steel using continuous external welded joints in rectangular sections.

c. Construct of 18-gauge, 0.050-inch stainless steel using continuous external welded joints in rectangular sections.

d. Liquidtight with continuous external weld for seams and joints.

e. Where ducts are not self-draining back to equipment, provide low-point drain pocket with copper drain pipe to sanitary sewer.

f. Through-penetration firestop listed to UL 1479 or ASTM E814.

g. Manufacturers:

1) Metal-Fab.

2) Van-Packer.

3) Duravent.

4) Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Flexible Ducts: Connect to metal ducts with adhesive.

G. Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.

H. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

I. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

J. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

K. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

L. Use double nuts and lock washers on threaded rod supports.

M. Connect terminal units to supply ducts directly.

N. Connect diffusers to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

O. Roof Mounted Ductwork:

1. Provide roof curbs at all roof penetrations. Refer to Section 230548 - Vibration and Seismic Controls for HVAC for roof curb requirements.

2. Provide duct support pedestals at each support location. Refer to Section 230548 - Vibration and Seismic Controls for HVAC for pedestal requirements.

P. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

Q. Fire Partitions: Provide firestopping sealing. See Section 078400.

R. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 233300, 233600, and 233700.

S. Duct Insulation: Provide duct insulation. See Section 230713.

T. Painting: Provide surface finish as indicated on drawings. See Sections 099113 and 099123.

3.2 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean thoroughly each duct system. See Section 230130.51.

C. Clean duct system by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

D. TESTING

1. Provide leakage testing of the following ductwork systems:

a. All ductwork rated at 3" w.c. or greater pressure class.

b. All ductwork risers to be installed in vertical chases or shafts, regardless of pressure class.

c. Where required by code.

2. Perform leakage testing in accordance with SMACNA (LEAK). Any ductwork with leakage exceeding the above allowable leakage rate for its leakage class shall be resealed and retested until compliant.

3. Submit completed test reports to the Engineer for review.

END OF SECTION 23 31 00 233100

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SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Combination fire and smoke dampers.

D. Duct access doors.

E. Duct test holes.

F. Fire dampers.

G. Flexible duct connectors.

H. Volume control dampers.

I. Miscellaneous Products:

1. Duct opening closure film.

1.3 RELATED REQUIREMENTS

A. Section 01 91 13 - General Commissioning Requirements.

B. Section 078400 - Firestopping.

C. Section 230548 - Vibration and Seismic Controls for HVAC.

D. Section 233100 - HVAC Ducts and Casings.

E. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.4 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

D. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

E. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

1.5 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.6 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

1.9 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.

B. Complete installation, startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the start up procedure.

D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Manufacturers:

1. Krueger-HVAC, Division of Air System Components: www.krueger-hvac.com/#sle.

2. Titus HVAC, a brand of Johnson Controls: www.titus-hvac.com/#sle.

3. Substitutions: See Section 016000 - Product Requirements.

B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction, with push-pull operator strap.

2.2 BACKDRAFT DAMPERS - METAL

A. Manufacturers:

1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.

2. Nailor Industries, Inc: www.nailor.com/#sle.

3. Ruskin Company: www.ruskin.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Gravity Backdraft Dampers, Size 18 by 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

C. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:

1. Greenheck Inc.: www.greenheck.com

2. Nailor Industries, Inc: www.nailor.com/#sle.

3. Ruskin Company: www.ruskin.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Fire resistance rated at 1-1/2 hours, Class I leakage rating, 350 degree F temperature rating, fabricated in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

C. Provide factory sleeve and collar for each damper. Sleeve shall provide out-of-wall mounting where flush mounting of sidewall grille within the rated partition is shown on the drawings.

D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

E. Operators: UL listed and labeled; spring-return, electric-type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

F. Normally Closed Smoke Responsive Fire Dampers: Curtain type, opening upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure.

G. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

A. Manufacturers:

1. Nailor Industries, Inc: www.nailor.com/#sle.

2. Ruskin Company: www.ruskin.com/#sle.

3. SEMCO LLC: www.semcohvac.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.

1. Less Than 12 inches Square: Secure with sash locks.

2. Up to 18 inches Square: Provide two hinges and two sash locks.

3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.

4. Larger Sizes: Provide an additional hinge.

D. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 FIRE DAMPERS

A. Manufacturers:

1. Greenheck, Inc : www.greenheck.com

2. Nailor Industries, Inc: www.nailor.com/#sle.

3. Ruskin Company: www.ruskin.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Fire resitance rated at 1-1/2 hours, dynamic fire damper, fabricated in accordance with NFPA 90A and UL 555, and as indicated.

C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream where possible. Provide sleeve for out-of-wall mounting where flush mounting of sidewall grille with in the rated partition is shown on the drawings.

D. Fusible Links: 165 degrees F.

2.7 FLEXIBLE DUCT CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.

2. Elgen Manufacturing Company, Inc: www.elgenmfg.com/#sle.

3. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.

a. Net Fabric Width: Approximately 2 inches wide.

2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

2.8 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Greenheck, Inc: www.greenheck.com

2. Nailor Industries, Inc: www.nailor.com/#sle.

3. Ruskin Company: www.ruskin.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Splitter Dampers:

1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.

3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

D. Single Blade Dampers:

1. Fabricate for duct sizes up to 6 by 30 inch.

2. Blade: 24 gage, 0.0239 inch, minimum.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gage, 0.0478 inch, minimum.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

G. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

H. Constant Airflow Regulators:

1. General Requirements:

a. Provide bi-directional, air balancing regulator for pressure independent air volume control.

b. Complies with UL 2043 for heat and smoke release.

c. Complies with AMCA 500-D for the allowable leakage rates.

d. Airflow regulator to be field adjustable.

2. Construction:

a. Nominal Diameter: 4 inch.

b. Frame: Thermoplastic resin in compliance with UL 94.

c. Blade: Thermoplastic resin in compliance with UL 94.

d. Bearings: Hydraulic blade dampener.

e. Outer Seal: Removable rubber gasket-type around circumference of damper.

f. Spring: Stainless steel leaf-type.

g. Temperature Range: 25 to 150 degrees F .

h. Operating Range: 0.2 to 2 in-wc.

3. Accessories:

a. Provide airflow regulators with rectangular to round transitions.

2.9 MISCELLANEOUS PRODUCTS

A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.

1. Thickness: 2 mils.

2. High tack water based adhesive.

3. UV stable light blue color.

4. Elongation Before Break: 325 percent, minimum.

5. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves and breakaway duct connections.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

K. Use splitter dampers only where indicated.

L. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

M. Install balancing dampers as far as possible from each diffuser, grille or register.

END OF SECTION 233300

SECTION 233319 - DUCT SILENCERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Duct silencers.

1.3 RELATED REQUIREMENTS

A. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment".

B. Section 233100 - HVAC Ducts and Casings: Connections to silencers.

C. Section 233300 - Air Duct Accessories: Flexible duct connections.

1.4 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment.

C. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.

D. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

E. AMCA 302 - Application of Sone Loudness Ratings for Non-Ducted Air Moving Devices.

F. AMCA 303 - Application of Sound Power Level Ratings for Fans.

G. ANSI/ASA S1.4 PART 3 - American National Standard Electroacoustics – Sound Level Meters – Part 3: Periodic Tests.

H. ANSI S1.4 - American National Standard Specification for Sound Level Meters; 1983 (R2006) with Amd.S1.4A-1985.

I. ANSI S1.8 - American National Standard Reference Values for Levels Used in Acoustics and Vibrations.

J. ANSI S1.13 - American National Standard Measurement of Sound Pressure Levels in Air.

K. ANSI S12.1 - American National Standard Guidelines for the Preparation of Standard Procedures to Determine the Noise Emission from Sources.

L. ANSI S12.60-2002 - American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools.

M. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

N. ASHRAE Std 68 - Laboratory Method of Testing to Determine the Sound Power in a Duct.

O. ASTM E477 - Standard Test Method for Laboratory Measurements of Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.

P. ASTM E596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures.

Q. NEBB (STDS) - Procedural Standard for Measurement of Sound and Vibration.

R. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog information indicating, materials, dimensional data, pressure losses, and acoustical performance.

C. Shop Drawings: Indicate assembly, materials, thicknesses, dimensional data, pressure losses, acoustical performance, layout, and connection details.

D. Design Data: Provide engineering calculations, referenced to specifications and AHRI 270, AHRI 270, AMCA 301, AMCA 301, AMCA 302, AMCA 302, AMCA 303, AMCA 303, ANSI S12.1, and ANSI S12.1 standards indicating that maximum room sound levels are not exceeded.

E. Test Reports: Indicate dynamic insertion loss and noise generation values of silencers.

F. Manufacturer's Installation Instructions: Indicate installation procedures necessary to maintain integrity of sound isolation.

G. Manufacturer's Field Reports: Indicate installation is complete and in accordance with instructions.

H. Project Record Documents: Record actual locations of cross-talk silencers, acoustic housings, ductwork lagging, and air transfer silencers.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Perform Work in accordance with AHRI 575, AHRI 575, AMCA 300, AMCA 300, ANSI S1.13, or ANSI S1.13 standards and recommendations of ASHRAE Std 68 ASHRAE Std 68.

1. Maintain one copy of each document on site.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for sound levels at occupied space.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Vibro-Acoustics; www.vibro-acoustics.com

B. Substitutions: See Section 016000 - Product Requirements.

2.2 DUCT SILENCERS

A. General Requirements:

1. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.

2. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.

3. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in other sections are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.

4. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.

5. All perforated steel shall be adequately stiffened to insure flatness and form. All spot welds shall be painted.

6. Fire-Performance Characteristics: Silencer assemblies, including acoustic media fill and sealants shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.

B. Rectangular Silencers**:** Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 22 gauge.

C. Rectangular Elbow Silencers**:** Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel, 18 gauge. All acoustical splitters shall be internally radiused and aerodynamically designed for efficient turning of the air. Half and full splitters are required as necessary to achieve the scheduled insertion loss. All elbow silencers with a turning cross-section dimension greater than 48” shall have at least two half splitters and one full splitter.

D. Inner perforated metal liner: ASTM A 653/A 653M, G90 galvanized sheet steel.

1. Circular Silencers:

2. Connection diameter up to 18 inches: 26 gauge.

3. Connection diameter greater than 18 inches: 22 gauge.

4. Rectangular Silencers: 26 gauge

5. Rectangular Elbow Silencers: 22 gauge.

E. Principal Sound-Absorbing Mechanism:

1. Dissipative and Film Lined silencers:

a. Rectangular and rectangular elbow type with acoustic media. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

2. HTL Casings: Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, breakout noise calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Breakout noise calculations shall be based on the sound power levels of the specified equipment.

3. Special Construction:

a. Where noted on the silencer schedule, silencers shall have 16 gauge casing, continuously welded.

b. Where indicated on the silencer schedule, silencers shall have RF filters integral to the silencer. Performance shall be 100 dB at 1 MHz. Pressure drop shall be included in overall silencer pressure drop. RF filter shall be located such that it cannot be bypassed.

c. Where indicated on the silencer schedule, provide a non-conductive section in the silencer casing at the end of the silencer next to the room wall, and provide a minimum of 10” (254mm) x 10” (254mm) inspection port in the silencer casing next to the wall. These features shall not compromise the composite HTL casing of the silencer.

d. Where indicated on the silencer schedule, provide security bars running at 6” (150mm) centers both ways inside the silencer casing to prevent ingress through the silencer.

4. Accessories:

a. Access Doors: Where indicated on the silencer schedule, silencers shall be supplied with an access door(s) to permit fire damper service. Access doors shall be supplied as an integral part of the silencer by the silencer manufacturer. Where HTL walls are also supplied, the access doors shall not reduce the effectiveness of the HTL walls.

b. Shipping Protection: Silencers shall be shipped with factory-installed end caps to prevent contamination during shipping.

F. Capacities and Characteristics:

1. See duct silencer performance schedule on mechanical drawings. Alternate manufacturer has to provide acoustical analysis to the Mechanical Consultant showing silencers meet the required insertion loss performance as per the acoustical report.

G. Performance:

1. Refer to the schedule on the plans for types, sizes and performance.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support duct silencers rigidly to ducts. See Section 233100 and Section 233300.

3.2 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of an independent testing agency to take noise measurements in accordance with provisions of NEBB (STDS). Use meters meeting requirements of ANSI/ASA S1.4 PART 3.

C. After start-up, final corrections and balancing of systems take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and pipe shafts, and other critical locations, as directed.

D. Provide one-third octave band measurements of artificial sound sources in areas indicated as having critical requirements.

E. Ensure duct silencers are installed with airflow arrows in direction of airflow.

F. Submit complete report of test results including sound curves.

END OF SECTION 233319

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SECTION 233413 - AXIAL HVAC FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Residential ceiling fans.

1.2 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on axial fans and accessories, including fan curves with specified operating point plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

C. Shop Drawings: Indicate assembly of axial fans and accessories including fan curves with specified operating point plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

D. Manufacturer's Instructions: Indicate installation instructions.

E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.7 FIELD CONDITIONS

A. Do not use permanent fans for ventilation during construction.

B. Permanent fans may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings lubricated, and fan run tested under observation.

PART 2 PRODUCTS

2.1 RESIDENTIAL CEILING FANS

A. Manufacturers:

1. Big Ass Fans: www.bigassfans.com/#sle.

2. Greenheck.

3. Hunter.

4. Substitutions: See Section 016000 - Product Requirements.

B. Construction: Aluminum blades, statically and dynamically balanced, locked to shaft, directly connected to direct-drive, reversible motor.

C. Number of Fan Blades: Three.

D. Mounting Options: Ceiling.

E. Motor: Variable speed brushless DC electronically commutated type.

F. Accessories:

1. Controller: Wall-mounted bluetooth fan speed controller..

G. Hardware Color:

1. To be selected by Architect from manufacturer's standard color chart.

H. Blade Color:

1. To be selected by Architect from manufacturer's standard color chart.

I. Safety Cable: Supplied with steel cable fastened to seismic restraint point integrated into the fan housing.

J. Certification: UL Standard 507 for Safety Electric Fans, CAN//CSA-C22.2 No. 1113 and UL 94 5VA as certified by nationally recognized testing laboratory. Acceptable laboratories include ETL, UL or other nationally recognized testing laboratories.

K. Identification: Permanently affixed manufacturer’s nameplate including the following: Model Number, Serial Number, Motor Power Specifications, Country of Manufacture and Safety Marks: ETL (US & CA) & CE (EU).

L. Performance Ratings: As indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with resilient mountings and flexible electrical leads; see Sections 230548 and 260583.

END OF SECTION 233413

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SECTION 233423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Roof exhausters.

B. Wall exhausters.

C. Kitchen hood upblast roof exhausters.

1.3 RELATED REQUIREMENTS

A. Section 01 91 13 - General Commissioning Requirements.

B. Section 230548 - Vibration and Seismic Controls for HVAC.

C. Section 233300 - Air Duct Accessories: Backdraft dampers.

D. Section 251400 - Integrated Automation Local Control Units.

E. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

F. Section 500000 - Commissioning Requirements.

1.4 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program.

B. AMCA 99 - Standards Handbook.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

G. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

H. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

I. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances.

1.5 SUBMITTALS

A. See Section 01 33 00 - Submittial Procedures, for submittal procedures.

B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.7 FIELD CONDITIONS

A. Permanent ventilators may be used for ventilation during construction only after ductwork is clean, filters are in place, bearings have been lubricated, and fan has been test run under observation.

1.8 WARRANTY

A. The warranty period shall be a non-prorated period of 24 months from the date of final acceptance by Owner, unless otherwise noted., not to exceed 30 months from date of manufacture. Warranty shall cover pump, motor and add-on modules as complete unit.

1.9 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.

B. Complete installation, startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the start up procedure.

D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

F. Contractor shall replace all damaged components and components that failed the inspections at no additional charge.

G. Inspections by the Commissioning Agent shall be on “spot check basis”. Commissioning process does not reduce responsibility of installing contractors to provide a finished and fully functioning product.

H. This section shall in no way diminish the responsibility of the Contractors, Sub-contractors and Suppliers in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this section are in addition to requirements outlined in related specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Loren Cook Company (Basis of design): www.lorencook.com.

B. Greenheck: www.greenheck.com.

C. Loren Cook Company: www.lorencook.com.

D. Twin City Fans & Blowers: www.tcf.com

E. Substitutions: See Section 016000 - Product Requirements.

2.2 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. UL Compliance: UL 705, listed, labeled, designed, manufactured, and tested.

F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

G. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.3 ROOF EXHAUSTERS

A. Product Requirements:

1. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

2. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

3. Fabrication: Conform to AMCA 99.

4. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

B. Fan Unit: direct or belt driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen. The aluminum base shall have a one-piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. A two-piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools.

C. Motor: ECM

D. Roof Curb: 18 inch high (above finish roof) self-flashing of galvanized steel with continuously welded seams, built-in cant strips, interior baffle with acoustic insulation, curb bottom, factory installed nailer strip, and damper tray.

E. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

F. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

2.4 WALL EXHAUSTERS

A. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm can be reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

2.5 KITCHEN HOOD UPBLAST ROOF EXHAUSTERS

A. Direct Drive Fan:

1. Fan Wheel:
    a. Type: Non-overloading, backward inclined centrifugal.
    b. Material: Aluminum, statically and dynamically balanced.
2. Housing:
    a. Construct of heavy gage aluminum including curb cap, windband, and motor compartment. A two-piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools.
    b. Rigid internal support structure.
    c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
    d. Construct drive frame assembly of heavy gauge steel, mounted on vibration isolators.
    e. Provide breather tube for fresh air motor cooling and wiring.

B. Disconnect Switches:
1. Factory mounted and wired.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
    a. Outdoor Locations: Type 3R.
3. Positive electrical shutoff.
4. Wired from fan motor to junction box installed within motor compartment.

C. Roof Curb: 24 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.

D. Drain Trough: Allows for single-point drainage of water, grease, and other residues.

E. Options/Accessories:
1. Birdscreen:
    a. Provide galvanized steel construction.
    b. Protects fan discharge.
2. Clean Out Port: Removable grease repellent compression rubber plug allows access for cleaning wheel through windband.
3. Drain Connection:
    a. Aluminum construction.

b. Container allows single-point drainage of grease, water, or other residues.

4. Grease Trap:

a. Aluminum.

b. Container system to collect grease residue.

5. Hinge Kit:

a. Aluminum hinges.

b. Hinges and restraint cables mounted to base sleeve.

c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.

6. Heat Baffle: Prevents heat from radiating into motor compartment.

7. Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

3.2 CLOSEOUTS

A. See Section 017800-Closeout Submittals, for closeout submittals.

B. See Section 017900-Demonstration and Training, for additional requirements.

C. Provide minumum of 2 hours of training.

END OF SECTION 233423

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. Round ceiling diffusers.

B. Rectangular ceiling diffusers.

C. Perforated face ceiling diffusers.

D. Ceiling slot diffusers.

E. Duct-mounted supply and return registers/louvers.

F. Ceiling exhaust and return registers/grilles.

G. Ceiling egg crate exhaust and return grilles.

H. Wall supply registers/grilles.

I. Wall exhaust and return registers/grilles.

J. Gravity ventilators.

1.3 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting - Painting of ducts visible behind outlets and inlets.

B. Section 230548 - Vibration and Seismic Controls for HVAC

C. Section 23 31 00 - HVAC Ducts and Casings.

D. Section 23 33 00 - Air Duct Accessories.

1.4 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating.

B. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices.

C. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers.

D. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2001.

E. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

H. SMACNA (ASMM) - Architectural Sheet Metal Manual.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.5 SUBMITTALS

A. See Section 01 33 00 - Submittial Procedures, for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.6 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.

B. Krueger: www.krueger-hvac.com/#sle.

C. Price Industries: www.price-hvac.com/#sle.

D. Substitutions: See Section 016000 - Product Requirements.

2.2 ROUND CEILING DIFFUSERS

A. Type: Round, adjustable pattern, stamped or spun, multicore diffuser to discharge air in 360-degree pattern, with sectorizing baffles where indicated. Project diffuser collar not more than 1 inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.

B. Fabrication: Steel with baked enamel finish.

C. Color: As selected by Engineer from manufacturer's standard range.

2.3 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide multi-louvered diffuser to discharge air in one way, two way, three way, and four way pattern with sectorizing baffles where indicated.

B. Connections: Round.

C. Frame: Provide inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Fabrication: Steel with powder coat finish.

2.4 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Inverted T-bar type.

C. Fabrication: Steel with aluminum frame and baked enamel finish.

D. Color: As selected by Engineer from manufacturer's standard range.

2.5 CEILING SLOT DIFFUSERS

A. Type: Continuous 1 inch wide slot, two or three slots wide, with adjustable vanes for left, right, or vertical discharge.

B. Fabrication: Aluminum extrusions with factory baked enamel finish.

C. Color: To be selected by Engineer from manufacturer's standard range.

D. Frame: 1-1/4 inch margin with support clips for T bar mounting and gasket, mitered end border.

E. Plenum: Integral, galvanized steel, insulated.

2.6 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

A. Type: Duct-mounted, rectangular louver for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, extractor, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

B. Material: Extruded aluminum.

C. Provide crossing spiral fitting-body of matching duct diameter.

D. Color: As indicated on drawings.

2.7 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Engineer from manufacturer's standard range.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.8 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.

B. Fabrication: Grid core consists of aluminum with mill aluminum finish.

C. Color: To be selected by Engineer from manufacturer's standard range.

D. Frame: 1-1/4 inch margin with countersunk screw mounting.

E. Frame: Channel lay-in frame for suspended grid ceilings.

F. Accessories: Provide 2 inch filter frame, plaster frame, and _____.

2.9 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch 3/4 inch minimum depth, 3/4 inch 3/4 inch maximum spacing with spring or other device to set blades, vertical vertical face, double deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Engineer from manufacturer's standard range.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.10 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Engineer from manufacturer's standard range.

E. Gymnasiums: Provide front pivoted or welded in place blades, securely fastened to be immobile.

2.11 GRAVITY VENTILATORS

A. Spun Aluminum Intake and Relief Gravity Ventilator:

1. Manufacturers:

a. Greenheck Fan Corporation: www.greenheck.com/#sle.

b. Loren Cook Company: www.lorencook.com/#sle.

c. Substitutions: See Section 016000 - Product Requirements.

2. General:

a. Provide low silhouette or tiered configuration for intake and relief applications with natural gravity or negative pressure system.

b. Performance ratings and factory testing in accordance with AMCA 511 and AMCA 550.

c. Suitable for ducted applications.

d. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.

3. Hood:

a. Material: Aluminum.

b. Internal structure constructed of galvanized steel.

4. Birdscreen:

a. Fabricate in accordance with ASTM B221 (ASTM B221M).

b. Construction: 1/2 inch galvanized mesh.

c. Horizontally mounted across hood intake area.

5. Housing:

a. Curb Cap:

1) Type: Hinged.

2) Construction: Aluminum.

3) Integral deep spun inlet venturi with pre-punched mounting holes to ensure correct attachment to roof.

b. Windband:

1) One piece spun aluminum construction with uniform, original material thickness throughout housing.

2) Include integral rolled bead for strength.

6. Options/Accessories:

a. Roof Curbs:

1) Provide with 18" high, wind rated roof curb with damper tray and internal liner.

2) Refer to Section 230529 230548 - Vibration and Seismic Controls for HVAC for roof curb requirements.

b. Curb Seal: Rubber seal between fan and roof curb.

c. Dampers:

1) Type: Gravity.

2) Factory designed to prevent outside air from entering back into building when fan is off.

3) Balanced for minimal resistance to flow.

4) Galvanized frames with pre-punched mounting holes.

d. Tie-Down Points: Aluminum brackets located on hood supports to secure fan in heavy wind applications.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate RGD color and border type with Architect.

C. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

D. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

E. Install diffusers to ductwork with air tight connection.

F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099123.

END OF SECTION 233700

SECTION 235100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 SECTION INCLUDES

A. Manufactured breechings.

B. Manufactured chimneys and breeching for gas fired equipmnet (For Boilers & Gas Water Heaters).

C. Double wall metal stacks.

1.3 RELATED REQUIREMENTS

1.4 REFERENCE STANDARDS

A. ANSI Z21.66 - Automatic Damper Devices for Use with Gas-Fired Appliances.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

C. NFPA 54 - National Fuel Gas Code.

D. NFPA 70 - National Electrical Code.

E. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

G. UL 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances.

H. UL 441 - Standard for Gas Vents.

I. UL 641 - Type L Low Temperature Venting Systems.

J. UL 959 - Medium Heat Appliance Factory Built Chimneys.

K. UL 1738 - Standard for Venting Systems for Gas Appliances, Catergories II, III and IV.

1.5 DEFINITIONS

A. Breeching: Vent connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Smoke Pipe: Round, single wall vent connector.

D. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

E. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.6 SUBMITTALS

A. See Section 01330 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.

C. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory built units are used.

D. Manufacturer's Instructions: Include installation instructions, and indicate assembly, support details, and connection requirements.

1.7 QUALITY ASSURANCE

A. Designer Qualifications: Design stacks under direct supervision of a Professional Structural Engineer experienced in design of the type of work specified and licensed in the State in which the Project is located.

B. Comply with NFPA 54

C. Components coming in contact with the products of combustion shall carry the appropriate UL or cUL listing, mark or label.

D. Must install duct in accordance to manufacturer's listings and installation instructions.

E. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 5 years of documented experience.

F. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years documented experience, and approved by manufacturer.

1.8 REGULATORY REQUIREMENTS

A. Conform to applicable code for installation of natural gas burning appliances and equipment.

B. Conform to applicable code for installation of oil burning appliances and equipment.

1.9 WARRANTY

A. Condensing Appliance vent listed to UL1738 shall have a limited lifetime warranty to begin at the date of installation. Any portion of the vent repaired or replaced under warranty shall be warranted for the remainder of the original warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal-Fab, Inc: www.mtlfab.com. Reference Standard

B. Selkirk Corporation: www.selkirkcorp.com.

C. Duravent.

D. Substitutions: See Section 016000 - Product Requirements.

2.2 BREECHINGS, CHIMNEYS, AND STACKS - GENERAL REQUIREMENTS

A. Regulatory Requirements:

1. Comply with applicable codes for installation of natural gas burning appliances and equipment.

2. Design metal stacks for wind loading and seismic loads for at site location.

2.3 DOUBLE WALL METAL STACKS- GAS APPLIANCES

A. Provide double wall metal stacks, tested to UL 103, UL 1738 and UL listed, for use with building heating equipment, in compliance with NFPA 54.

B. Fabricate with 1 inch minimum air space between walls.

C. Maximum temperature shall not exceed 550˚ F (288˚ C).

D. Vent shall be listed for an internal static pressure of 6 inch w.g. and tested to 15 inch w.g. for diameters 6 inch - 36 inch.

E. Vent shall be constructed of AL29-4C material tested to UL1738, .015 thickness for 6 inch - 12 inch diameters, .024 thickness for 14 inch to 24 inch diameters with 1-1/2” long internal sleeve on one end with 1/2” flanges on both ends.

F. Outer casing shall be constructed of 430 SS, .018 inch thickness for 6 inch to 12 inch diameters, .024 inch thickness for 14 inch to 24 inch diameters.

G. Accessories, UL labeled:

1. Ventilated Roof Thimble: Consists of roof penetration, vent flashing with spacers and storm collar.

2. Exit Cone: Consists of inner cone, and outer jacket, to increase stack exit velocity 1.5 times.

3. Stack Cap: Consists of conical rainshield with inverted cone for partial rain protection with low flow resistance.

4. Appliance Adapter: Sized to fit specified appliance.

5. Horizontal/Vertical Drain Section: Consists of concentric inner and outer pipe with drain connection fitting.

6. Provide all necessary installation accessories, including but not limited to wall supports, wall hangers, plate supports, couplings, tees, elbows, caps, etc. to provide for a complete and functional system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

C. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support vertical breechings, chimneys, and stacks at 12 foot spacing, to adjacent structural surfaces, **with stainless steel guy wires,** or at floor penetrations. Refer to SMACNA (DCS) for equivalent duct support configuration and size.

D. Install concrete inserts for support of breechings, chimneys, and stacks in coordination with formwork.

E. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.

F. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement. Connect base section to foundation using anchor lugs.

G. Level and plumb chimney and stacks.

H. Clean breechings, chimneys, and stacks during installation, removing dust and debris.

I. At appliances, provide slip joints permitting removal of appliances without removal or dismantling of breechings, breeching insulation, chimneys, or stacks.

J. For condensing applications, provide drain section in chimney. Run drain pipe from drain connection to acid neutralizer tank. Install in accordance with the manufacturers instructions.

K. For natural draft equipment, install barometric draft regulators in accordance with the equipment manufacturers instructions.

3.2 STORAGE AND CONSTRUCTION

A. Protect materials from accidental damage.

B. All supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be included.

C. Joint assembly utilizes flange & 1-1/2” long internal sleeve connection for diameters 6 inch –24 inch. P077 sealant will be used on the flange surface. Flanges are joined with a vee band secured by tightening draw bolts.

D. Where exposed to weather, the outer closure band shall be sealed to prevent moisture from entering the space between the walls.

E. Vent shall terminate in accordance with installation instructions and local codes.

F. Installation shall conform to manufacturers installation instructions.

3.3 CLOSEOUTS

A. See Section 017800-Closeout Submittals, for closeout submittals.

B. See Section 017900-Demonstration and Training, for additional requirements.

3.4 SCHEDULES

A. Breechings, Chimneys and Stacks.

1. Boiler: Double wall metal stack.

2. Water Heater: Double wall metal stack.

END OF SECTION 235100

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SECTION 235216 - CONDENSING BOILERS

VEPART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Boilers.

1.3 RELATED SECTIONS

A. Section 23 21 13 - Hydronic Piping.

1.4 REFERENCES

A. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2004 (addendum 2005).

B. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2004.

1.5 PERFORMANCE REQUIREMENTS

A. Performance rating shall be in accordance with Hydronics Institute Testing and Rating Standard for Commercial Boilers.

B. Refer to the schedule on the plans for project specific performance requirements.

1.6 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, and method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring.

C. Source Quality Control Tests and Inspection Reports: Indicate and interpret test results for compliance with performance requirements before shipping.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Maintenance Data: Include in the maintenance manuals specified in Division 1. Include parts list, maintenance guide, and wiring diagrams for each boiler.

1.7 REGULATORY REQUIREMENTS

A. Conform to ASME (BPV IV) for construction of boilers.

B. Boilers shall meet SCAQMD Low NOx emission requirement of 14NG/J.

C. Boilers shall meet CSD-1 requirements.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.9 WARRANTY

A. The heat exchanger assembly shall carry a ten (10) year warranty with an additional twenty one (21) year thermal shock warranty on heat exchanger.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Lochinvar Crest

B. Substitutions: See Section 016000 - Product Requirements.

2.2 BOILERS

A. BOILER CONSTRUCTION

1. Description: Boiler shall be natural gas fired, fully condensing, and fire tube design. The boiler shall be factory-fabricated, factory-assembled, and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

2. Heat Exchanger: The heater exchanger shall bear the ASME “H” stamp for 160 psi working pressure and shall be National Board listed. The heat exchanger shall be constructed of a fully welded 316L stainless steel and of fire tube design. Fire tube shall be of the Wave Fire Tube design and capable of transferring 16,000 to 20,000 Btu’s per tube. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. There shall be no banding material, bolts, gaskets or “O” rings in the heat exchanger design. Cast iron, aluminum, or condensing copper tube boilers will not be accepted.

3. Condensate Collection Basin: Fully welded 316L stainless steel.

4. Intake Filter and Dirty Filter Switch: Boiler shall include an intake air filter with a factory installed air pressure switch. The pressure switch will alert the end user on the screen of the boiler that the intake filter is dirty and needs to be changed.

5. Pressure Vessel: The pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The pressure vessel shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 6.5 psi at 180 gpm.

6. Burner: Natural gas, forced draft single burner premix design. The burner shall be high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The burner shall be capable of the stated gas train turndown without loss of combustion efficiency. The burner shall have an independent laboratory rating for Oxides of Nitrogen (NOx) to meet requirements of South Coast Air Quality Management District (SCAQMD) as compliant with Rule 1146.2, Bay Area Quality Management District as compliant with Regulation 9 Rule 7 and Texas Commission on Environmental Quality as being compliant with Section 117.465.

7. Blower: Boiler shall be equipped with a pulse width modulating blower system to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The burner firing sequence of operation shall include pre-purge, firing, modulation, and post-purge operation.

8. Gas Train: The boiler shall be supplied with two gas valves designed with negative pressure regulation and shall be capable of a minimum turndown of 25:1.

9. Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision.

10. High Altitude: Boiler shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments. High altitude operation shall be certified at a minimum of 4,500 feet above sea level by a third party organization. High altitude boilers shall be certified to 3,000 to 12,000 feet above sea level. The boilers shall carry a CSA certification for high altitude operation up to 12,000 feet.

11. Casing:

    a. Jacket: Heavy gauge primed and painted steel jacket with snap-in closures.

    b. Control Compartment Enclosures: NEMA 250, Type 1A.

    c. Insulation: Minimum ½ inch thick, mineral fiber insulation surrounding the heat exchanger.

    d. Combustion-Air Connections: Inlet and vent duct collars.

B. BOILER TRIM

1. Safety Relief Valve:

    a. Size and Capacity: 75 lb.

    b. Description: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.

2. Pressure Gage: Minimum 3-1/2 inch diameter. Gage shall have normal operating pressure about 50 percent of full range.

3. Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.

4. Condensate Neutralization Kit: Factory supplied condensate trap with condensate trip sensor, high capacity condensate receiver prefilled with appropriate medium.

C. BOILER CONTROLS

1. Boiler controls shall feature a standard, factory installed 8” LCD screen display with the following standard features:

   a. Variable Speed Boiler Pump Control: Boiler may be programmed to send a 0-10V DC output signal to an ECM or VFD boiler pump to maintain a designed temperature rise across the heat exchanger. The boiler shall be able to operate in this mode with a minimum temperature rise of 20 degrees F and a maximum temperature rise of 60 degrees F.

   b. Password Security: Boiler shall have a different password security code for the User and the Installer to access adjustable parameters.

   c. Outdoor air reset: Boiler shall calculate the set point using a field installed, factory supplied outdoor sensor and an adjustable reset curve.

   d. Pump exercise: Boiler shall energize any pump it controls for an adjustable time if the associated pump has been off for a time period of 24 hours.

   e. Ramp delay: Boiler may be programmed to limit the firing rate based on six limits steps and six time intervals.

   f. Boost function: Boiler may be programmed to automatically increase the set point a fixed number of degrees (adjustable by installer) if the setpoint has been continuously active for a set period of time (time adjustable by installer). This process will continue until the space heating demand ends.

   g. Domestic hot water priority: Boiler shall make the domestic hot water call for heat a priority over any space heating call and adjust the boiler setpoint to the domestic hot water boiler setpoint.

   h. Domestic hot water modulation limiting: Boiler may be programmed to limit the maximum domestic hot water firing rate to match the input rating of the indirect tank coil.

   i. Domestic hot water night setback: Boiler may be programmed to reduce the domestic hot water tank set point during a certain time of the day.

   j. PC port connection: Boiler shall have a PC port allowing the connection of PC boiler software.

   k. Time clock: Boiler shall have an internal time clock with the ability to time and date stamp lock-out codes and maintain records of runtime.

l. Service reminder: Boiler shall have the ability to display a yellow colored service notification screen based upon months of installation, hours of operation, and number of boiler cycles. All notifications are adjustable by the installer.

m. Three pump control: Boiler shall have the ability to control the boiler pump, system pump and the domestic hot water pump.

n. Anti-cycling control: Boiler shall have the ability to set a time delay after a heating demand is satisfied allowing the boiler to block a new call for heat. The boiler will display an anti-cycling blocking on the screen until the time has elapsed or the water temperature drops below the anti-cycling differential parameter. The anticycling control parameter is adjustable by the installer.

o. Night setback: Boiler may be programmed to reduce the space heating temperature set point during a certain time of the day.

p. Freeze protection: Boiler shall turn on the boiler and system pumps when the boiler water temperature falls below 45 degrees. When the boiler water temperature falls below 37 degrees the boiler will automatically turn on. Boiler and pumps will turn off when the boiler water temperature rises above 43 degrees.

q. Isolation valve control: Boiler shall have the ability to control a 2-way motorized control valve. Boiler shall also be able to force a fixed number of valves to always be energized regardless of the number of boilers that are firing.

r. BMS integration with 0-10V DC input: The Control shall allow an option to Enable and control set point temperature or control firing rate by sending the boiler a 0- 10V input signal.

s. Data logging: Boiler shall have non-volatile data logging memory including last 10 lockouts, hours running and ignition attempts and should be able to view on boiler screen.

2. The boiler shall have a built in Cascade controller to sequence and rotate lead boiler to ensure equal runtime while maintaining modulation of up to 8 boilers of different btu inputs without utilization of an external controller. The factory installed, internal cascade controller shall include:

a. Lead lag:

b. Efficiency optimization: The Control module shall allow multiple boilers to fire at minimum firing rate in lieu of Lead/Lag.

c. Front end loading:

d. Rotation of lead boiler: The Control module shall change the lead boiler every hour for the first 24 hours after initializing the Cascade. Following that, the leader will be changed once every 24 hours.

3. Boiler operating controls shall include the following devices and features:

a. Set-Point Adjust: Set points shall be adjustable.

b. Operating Pressure Control: Factory wired and mounted to cycle burner.

c. Sequence of Operation: Factory installed controller to modulate burner firing rate to maintain system water temperature in response to call for heat.

d. Sequence of Operation: Electric, factory-fabricated and factory-installed panel to control burner firing rate to reset supply-water temperature inversely with outside air temperature. At 10 deg F outside-air temperature, set supply-water temperature at 180 deg F; at 60 deg F outside-air temperature, set supply-water temperature at 140 deg F.

4. Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

a. High Temperature Limit: Automatic and manual reset stops burner if operating conditions rise above maximum boiler design temperature. Limit switch to be manually reset on the control interface.

b. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manually reset on the control interface.

c. Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.

d. High and Low Gas Pressure Switches: Pressure switches shall prevent burner operation on low or high gas pressure. Pressure switches to be manually reset on the control interface.

e. Proof of Closure Valve (FB 6001 only): Proof of closure valve (POC) shall prevent the boiler from firing if the POC valve seat is detected open. Upon a call for heat, once the POC valve seat is proven to be closed, the pre-purge cycle will begin and the POC valve will begin to open.

f. Blocked Drain Switch: Blocked drain switch shall prevent burner operation when tripped. Switch to be manually reset on the control interface.

g. Low air pressure switch: Pressure switches shall prevent burner operation on low air pressure. Switch to be manually reset on the control interface.

h. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for any lockout conditions.

5. Building Automation System Interface: Factory installed Modbus and BACnet MSTP gateway interface to enable building automation system to monitor, control, and display boiler status and alarms.

a. BACnet IP and LonWorks gateways are available as optional equipment.

6. CON•X•US Remote Connect: Integral remote connectivity technology that allows a mobile device to monitor and control boiler functionality. Internet connection is available on the Crest via Wi-Fi or hardwired Ethernet connection.

D. ELECTRICAL POWER

1. Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

2. Electrical Characteristics:

a. Refer to schedules on Construction Drawings.

E. BOILER VENTING

1. Refer to Section 235100 - Breechings, Chimneys, and Stacks for exhaust venting requirements.

2. Refer to Section 233100 - HVAC Ducts and Casingsfor combustion air duct requirements.

3. Boiler shall come standard with a flue sensor to monitor and display flue gas temperature on factory provided LCD display.

F. SOURCE QUALITY CONTROL

1. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test.

2. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

3. Allow Owner access to source quality-control testing of boilers. Notify Architect 14 days in advance of testing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine area to receive boiler for compliance with requirements for installation tolerances and other conditions affecting boiler performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install boilers level and plumb, according to manufacturer’s written instructions and referenced standards.

B. Install gas-fired boilers according to NFPA 54.

C. Support boilers on a minimum 4-inch thick concrete base, 4 inches larger on each side than base of unit.

D. Install electrical devices furnished with boiler, but not specified to be factory mounted.

E. Connect gas piping full size, to boiler gas-train inlet with union.

F. Connect hot water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

G. Install piping from safety-relief valves to 6" AFF.

H. Connect breeching to boiler outlet, full size of outlet. The boiler shall operate under positive (Category IV) stack pressure.

3.3 STARTING EQUIPMENT

A. Engage a factory-authorized service representative to provide startup service. Start up to be performed only after complete boiler room operation is field verified to offer a substantial load, and complete system circulation. One-year warranty shall be handled by factory authorized tech.

B. Verify that installation is as indicated and specified.

1. Verify that electrical wiring installation complies with manufacturer’s submittal and installation requirements in Division 16 Sections. Do not proceed with boiler startup until wiring installation is acceptable to equipment Installer.

C. Complete manufacturer’s installation and startup checklist and verify the following:

1. Boiler is level on concrete base.

2. Flue and chimney are installed without visible damage.

3. No damage is visible to boiler jacket, refractory, or combustion chamber.

4. Pressure-reducing valves are checked for correct operation and specified relief pressure. Adjust as required.

5. Clearances have been provided and piping is flanged for easy removal and servicing.

6. Heating circuit pipes have been connected to correct ports.

7. Labels are clearly visible.

8. Boiler, burner, and flue are clean and free of construction debris.

9. Pressure and temperature gages are installed.

10. Control installations are completed.

D. Ensure pumps operate properly.

E. Check operation of gas pressure regulator device on gas train, including venting.

F. Check that fluid-level, flow-switch (optional), and high-temperature interlocks are in place.

G. Start pumps and boilers, and adjust burners to maximum operating efficiency.

1. Fill out startup checklist and attach copy with Contractor Startup Report.

2. Check and record performance of factory-provided boiler protection devices and firing sequences.

3. Check and record performance of boiler fluid-level, flow-switch (optional), and high-temperature interlocks.

4. Operate boilers as recommended or required by manufacturer.

H. Perform the following tests for maximum and minimum firing rates for modulating burner. Adjust boiler combustion efficiency at maximum and minimum modulation rates. Perform combustion flue gas test at minimum and maximum modulation rate. Measure and record the following:

1. Differential pressure across air / gas orifice.

2. Combustion-air temperature at inlet to burner.

3. Flue-gas temperature at boiler discharge.

4. Flue-gas carbon dioxide, oxygen, and carbon monoxide concentration.

5. Flue gas NOx emissions where applicable.

6. Natural flue draft.

I. Measure and record temperature rise through each boiler.

3.4 CLEANING

A. Flush and clean boilers on completion of installation, according to manufacturer’s written instructions.

B. After completing boiler installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes including chips, scratches, and abrasions with manufacturer's stainless steel polish.

3.5 TRAINING

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel for a minimum of 4 hours as specified below:

1. Operate boiler, including accessories and controls, to demonstrate compliance with requirements.

2. Train Owner’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in the maintenance manuals. Refer to Division 1 Section “Contract Closeout.”

4. Review data in the maintenance manuals. Refer to Division 1 Section “Operation and Maintenance Data.”

5. Schedule training with Owner with at least 7 days’ advance notice.

END OF SECTION 23 52 40 235216

SECTION 237416 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

B. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to this section.

1.2 GENERAL DESCRIPTION

A. Packaged rooftop units (3 - 10 tons).

B. Packaged rooftop units (27.5 - 50 tons)

1.3 RELATED REQUIREMENTS

A. Section 01 91 13 - General Commissioning Requirements.

1.4 QUALITY ASSURANCE

A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.

B. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

C. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

D. ANSI/ASHRAE 37 - Testing Unitary Air Conditioning and Heat Pump Equipment.

E. Unit shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.

F. Unit Energy Efficiency Ratio (EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

G. AHRI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment. (all under 135,000 btuh)

H. AHRI 270 - Sound Rating of Outdoor Unitary Equipment. (all below 135,000).

I. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment. (all above 135,000 Btuh)

1.5 SUBMITTALS

A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be shipped with doors bolted shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.7 WARRANTY

A. Provide parts warranty (excluding refrigerant) for one year from start-up.

B. Provide five-year extended warranty for compressors.

1.8 EXTRA MATERIALS

A. Provide one set of filters.

B. Furnish a complete set of fan motor drive belts.

1.9 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.

B. Complete installation, startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the startup procedure.

D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

E. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

F. Contractor shall replace all damaged components and components that failed the inspections at no additional charge.

G. Inspections by the Commissioning Agent shall be on “spot check basis”. Commissioning process does not reduce responsibility of installing contractors to provide a finished and fully functioning product.

H. This section shall in no way diminish the responsibility of the Contractors, Sub-contractors and Suppliers in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this section are in addition to requirements outlined in related specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Products shall be provided by the following manufacturers:

1. AAON: www.aaon.com (Basis of Design).

2. Substitutions: See Section 016000 - Product Requirements.

2.2 PACKAGED ROOFTOP AIR CONDITIONING UNITS

A. General Description

1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, water-cooled condenser, reheat coil, exhaust fans, energy recovery wheels, and unit controls.

2. Unit shall be factory assembled and tested including leak testing of the DX coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment’s literature pocket.

3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.

4. Unit components shall be labeled, including refrigeration system components and electrical and controls components.

5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.

6. Installation, Operation, and Maintenance manual shall be supplied within the unit.

7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment’s hinged access door.

8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment’s hinged access door.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, reduces heat transfer through the panel, and prevents exterior condensation on the panel.

4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.

6. Access to filters, dampers, cooling coils, reheat coil, energy recovery wheels, compressors, water-cooled condensers, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full-length stainless-steel piano hinges shall be included on the doors.

7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.

9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.

10. Unit shall include lifting lugs on the top of the unit.

11. Unit base shall be fabricated of 1-inch-thick double wall, impact resistant, rigid polyurethane foam panels.

C. Electrical

1. Unit shall have a 5kAIC SCCR.

2. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.

3. Unit shall be provided with a factory installed and factory wired 115V, 12-amp GFI outlet disconnect switch in the unit control panel.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

E. Exhaust Fans

1. Exhaust dampers shall be sized for 100% relief.
2. Fans and motors shall be dynamically balanced.
3. Unit shall include barometric relief dampers.
4. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
5. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.
6. Unit shall include belt driven, unhoused, backward curved, plenum exhaust fans.
7. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

F. Cooling Coils

1. Evaporator Coils
    a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
    b. Coils shall have interlaced circuitry and shall be standard capacity.
    c. Coils shall be hydrogen or helium leak tested.
    d. Coils shall be furnished with factory installed expansion valves.

G. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.

2. Compressors shall be scroll type with thermal overload protection and carry a 5-year non-prorated warranty, from the date of original equipment shipment from the factory.

3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.

5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.

6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low-pressure sides and a factory installed liquid line filter driers.

7. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.

8. Unit shall include factory provided and installed compressor sound jackets on all compressors.

9. Lead refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

H. Condensers

1. Air-Cooled Condenser

a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.

b. Coils shall be designed for use with R-410A refrigerant. Coils shall be multi-pass and fabricated from aluminum microchannel tubes.

c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

d. Coils shall be hydrogen or helium leak tested.

e. Condenser fans shall be VFD driven variable speed for condenser head pressure control. Factory provided and factory programmed VFDs shall continuously modulate the fan air flow to maintain head pressure at acceptable levels. Cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

I. Heating Coils

1. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

2. Fins: Aluminum continuous plate type with full fin collars.

3. Casing: Die formed channel frame of 16 gauge, 0.0598 inch galvanized steel with 3/8 inch mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.

4. Headers: Seamless copper tube with silver brazed joints.

5. Testing: Air test under water to 200 psi for working pressure of 200 psi and 220 degrees F.

6. Configuration: Drainable, with threaded plugs for drain and vent; threaded plugs in return bends and in headers opposite each tube.

J. Filters

1. Unit shall include 4-inch thick, pleated panel filters with an ASHRAE MERV rating of 13, upstream of the cooling coil. Unit shall also include 2-inch thick, pleated panel pre filters with an ASHRAE MERV rating of 8, upstream of the 4-inch standard filters.

2. Unit shall include 1 inch aluminum mesh pre filters upstream of the outside air opening.

3. Unit shall include a clogged filter switch.

K. Outside Air/Economizer

1. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals.

2. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper.

3. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by factory installed DDC actuator with spring return.

4. Unit shall include outside air opening bird screen, outside air hood, and relief dampers.

5. Outdoor Airflow Monitoring

   a. Unit shall include outside airflow measuring station and airflow signal processor that communicates directly with the factory provided control systems or can also be used with customer provided controls with a 0-10 VDC output signal. Lon Talk and BACnet may also be available for some applications. Monitoring size is dependent on the cfm.

L. Energy Recovery

1. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. Frame shall slide out for service and removal from the cabinet.

2. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.

3. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

4. Energy recovery wheel cassette shall carry a 5-year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard AAON limited parts warranty. The remaining period of the warranty shall be covered by Airxchange. The 5-year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18-month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for Installation, Operation, and Maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.

5. Hinged service access doors shall allow access to the wheel.

6. Unit shall include energy recovery wheel defrost control which includes an adjustable temperature sensor and timer wired to periodically stop the wheel rotation, which allows the warm exhaust air to defrost the wheel.

7. Unit shall include energy recovery wheel rotation detection sensors and a set of normally open and normally closed contracts for field indication of wheel rotation.

M. Controls

1. Field installed DDC controls by others. Unit shall be provided with an integral refrigeration control board, factory installed damper actuators, integral safety circuits, and a wiring terminal block.

2. Unit shall be provided with refrigeration detection and safety circuitry in accordance with ASHRAE Std 15 and UL Standard 60335-2-40 requirements. Upon detection of a refrigerant leak, the supply fan shall run and and an alarm shall be generated at the terminal block.

3. Unit shall be provided with a high condensate level switch that shuts down the unit when a high-water level is detected in the drain pan.

N. Curbs

1. Install unit on roof curb in accordance with Section 230548 - Vibration and Seismic Controls for HVAC

2.3 UV LIGHTS

ERU UNITS

1. The AAON feature selectable UV lights is for drain pan maintenance purposes only. Airstream disinfection via higher intensity UV—C lighting downstream of the coil for RN—series (vertical and horizontal) requires a Special Pricing Agreement (SPA).

2. System

3. Ultraviolet Germicidal Irradiation (UVGI) uses show—wave ultraviolet energy (254nm, UV—C) to inactivate viral, bacterial, and fungal organisms so they are unable to replicate and potentially ca use disease ,1

4. UVGI works by disrupting the DNA or RNA of microorganisms to prevent them from replicating. UVGI has been used in waste water treatment and hospitals for decades. UVGI's effectiveness on Coronaviruses (MERS-CoV and SARS-CoV) has been used to predict the effectiveness of UVGI on SARS-CoV-2 (C0VID-19).• °

5. For this SPA, the UVGI lamp array will be Installed downstream of the coil. Therefore, this SPA option requires the UV light feature to be selected (RN F16 = H,K,M,N; RN Horiz F15=C,G,K,P,R,V,Z,4). Due to space restrictions, some options may not be available in conjunction with this feature.

6. The table below provides estimated operational values based on bulb supplier's information and bulleted operational criteria. Warmer temperatures or lower airflows will increase the UV effectiveness.

   a. All dosage and estimated inactivation rates at bulb end of life

   b. Wind chill degradation for 55°F incoming air

   c. Residence Time based on 500 FPM on the coil

Box Size	Nominal Tons	Number of Lamps	Lamp Power (W)	Irradiance on Evaporator Coil (W/ft')	Residence Time (seconds)	Tota1 UV Dose (pW-s/cm')	Estimated Single Pass Inactivatlon Rate'
A	6-10	6	75	52.9	0.090	704	91%
B	9-15	8	75	41.1	0.141	673	90%
C	14-30	8	75	30.2	0.162	669	90%
D	26—40	8	145	36.4	0.270	1302	99%
D	50-70	10	145	33.1	0.171	750	92%

7. Safety, Maintenance, & Disposal

8. Lamps are a Group 3 Ultraviolet product. These lamps emit high-power UV radiation that can cause severe Injury to skin and eyes. At 2S4nm, these lights do not produce Ozone.

9. Door interlock safety, UV warning decals, and appropriate transformer will be included with these SPAs.

10. Depending on individual operating conditions, lights may require cleaning with a no-residue glass cleaner and lint free cloth per manufacturer recommendations.

11. Manufacturer stated nominal useful life is 9,000 hours. Lamps contain mercury (Hg). Local handling and disposal guidelines must be followed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall verify that roof is ready to receive work and opening dimensions are as detailed on drawings.

B. Contractor shall verify that proper power supply is available.

3.2 INSTALLATION, OPERATION, AND MAINTENANCE

A. Contractor shall install in accordance with manufacturer's instructions.

B. Mount units on factory-built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

C. Provide the services of a factory trained technician for start-up of unit. Provide assistance to the Balancing Contractor and Commissioning Agent as required in order to ensure proper start-up, balancing and commissioning of equipment.

3.3 CLOSEOUTS

A. See Section 017800-Closeout Submittals, for closeout submittals.

B. See Section 017900-Demonstration and Training, for additional requirements.

C. Provide minimum 6 hours of training

END OF SECTION 237416

SECTION 238126 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary".

1.2 SECTION INCLUDES

A. The Air Conditioner system shall be a split system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall mounted remote controller.

1.3 RELATED REQUIREMENTS

A. Section 230913 - Instrumentation and Control Devices for HVAC: Thermostats.

B. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.4 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment.

C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

E. NFPA 70 - National Electrical Code.

F. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

G. Project Record Documents: Record actual locations of components and connections.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the ARI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

E. A dry air holding charge shall be provided in the indoor section.

F. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet of refrigerant tubing.

1.7 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (10) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

C. Manufacturer shall have over thirty (30) years of continuous experience in the U.S. market.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mitsubishi

B. Substitutions: See Section 016000 - Product Requirements.

2.2 OUTDOOR UNIT

A. General

1. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.

2. The outdoor unit shall be capable of cooling operation down to 0°F ambient temperature without additional low ambient controls (optional wind baffle shall be required).

3. The outdoor unit shall be able to operate with a maximum height difference of 100 feet between indoor and outdoor units.

4. System shall operate to a maximum refrigerant tubing length of 100 feet between indoor and outdoor units without the need for line size changes, traps or additional oil and shall be pre-charged for a maximum of 70 feet of refrigerant tubing.

5. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

B. Cabinet

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a Munsell 3Y 7.8/1.1 finish.

2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.

3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.

4. The fan grill shall be of ABS plastic.

5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

C. Fan

1. Unit shall be furnished with a single DC fan motor.

2. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.

3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts

D. Coil

1. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.

2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be controlled by a microprocessor controlled step motor.

3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

E. Compressor

1. The compressor shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.

2. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.

3. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.

4. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical

1. The electrical power of the unit shall be 208volts or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.

2. Power for the indoor unit shall be supplied from the outdoor unit using three (3) fourteen (14) gauge AWG conductors plus ground wire connecting the units.

3. The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

4. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.

5. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

2.3 INDOOR UNIT

A. General

1. The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired wall-mounted controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

B. Cabinet

1. The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white – Munsell 1.0Y 9.2/0.2. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

C. Fan

1. The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

D. Vane

1. There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

E. Filter

1. Return air shall be filtered by means of an easily removable washable filter.

F. Coil

1. The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. An optional drain pan level switch, designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing.

G. System Control

1. The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector CN152 and a 12 VDC output.

H. Wired Remote Controller

1. The Wired Remote Controller shall be approximately 5” x 5” in size and white in color with a light-green LCD display. The controller shall support a selection from multiple languages (Spanish, German, Japanese, Chinese, English, Russian, Italian, or French) for display information. There shall be a built-in weekly timer with up to 8 pattern settings per day. The controller shall consist of an On/Off button, Increase/Decrease Set Temperature buttons, a Cool/Auto/Fan/Dry mode selector, a Timer Menu button, a Timer On/Off button, Set Time buttons, a Fan Speed selector, a Ventilation button, a Test Run button, and a Check Mode button. The controller shall have a built-in temperature sensor. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C), and Temperature changes shall be by increments of 1°F (0.5°C). The PAR-21MAA shall have the capability of controlling up to a maximum of 16 systems, as a group with the same mode and set-point for all, at a maximum developed control cable distance of 1,500 feet (500 meters).

2. The control voltage from the wired controller to the indoor unit shall be 12/24 volts, DC. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. Up to two wired controllers shall be able to be used to control one unit.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

C. Coordinate with installers of systems and equipment connecting to this system.

D. Connect indoor units to condensate piping.

E. Coordinate BAS, BMS, or Integrated Automation linking between local controller(s) and remote software app or terminal; see Section 230923 - Direct-Digital Control System for HVAC.

F. Provide refrigerant detection systems for units and piping in accordance with ASHRAE Std 15.

3.2 INSTALLATION OF INDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

B. In rooms without ceiling, arrange piping and tubing, controls, and electrical power serving units to provide a neat and finished appearance.

C. For wall-mounted units that are exposed, conceal piping and tubing, controls, and electrical power serving units within walls.

D. Attachment: Install hardware for proper attachment to supported equipment.

3.3 INSTALLATION OF OUTDOOR UNITS

A. Install units to be level and plumb while providing a neat and finished appearance.

3.4 REFRIGERANT PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping and tubing systems. Install piping and tubing as indicated, and as approved by manufacturers representative unless deviations to layout are approved on coordination drawings.

B. Install refrigerant piping in strict accordance to Manufacturers written instructions.

C. Install piping and tubing in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping and tubing at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping and tubing above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping and tubing to permit valve servicing.

G. Install piping and tubing at indicated slopes.

H. Install piping and tubing free of sags.

I. Install piping and tubing to allow application of insulation.

J. Refrigerant Piping: See Section 232300 with Section 230719 for insulation, and Section 230529 for hangers and supports unless following specific manufacturer recommendations.

3.5 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to inspect installation prior to startup.

3.6 SYSTEM STARTUP

A. Provide manufacturer's field representative to observe and approve system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

3.7 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed components of dirt, finger marks, and other disfigurements.

3.8 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for additional requirements.

B. Execute BAS, SCADA, or other linked integration automation system commissioning as indicated in Section 230923 - Direct-Digital Control System For HVAC and 230993 - Sequence of Operations for HVAC Controls

C. Replace components not functioning properly.

3.9 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of one day of training.

3. Instructor: Manufacturer's training personnel.

4. Location: At project site.

3.10 PROTECTION

A. Protect installed components from subsequent construction operations.

3.11 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

END OF SECTION 238126

SECTION 238129 - VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Air-source heat pumps.

B. Indoor ductless units.

C. Indoor ducted units

D. Controls.

1.3 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

C. Design Data: Indicate refrigerant pipe sizing.

D. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

E. Project Record Documents: Record actual locations of components and connections.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.

B. Units shall be tested by a nationally recognized testing laboratory and bear the ETL Label.

C. Units shall be manufactured in a factory that is ISO 9001 and ISO 14001 registered.

D. VRF system shall have published performance ratings certified by AHRI and listed in the AHRI Standard 1230 certified product directory.

E. The VRF system shall be installed by a contractor with extensive installation and service training. The contractor shall show proof of completion of mandatory service and installation training by the manufacturer.

1.5 WARRANTY

A. The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from the date of installation. In addition the compressor shall have a limited warranty for a period of five (5) years from the date of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Mitsubishi Electric and Electronics: www.mehvac.com

B. Daikin Industries: www.daikin.com

C. The Trane Company; Model _____: www.trane.com.

D. Substitute equipment may be considered for approval that includes at a minimum:

1. R-410a refrigerant

2. Inverter compressor technology.

3. Communication capability to EMS.

4. Ability to meet all other provisions of the specifications herein and as specified on the drawings.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SYSTEM DESCRIPTION

A. The VRF system shall be a variable capacity, direct expansion (dx), split system heat recovery heat pump capable pf providing simultaneous heating and cooling in the individual zones. Communication between components shall be provided as an integrated feature of the VRF system.

B. Each system shall consist of an outdoor unit, heat recovery units(s), multiple indoor units and manufacturer's Digital Controls. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. Each indoor unit or group of indoor units shall be independently controlled.

2.3 OUTDOOR UNIT

A. General:

1. The outdoor unit shall be used specifically with specific components from the same manufacturer.

2. Outdoor Unit shall be capable of maintaining continuous compressor operation under all of the following operating ambient air conditions.

    a. Heat Recovery System

        1) All IDUs Cooling: 14°F DB to 122°F DB

        2) All IDUs Heating: -13°F WB to 61°F WB

        3) Cooling-based synchronous: 14°F DB to 81°F DB

        4) Heating-based synchronous: 14°F WB to 61°F WB

3. The VRF system shall maintain normal heating and/or cooling operation at all IDUs while any one IDU is powered down for service. When power is restored to the IDU serviced, normal operation shall be restored with no system shutdown, interruption, reset, or power cycling of the outdoor unit.

4. The system shall use R410A refrigerant.

5. Each system shall have one, two or three air source outdoor units.

6. Multi-frame configurations shall be field piped together using manufacturer's designed and supplied Y-branch kit and field provided interconnecting pipe to form a common refrigerant circuit.

7. Refrigerant circuit configuration for Heat Recovery System

    a. The refrigerant circuit shall be constructed using field provided copper piped together with manufacturer supplied Heat Recovery unit(s) and Y- branches or Header fittings connected to multiple (ducted, non-ducted or combination thereof) indoor units to effectively and efficiently control the simultaneous heating and cooling operation of the VRF system.

    b. Each refrigerant pipe, y-branch, header kit, elbows and valves shall be individually insulated with no air gaps. All joints shall be glued and sealed.

8. Refrigerant circuit configuration for Heat Pump System

    a. The refrigerant circuit shall be constructed using field provided copper piped together with manufacturer supplied Y- branches or Headers connected to multiple (ducted, non-ducted or combination thereof) indoor units to effectively and efficiently control heating or cooling operation of the VRF system.

    b. All refrigerant pipe, y-branch, header kit, elbows and valves shall be individually insulated with no air gaps. All joints shall be glued and sealed.

9. The VRF manufacturer shall provide published documentation that specifically allows the installation of field provided full-port high quality refrigerant system isolation valves rated for use with R410A on any and all pipes of the VRF system. Isolation valves shall be strategically placed in the refrigerant piping system to allow the VRF system service provider to isolate a portion of the piping system to avoid a pump down of the entire refrigerant piping system when replacing/repairing the refrigeration circuit piping, HR unit(s), or indoor unit(s).

10. Factory installed microprocessor controls in the outdoor unit(s), HR unit(s), and indoor unit(s) shall perform functions to efficiently operate the VRF system and communicate in a daisy chain configuration between outdoor unit and HR unit(s) and indoor unit(s) over a RS485 18AWG stranded and twisted wire data link.

11. Outdoor unit shall be able to connect to up to 64 indoor units depending upon model.

12. The total nominal capacity of all indoor units shall be no less than 50% and no more than 130% of outdoor unit's nominal capacity to ensure the VRF system will have sufficient capacity to meet the building's cooling and heating load at design day weather conditions.

13. The maximum allowable system combination ratio shall be 130%. Systems designed with a combination ratio above 130% will not be accepted.

14. Each outdoor unit refrigerant circuit shall have a high-pressure safety threaded rupture disk or threaded fusible plug fitting.

15. The outdoor unit assembly, indoor unit assembly and/or heat recovery unit assembly shall be shipped from the factory assembled and pressure tested including internal refrigerant piping, compressor, contacts, relay(s), control components, power and communications wiring necessary.

16. Each outdoor unit refrigeration circuit shall have the following components:

    a. Inverter variable speed compressor(s)

    b. Outdoor unit heat exchanger

    c. Refrigerant strainer(s)

    d. Check valve(s)

    e. Oil separator

    f. Accumulator

    g. Heat exchanger circuiting control

    h. Electronic expansion valve(s)

    i. 4-way reversing valve

    j. Sub-cooler circuit with controls

k. High and low side Schrader valve service ports with caps.

l. Service valves

B. System

1. Each outdoor unit frame shall have a stand-alone microprocessor control that varies the use of the outdoor coil circuits to optimize the use of heat transfer surface. Control shall be able to dynamically change the path and coil circuiting based on one of the following operating parameters: head pressure, suction pressure, system sub-cooling requirements, available refrigerant charge, system mode of operation, coil heat transfer efficiency shall have a variable flow path heat exchanger function to vary the refrigerant flow path based on system operating mode and operating conditions.

2. System inverter compressors shall have a mid-stage, medium pressure vapor economizer apparatus to maximize refrigerant compression efficiency.

3. System accumulator shall be provided with controls that continuously monitors, modifies, and controls the amount of refrigerant in circulation (active refrigerant charge) while the system is operating. The active refrigerant charge microprocessor shall monitor system high and low side gas pressure, coil approach temperature, liquid line temperature and pressure, and system sub-cooling requirement to control the refrigerant charge.

4. System shall comprise of the following frame configurations.

a. 6 through 14 ton systems shall be a single frame only.

b. 16 through 28 ton systems shall be dual frame only.

c. 30 to 42 ton systems shall be triple frame only

C. Refrigerant Pipe System Design Parameters

1. The outdoor unit shall be capable of operating at an elevation difference of up to 360 feet above or below the lowest or highest indoor unit respectively.

2. The outdoor unit shall be capable of operating with up to 3280 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.

3. The outdoor unit shall be capable of operating with up to 656 actual feet or 738 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and farthest indoor unit.

D. Defrost Operations

1. The outdoor unit(s) shall be capable of Intelligent defrost operation to melt accumulated frost, snow and ice that may have accumulated on the outdoor unit heat exchanger. The defrost cycle length and sequence shall be based on outdoor ambient temperatures, outdoor unit heat exchanger temperature, and various differential pressure variables.

2. Defrost Mode Selection: The outdoor unit shall be provided with three field-selectable defrost operation modes; Normal, Fast, or Forced.

a. Normal Defrost operation intended for use in areas of the country with mild winter temperatures and light to moderate humidity levels. The strategy minimizes defrost cycle frequency allowing frozen precipitation to build longer in between cycles. Minimum time between defrost cycles shall be 20 minutes. Intelligent Defrost shall choose between split coil/frame and full system methods to minimize energy consumption and cycle time.

b. Fast Defrost operation intended for use in areas of the country that experience adverse winter weather with periods of heavy winter precipitation and extremely low temperatures. This strategy shall maximize the systems heating performance and maintain operational efficiency. When the ambient temperature is above 32°F, Intelligent Defrost shall continue to heat until the discharge temperature declines. At temperatures below 32°F, the time between defrost cycles shall be a minimum of 90 minutes. At temperatures below 4°F, a defrost cycle shall occur every two hours to optimize system heating efficiency.

c. Forced Defrost operation shall be available for the service provider to test defrost operations at any weather condition and to manually clear frozen water from the outdoor coil surfaces.

3. Defrost Method Selection: The outdoor unit shall be provided with two field-selectable defrost operation methods; Split Coil/Frame and Full System.

a. Split Coil/Frame method shall be available when Normal Defrost mode is selected. Split Coil method shall be available on all Heat Pump and Heat Recovery single-frame VRF systems. Split Frame defrost shall be available on all Heat Pump and Heat Recovery multi-frame outdoor units.

b. Split Coil method shall remove ice from the bottom half of the outdoor unit coil first for six minutes, then the bottom half for six minutes. Next the bottom coil shall be heated again for an additional three minutes to remove any frozen water that may have dripped onto the lower coil during the top coil defrost operation.

c. When Split Coil/Frame method is selected, a Full System defrost shall occur every third defrost cycle to assure 100% of the frozen precipitation has been removed to maintain optimum efficient performance.

d. Full System method shall be available as a field selectable option. Outdoor units located in areas of the country where large volumes of frozen precipitation are common, the commissioning agent shall select the Full System defrost method.

4. Indoor Unit Fan Operation During Defrost

a. During partial defrost operation indoor units operating in cooling or dry mode shall continue normal operation.

b. During partial defrost operation, indoor units that are commissioned with fans set for continuous operation shall maintain normal fan speed unless the leaving air temperature drops, then the fan speed will be reduced to low speed for the remainder of the defrost cycle.

c. During full system defrost operation, indoor unit fans will cycle off and remain off during the remainder of the defrost cycle.

E. Oil Management

1. Each outdoor unit shall have an independently operating Hi-POR (High Pressure Oil Return) system to maximize compressor efficiency and ensure a consistent film of oil on all moving compressor parts at all speeds.

2. The oil return system shall include a dedicated centrifugal oil separator for each compressor designed to extract oil from the oil/refrigerant gas stream leaving the compressor.

3. Oil collected by each compressors independent oil return system shall be returned directly to the compressor oil sump passively without the use of mechanical pumps or other apparatus

4. Oil return systems that depend on differential pressure to return oil to the compressor sump, for example bleeding off or bypassing any amount of high pressure gas to push oil back to the compressor sump or the suction inlet of the compressor chamber, shall not be accepted.

5. Compressor oil shall be maintained at the same temperature as the discharge gas leaving the compressor to prevent any blending of refrigerant and oil to maintain stable oil viscosity during compressor operation.

6. The oil return system shall not inject, blend, or otherwise mix collected oil with suction vapor refrigerant before entering the compressor scroll or other gas compression apparatus.

7. The oil return system shall provide an oil level monitor for each compressor that provides continuous feedback to the outdoor unit microprocessor.

8. The microprocessor shall initiate an oil return cycle when the oil level monitoring sensor indicates a low oil level in the compressor sump.

9. Timed and/or scheduled unmonitored oil return operations and/or any oil return system that does not initiate an oil return cycle based on compressor sump low level reading shall not be permitted

F. Cabinet:

1. Outdoor unit cabinet shall be made of 20 gauge galvanized steel with an enamel finish.

2. Outdoor unit cabinet shall have a heavy gauge coated wire coil guard.

3. Outdoor unit cabinet finish shall have been tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.

4. All internal serviceable components shall be accessible by removing the front panel of the unit. Outdoor units that require the removal of side and/or rear service panels shall not be permitted.

5. A controls maintenance and unit diagnostic access port shall be provided in front of the microprocessor to allow quick access to read service codes, set DIP switches, perform microprocessor operational checks, address system components and extract operational data without removing the unit's front panel(s).

6. The controls access port shall be no larger than 6-1/4" x 6-3/4" to the possibility of weather related moisture entering the control panel while service is in progress.

7. A baked galvanized steel access port cover with a baked enamel finish (color matching unit cabinet) shall be provided and easily removed.

8. Controls access port cover shall be secured to the unit with a factory provided braided steel wire lanyard to prevent loss/damage to the port cover.

9. The cabinet shall be designed with pre-punched pipe and electrical knockouts. Cabinet shall be designed to accept connection of refrigerant pipe, power cable, and communications wiring either:

   a. Through the front panel

   b. Through the right side

   c. Through the unit's base pan (bottom)

G. Fan:

1. Each 6 ton cabinet shall be equipped with one direct drive variable speed propeller fan with Brushless Digitally Controlled (BLDC) motor mounted in a vertical top air discharge configuration.

2. Each 8 to 14 ton cabinet shall be equipped with two direct drive variable speed propeller fans with independent BLDC motors mounted in a vertical top air discharge configuration.

3. The fan blades shall be made of non-metallic light-weight Acrylonitrile Butadiene Styrene (ABS) material.

4. Fan blade design shall be a quiet, deep-V designed to minimize air turbulence as air passes over and leaves the trailing edge of the fan blade. Fan shroud shall be designed in conjunction with fan blade to minimize air turbulence along the edge of the blades to minimize noise generation.

5. Outdoor unit fan motors shall be powered using a dc inverter drive capable of operating the fans at a maximum speed of 1100 RPM.

6. Each fan motor case/frame shall be made with a lightweight non-ferrous metal alloy. Bearing shall be sealed and permanently lubricated.

7. Only one fan blade per fan motor shall be accepted. Dual fan assemblies driven by a double-end shaft motor shall not be permitted.

8. Each fan blade and motor assembly shall be balanced, tested, and mounted to the unit frame using a means of isolation that will eliminate any objectionable audible harmonic or vibration being transferred to the unit frame.

9. A raised ferrous wire metal guard with a baked enamel finish (color matching unit cabinet) shall be provided to prevent large object and animal contact with moving parts.

10. The outdoor fan inverter drive shall be provided with a DIP switch that reprograms the DC inverter drive to allow outdoor unit fan assemblies to operate under high discharge static conditions (up to 0.32 in-wg external static pressure) such as a ducted discharge application.

H. Coil:

1. Shall be a variable path design.

2. Shall be provided and built by the VRF outdoor unit provider.

3. It shall be comprised of aluminum fins mechanically bonded on copper tubing.

4. The copper tubes shall be internally ribbed to maximize heat transfer. Smooth bore tubes are not acceptable.

5. The aluminum fin heat transfer surfaces shall be treated to maximize the life of the fin material. Coil fin heat transfer surfaces shall be treated with a factory applied corrosion resistant GoldFin™ coating. Coating of fins shall be a two-step process. Base coat shall be an anticorrosive paint specifically engineered for bonding to bare aluminum. The top coat shall be a Hydrophilic paint with a gloss finish to protect the anti-corrosion coat. Hydrophilic paint shall be specifically formulated to promote liquid precipitation runoff and assist in minimizing particulate debris from sticking to the fin's heat transfer surfaces.

6. Fin material coating shall be tested in accordance with ASTM B-117 salt spray test procedure for a minimum of 1000 hours.

7. The outdoor unit coil assembly shall be factory pressure tested to a pressure of 551 psig.

8. Coil fin series shall be up to 22 Fins per Inch (FPI).

9. All the outdoor units shall have a minimum of a 3 row heat exchanger.

I. Compressor:

1. Each 6, 8, 10 ton frames shall be equipped with one hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressor.

2. The 12 and 14 ton frames shall be equipped with two hermetically-sealed, inverter-speed controlled scroll compressors.

3. Outdoor unit frames containing constant speed 50-60 Hz compressor(s) or containing a constant speed 50-60 Hz compressor in combination with an inverter compressor(s) are not acceptable.

4. Each inverter driven, HSS scroll compressor shall be capable of operating in a frequency range from 15 Hz to 150 Hz with control in 0.5 Hz increments.

5. Each compressor shall be equipped with a minimum of a 60 Watt crankcase heater.

6. The compressor shall be provided from the factory with a full charge of Polyvinyl Ether (PVE) oil. Ester based oils are not acceptable (POE) to prevent gum from forming in the system in the case of a motor burn.

7. All compressor bearing(s) shall have Teflon™ coating.

8. All compressors shall be protected with:

   a. High Pressure switch

   b. Over-current/under current protection

   c. Phase failure

   d. Phase reversal

J. Sound Levels

1. Outdoor unit noise levels shall not exceed 60 dB A. Test protocol includes a sound level measurement taken at an elevation of 5 ft. above the mounting surface at the center point of the width of the outdoor unit frame at a distance of 1 meter in front of the front panel surface with all fans running at absolute maximum motor design speed at all unit operating modes including high heating mode in an anechoic chamber using ISO3745 test standard protocol.

K. Sensors

1. Each single cabinet shall have

   a. Suction temperature sensor

   b. Discharge temperature sensor

   c. High Pressure sensor

   d. Low Pressure sensor

   e. Outdoor temperature sensor

   f. Outdoor unit heat exchanger temperature sensor

2.4 HEAT RECOVERY UNIT

A. General

1. HR unit shall be designed and manufactured by the same manufacturer of VRF indoor unit(s) and outdoor unit(s).

2. HR units shall be available in a 2, 3, and 4-port design. Single port designs and pipe system designs that require a dedicated HR unit is not acceptable.

3. HR unit casing shall be made with galvanized steel and have a galvanized steel finish.

4. HR unit shall be powered using a 208-230V/1-phase/60Hz power supply.

5. HR Unit shall be an intermediate refrigerant control device between the air source outdoor unit and the indoor units to control the systems simultaneous cooling and heating operation.

6. HR unit shall be engineered to work with a three pipe VRF system comprised of the following:

    a. High Pressure Vapor Pipe

    b. Low Pressure Vapor Pipe

    c. Liquid Pipe

7. HR unit shall be designed to be piped in a series or parallel pipe configuration relative to each other.

8. HR unit shall be a multi-port design capable of serving between one and 8 indoor units per HR unit port with a combined cooling nominal capacity of 54 Mbh per IDU port. HR units shall be able to accept/service at least two indoor units per HR unit up to a combined connected IDU cooling capacity of 192 Mbh.

9. VRF system controller shall be capable of accommodating up to 16 HR units connected to HR units piped in a single series string.

10. Each port shall be capable of operating in cooling or heating independently regardless of the operating mode of any other port on the HR unit or in the system.

11. HR unit shall be internally piped, wired, assembled, leak and run tested at the factory.

12. HR unit shall be designed for installation in a conditioned environment and provided with factory applied insulation on all cold surfaces.

13. HR unit shall have a liquid bypass circuit between the high pressure vapor and the low pressure vapor pipes.

14. Each port IDU port shall have a pair (2) two-position solenoid valves.

15. HR unit shall have a balancing valve to control the pressure between the high pressure and low pressure pipe during mode switching.

16. HR unit shall contain a sub-cooler circuit with stand-alone controls for each HR unit.

17. HR cold surface pipes shall be factory insulated to prevent condensation.

18. HR unit shall not require a condensate drain. Manufacturer's providing HR models that require a condensate drain line shall reimburse the pipe fitter or others responsible for the portion of the cost associated with the condensate drain system design, parts, and installation.

19. All field provided refrigerant piping and VRF system refrigerant piping components between outdoor unit and HR unit and from HR unit to indoor unit shall be field insulated.

20. The HR unit shall not exceed a net unit weight of 49 lbs.

B. Controls

1. HR unit(s) shall have factory installed unit mounted control boards and integral microprocessor to communicate with indoor units and outdoor units over a single stranded, shielded, twisted wire pair.

2. Manufacturer shall provide screw terminal connections at the HR unit to terminate power wiring and communications cables.

2.5 CEILING CASSETTE - 4 WAY

A. General:

1. Unit shall be factory assembled, wired, piped and run tested.

2. Unit shall be designed to be installed for indoor application.

3. Unit shall be designed to mount recessed in the ceiling and has a surface mounted grille on the bottom of the unit.

4. The unit shall be available in both 2' x 2' and 3' x 3' chassis.

B. Casing/Panel

1. Unit case shall be manufactured using galvanized steel plate.

2. The unit shall be provided with an off-white Acrylonitrile Butadiene Styrene (ABS) polymeric resin architectural grille.

3. The grille shall have a tapered trim edge, and a hinged, spring clip (screw-less) return air filter-grille door.

4. Unit shall be provided with metal ears designed to support the unit weight on four corners.

5. Ears shall have pre-punched holes designed to accept field supplied all thread rod hangers.

C. Cabinet Assembly:

1. Unit shall have four supply air outlets and one return air inlet.

2. The supply air outlet shall be through four-directional slot diffuser each equipped with independent oscillating motorized guide vane designed to change the airflow direction.

3. The grille shall have a discharge range of motion of 40° in an up/down direction with capabilities of locking the vanes.
4. The unit shall have a guide vane algorithm designed to sequentially change the predominant discharge airflow direction in counterclockwise pattern.
5. Guide vanes shall provide airflow in all directions.
6. Unit shall be equipped with factory installed temperature thermistors for:
    a. Return air
    b. Refrigerant entering coil
    c. Refrigerant leaving coil
7. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
8. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
9. The unit shall have factory designated branch duct knockouts on the unit case.
10. The unit shall have provision of fresh air ventilation through a knock-out on the cabinet.
11. The branch duct knockouts shall have the ability to duct up to ½ the unit airflow capacity.
12. The branch duct cannot be ducted to another room.
13. Unit shall have the following functions as standard:
    a. Self-diagnostic function
    b. Auto addressing
    c. Auto restart function
    d. Auto changeover function (Heat Recovery system only)
    e. Auto operation function
    f. Child lock function
    g. Forced operation
    h. Dual thermistor control
    i. Sleep mode
    j. Dual setpoint control
    k. Multiple aux heater applications

l. Filter life and power consumption display

D. Fan Assembly:

1. The unit shall have a single, direct drive, turbo fan made of high strength ABS HT-700 polymeric resin.

2. The fan impeller shall be statically and dynamically balanced.

3. The fan motor is Brushless Digitally controlled (BLDC) with permanently lubricated and sealed ball bearings.

4. The fan motor shall include thermal, overcurrent and low RPM protection.

5. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.

6. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.

7. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Power Cool, and Auto.

8. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.

9. Unit shall have factory installed motorized louver to provide flow of air in up and down direction for uniform airflow.

E. Filter Assembly:

1. The return air inlet shall have a factory supplied removable, washable filter with antifungal treatment.

2. The unit shall have the option for a secondary plasma filter accessory.

3. The filter access shall be from the bottom of the unit.

4. The unit shall have provision for an optional auto-elevating grille kit designed to provide motorized ascent/descent of the return air grille/pre filter assembly.

a. The ascent/descent of the return air grille shall be up to a distance of 14-3/4 feet allowing access to remove and clean the filter.

b. The auto-elevating grille shall have a control algorithm to accept up, down and stop control commands from the controller.

c. The auto-elevating grille shall have a control to stop the descent automatically if a contact is made with any obstacle.

F. Coil Assembly:

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.

2. The copper tubing shall have inner grooves for high efficiency heat exchanger.

3. Unit shall have a minimum 1 or 2 row coil, 18-19 fins per inch.

4. Unit shall have a factory supplied condensate drain pan below the coil constructed of EPS (expandable polystyrene resin).

5. Unit shall include an installed and wired condensate drain pump capable of providing minimum 27.5 inch lift from bottom surface of the unit.

6. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan.

7. Unit shall have provision of 45° flare refrigerant pipe connections.

8. The coil shall be factory pressure tested at a minimum of 551 psig.

9. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.

G. Microprocessor Control:

1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.

2. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable.

3. The unit controls shall operate the indoor unit using one of the five operating modes:

a. Auto changeover (Heat Recovery System only)

b. Heating

c. Cooling

d. Dry

e. Fan only

H. Electrical:

1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz)

2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

I. Controls:

1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

C. Notify Engineer if conditions for installation are unsatisfactory.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

E. Refrigerant Piping: See Section 232300 with Section 230719 for insulation, and Section 230529 for hangers and supports unless following specific manufacturer recommendations.

F. Connect indoor units to condensate piping.

G. Coordinate BAS, BMS, or Integrated Automation linking between local controller(s) and remote software app or terminal; see Section 230923 - Direct-Digital Control System for HVAC.

H. Provide refrigerant detection systems for units and piping in accordance with ASHRAE Std 15.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to inspect installation prior to startup.

3.4 SYSTEM STARTUP

A. Provide manufacturer's field representative to observe and approve system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

3.5 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.6 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for additional requirements.

B. Execute BAS, SCADA, or other linked integration automation system commissioning as indicated in Section 230923 - Direct-Digital Control System For HVAC and 230993 - Sequence of Operations for HVAC Controls

C. Replace components not functioning properly.

3.7 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of 4 hours of training.

3. Instructor: Manufacturer's training personnel.

4. Location: At project site.

3.8 PROTECTION

A. Protect installed components from subsequent construction operations.

3.9 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

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SECTION 238200 - CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section “Summary.”

1.2 RELATED REQUIREMENTS

A. Section 01 91 13 - General Commissioning Requirement

1.3 SECTION INCLUDES

A. Hydronic or steam finned tube radiation.

B. Hydronic or steam unit heaters.

C. Hydronic or steam cabinet unit heaters.

D. Duct-mounted coils.

1.4 RELATED REQUIREMENTS

A. Section 220513 - Common Motor Requirements for Plumbing Equipment.

B. Section 230513 - Common Motor Requirements for HVAC Equipment.

C. Section 230716 - HVAC Equipment Insulation.

D. Section 230719 - HVAC Piping Insulation.

E. Section 230913 - Instrumentation and Control Devices for HVAC.

F. Section 230993 - Sequence of Operations for HVAC Controls.

G. Section 232113 - Hydronic Piping.

H. Section 232114 - Hydronic Specialties.

I. Section 232213 - Steam and Condensate Heating Piping.

J. Section 232214 - Steam and Condensate Heating Specialties.

K. Section 233100 - HVAC Ducts and Casings.

L. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.5 REFERENCE STANDARDS

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

B. AHRI 440 - Performance Rating of Room Fan-Coils.

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications.

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality.

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Shop Drawings:

1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.

2. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

3. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.

D. Selection Samples: For each finish product specified, color chart representing manufacturer's full range of available colors.

E. Certificates: Certify that coils are tested and rated in accordance with AHRI 410.

F. Manufacturer's Instructions: Indicate installation instructions and recommendations.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

H. Warranty: (1) Year from the date of final acceptance by Owner unless otherwise noted. Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. (1) Year from date of acceptance by the Owner and completion of commissioning.

PART 2 PRODUCTS

2.1 HYDRONIC FINNED TUBE RADIATION

A. Manufacturers:

1. Modine Manufacturing Company: www.modineHVAC.com/#sle.

2. Zehnder Rittling: www.rittling.com/#sle.

3. Sterling A Mestek Co.

4. Substitutions: See Section 016000 - Product Requirements.

B. Required Directory Listing: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI).

C. Heating Elements: 3/4 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized nominal 4 x 4 inches, suitable for soldered fittings.

D. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

E. Enclosures: 18 gauge, 0.0478 inch sheet steel up to 18 inches in height, 16 gauge, 0.0598 inch sheet steel over 18 inches in height or aluminum as detailed, with easily jointed components for wall to wall installation.

1. Support rigidly, on wall mounted brackets.

F. Finish: Factory applied baked enamel of color as selected.

G. Damper: Where not thermostatically controlled, provide knob-operated internal damper at enclosure air outlet.

H. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 by 7 inch minimum size, integral with cabinet.

2.2 HYDRONIC UNIT HEATERS

A. Manufacturers:

1. Zehnder Rittling: www.rittling.com.

2. Modine Manufacturing Company: www.modineHVAC.com/#sle.

3. Trane Technologies, PLC: www.trane.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

C. Perform factory run test under normal operating conditions, water, and steam flow rates.

D. Casing: Minimum 18 gauge, 0.0478 inch thick sheet steel casing with threaded pipe connections for hanger rods for horizontal models and minimum 18 gauge, 0.0478 inch thick sheet steel top and bottom plates for vertical projection models.

E. Finish: Factory applied baked enamel of color as selected.

F. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.

G. Air Outlet: Adjustable pattern diffuser on vertical projection models and two- or four- way louvers on horizontal projection models.

H. Totally Enclosed Motors: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models. See Section 230513

I. Control: Local solid state disconnect switch with electropneumatic thermostat.

2.3 HYDRONIC CABINET UNIT HEATERS

A. Manufacturers:

1. Modine Manufacturing Company: www.modineHVAC.com/#sle.

2. Trane Technologies : www.trane.com.

3. Zehnder Rittling: www.rittling.com.

4. Substitutions: See Section 016000 - Product Requirements.

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.

C. Coils:

1. Evenly spaced aluminum fins mechanically bonded to copper tubes.

2. Heating Hot Water: Suitable for working temperatures up to a maximum not less than 200 degrees F.

D. Horizontal Recessed: Provide with a galvanized steel cabinet, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles with minimum 0.0478 inch thick bottom panel.

E. Finish: Factory applied baked enamel of color as selected by Architect on visible surfaces of enclosure or cabinet.

F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

G. Motor: Electronically commutated motors (ECM) factory-programmed and run tested in assembled units.

H. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.

2.4 DUCT-MOUNTED COILS

A. Water Coils:

1. Manufacturers:

a. Aerofin Corporation: www.aerofin.com/#sle.

b. Trane Technologies, PLC: www.trane.com/#sle.

c. USA Coil & Air: www.usacoil.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

2. Coils rated and tested in accordance with AHRI 410.

3. Tubes: Material to consist of seamless copper, mechanically expanded or tension wound to fins; appropriate tube joining methods based on tube material.

4. Fins: Material to consist of aluminum, continuous plate type with full fin collars or individual helical finned tube type wound under tension.

5. Casing: Heavy gauge galvanized steel with mounting holes, including intermediate tube supports if required by coil design and length.

6. Headers (Manifolds): Construct of seamless copper pipe or cast iron material with tube connection appropriate to header material provided.

7. Acceptable Factory Testing Methods:

a. Proof test at 1.5 times the maximum operating pressure and leak test at the maximum operating temperature.

b. Leak test at minimum 300 psig air pressure under water.

c. Perform hydrostatic testing for coils with removable headers in accordance with approved shop drawings and normally accepted means and methods.

2.5 HOSE KITS AND VALVES

A. Manufacturers:

1. Griswold Controls: www.griswoldcontrols.com/#sle.

2. Hays Fluid Controls: www.haysfluidcontrols.com/#sle.

3. IMI Flow Design, a brand of IMI Hydronic Engineering Division of IMI PLC: www.flowdesign.com/#sle.

4. Substitutions: See Section 016000 - Product Requirements.

B. Hoses:

1. Provide hoses for all units for connection to main water supply and return headers.

2. Length: 2 feet.

3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

C. Automatic Balancing Valves:

1. Refer to Section 232114 - Hydronic Specialties

2. Refer to Section 232114 - Hydronic Specialties for requirements.

D. Ball Valves:

1. Brass body for shutoff and hydronic balancing.

2. Provide memory, memory stop, and pressure/temperature ports.

E. Y Strainers:

1. Bronze body.

2. "Y" type configuration with brass cap.

3. Maximum Operating Pressure: Minimum 450 psi.

4. Screen: Stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are suitable for installation.

3.2 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Do not damage equipment or finishes.

D. Finned Tube Radiation:

1. Locate on outside walls and run cover continuously wall-to-wall unless otherwise indicated.

2. Center elements under window with elements of equal length centered under each window for multiple windows.

3. Install wall angles and end caps where units butt against walls.

4. Align cabinet joints with window mullions.

5. Install wall angles where units butt against walls and align cabinet joints with window mullions.

E. Cabinet Unit Heaters:

1. Coordinate to ensure correct recess size for recessed units.

F. Units with Hydronic Coils:

1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.

2. Provide float operated automatic air vents with stop valve for cabinet unit heaters.

G. Air Coils:

1. Install in ducts and casings in accordance with SMACNA (DCS).

a. Support coil sections independent of piping on steel channel or double angle frames and secure to casing.

b. Provide frames for maximum of three coil sections.

c. Arrange supports to avoid piercing drain pans.

d. Provide airtight seals between coil and casing or duct.

e. See Section 233100.

2. Coil Safeguards:

a. Protect coils to prevent damage to flanges and fins.

b. Comb out damaged fins.

3. Make connections to hydronic coils with unions and flanges.

4. Hydronic (Drainable) Coils:

a. Connect water supply to leaving air side of coil (counterflow arrangement).

b. Provide with shut-off valve on supply piping and tamper-proof, balancing valve on return piping.

c. Locate supply water connection on leaving air side at bottom of supply header, and return water connection at top.

d. Provide manual air vents with stop valves at high points.

1) Install drain connections at low points of installation.

2) See Section 232113 and Section 232114.

3.3 FIELD QUALITY CONTROL

A. Provide manufacturer's field representative to test, inspect, instruct, and observe.

3.4 CLEANING

A. After construction and painting is completed, clean exposed surfaces of units.

B. Vacuum clean coils and inside of units.

C. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

D. Install new filters.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

3.6 PROTECTION

A. Provide finished cabinet units with protective covers during the balance of construction.

B. Protect installed equipment from subsequent construction operations.

END OF SECTION 238200

SECTION 260500 - ELECTRICAL GENERAL CONDITIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Related Work Specified Elsewhere:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section..

2. This section applies to certain sections of Division 1, Division 23, "Mechanical". This section applies to all sections of Division 26, "Electrical," of this project specification unless specified otherwise in the individual sections.

3. Temporary Facilities and controls are specified in Section 01 50 00. Cooperate in ensuring adequate protection.

4. General material, equipment and workmanship standards are specified in Section 01 60 00.

5. Finished painting is specified in section 09 91 00.

6. Access doors and panels to be installed in finished surfaces are specified in Section 08 31 13.

7. Cutting and patching, chases, furred spaces, trenches, covers, pits, foundations and other construction required in conjunction with the work under this Division is specified in Section 01 73 29.

1.3 DRAWINGS AND COORDINATION

A. It is not the intention of the drawings to show every item, piece of equipment and detail. Provide complete, operating systems.

B. Install work as closely as possible to layouts shown on drawings. Modify work as necessary to meet job conditions and to clear other equipment. Consult Architect before making changes which affect the function or appearance of systems.

C. Dimensions, elevations and locations are shown approximately. Verify actual conditions in the field.

D. Owner, Architect, and Engineer reserve the right to order changes in layout of such items as switches, receptacles, and fixtures if such changes do not substantially affect costs and if affected items have not been fabricated or installed.

E. In some cases, drawings are based upon products of one or several manufactures as listed on the Contract Documents. This contractor shall be responsible for modifications made necessary by substitution of products of different manufacturers.

F. Do not install part of a system until all critical components of the system and related systems have been approved. Coordinate parts of systems to ensure proper operation of the entire system.

G. Install products in accordance with manufacturer's written instructions. Notify Engineer if Contract Documents conflict with manufacturer's instructions. Comply with Engineers interpretations.

H. Provide brackets, supports, anchors and frames required for installation of work specified herein.

1.4 CODES AND STANDARDS

A. The Codes and Standards listed below apply to all Work. Where Codes or Standards are mentioned in these Specifications, follow the latest edition or revision.

B. The current adopted editions of the following State or local Codes apply:

1. 2021 International Building Code
2. 2021 International Existing Building Code
3. 2021 International Mechanical Code
4. 2021 International Plumbing Code
5. 2020 National Electrical Code (NFPA 70)
6. 2021 International Energy Conservation Code
7. ICC/ANSI A117.1-2017 Accessible and Usable Buildings and Facilities

C. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.

D. Include in the Work, without extra cost to the Owner, any labor, materials, testing, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings and/or specified.

1.5 PERMITS AND FEES

A. Give all necessary notices, obtain all permits; pay all Government and State sales taxes and fees where applicable, and other costs, including utility connections or extensions in connection with the Work. File all necessary Drawings, prepare all Documents and obtain all necessary approvals of all Governmental and State departments having jurisdiction, obtain all required certificates of inspections for Work and deliver a copy to the Engineer before request for acceptance and final payment for the Work.

1.6 REFERENCES

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

B. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1993 (and Revision 1,2,3).

C. NEMA ICS 6 - National Electrical Manufacturers Association; 1993 Enclosures for Industrial Control and Systems

D. NEMA MG 10 - National Electrical Manufacturers Association; 1983; (R 1988) Energy Management Guide for Selection and Use of Polyphase Motors.

E. NEMA MG 11 - National Electrical Manufacturers Association; 1977; (R 1992) Energy Management Guide of Selection and Use of Single-Phase Motors.

F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2005.

G. SSPC-Paint 15 - Steel Joist Shop Paint; Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

H. IEEE 100 - 1992 Dictionary of Electrical and Electronics Terms.

I. IBC 2003, Structural Loads, Seismic bracing and restraints.

1.7 DEFINITIONS

A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

B. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

C. The technical paragraphs referred to herein are those paragraphs in PART 2 - PRODUCTS and PART 3 - EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.8 EQUIPMENT DEVIATIONS

A. Where the Contractor proposes to deviate (substitute or provide an equivalent) from the equipment or materials as hereinafter specified, he shall do so by making a request in writing within 60 days from the Award of Contract. The Contractor shall state in his request whether it is a substitution or an equivalent to that specified, and the amount of credit involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts.

1. The Base Product Specification shall be based on using the materials and equipment as specified and scheduled with no exceptions. Equipment Manufacturers Scheduled on Drawings are considered Base Product Specification and any other acceptable manufacturers listed in the specifications is considered an equivalent manufacturer to the Base Product Specification. Unlisted manufacturers are considered a substitution and equipment deviation and subject to the requirements for equipment substitution and deviation. When any alternate manufacturer does not qualify acceptable, as determined by the Engineer, provide the Base Bid manufacturer at no additional cost to Owner.

2. Where an equivalent manufacturer is listed in the specifications, it may or may not indicate that there is an equal product available. Any products must meet all criteria of the Base Product Specification as determined by the Engineer.

B. Substitutions and Equipment Deviations will not be considered if they have a direct bearing on the changing or revising of Contract Documents or if it involves other Contractor's scope of work or thier equipment. Coordination with all trades is required and must be acceptable to all other involved Contractors.

C. Substitutions may be considered for one of the following:

1. Substitution for Cause: Changes proposed by the Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of warranty terms.

2. Substitutions for Convenience: Changes proposed by the Contractor or Owner that are not required in order to meet other Project requirements, but may offer advantage to either the Owner or Contractor.

D. In these Specifications and on the accompanying Drawings, one or more makes of materials, apparatus or appliances may have been specified for use in this installation. This has been done for convenience in fixing the standard of workmanship, finish and design required for installation. In the event that only one (1) manufacturer of a product is specified and it is found that the manufacturer has discontinued the product, the Contractor shall use an acceptable equivalent product that meets the requirements of an equivalent product, as noted below, and has all the features of the originally specified product. The details of workmanship, finish and design, and the guaranteed performance of any material, apparatus or appliance which the Contractor desires to deviate for those mentioned herein shall also conform to these standards.

E. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for the Engineer's review.

F. Where two or more names are given as equivalents, the Contractor must use the specified item or one of the named equivalents. Where one name only is used and is followed by the words "or acceptable equivalent", the Contractor must use the item named or he may apply for an equipment deviation through the prescribed manner in accordance with this Specification.

G. Equipment, material or devices submitted for review as an "accepted equivalent" shall meet the following requirements:

1. The equivalent shall have the same construction features such as, but not limited to:
2. Material thickness, gauge, weight, density, etc.
3. Welded, riveted, bolted, etc., construction
4. Finish, undercoatings, corrosion protection
5. The equivalent shall perform with the same or better operating efficiency.
6. The equivalent shall have equal or greater reserve capacity.
7. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.
8. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as AMCA or ARI labels.

H. Where the Contractor proposes to use an item of equipment other than specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the Designers of Record at the expense of the Contractor and at no additional cost to the Owner.

I. Where such accepted deviation or substitution requires a different quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit and equipment from that specified or indicated on the Drawings, the Contractor shall, with the acceptance by the Engineer, furnish and install any such additional equipment required by the system at no additional cost to the Owner, including any costs added to other trades due to the substitution.

J. The Engineer shall determine if an "accepted equivalent" to a manufacturer listed in the Specifications is considered acceptable.

1.9 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.

B. Provide manufacturer's ORIGINAL printed product data, catalog cuts and description of any special installation procedures. Photocopied and/or illegible product data sheets shall not be acceptable. All product datasheets shall be highlighted or stamped with arrows to indicate the specific components being submitted for approval.

C. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable federal, military, industry, and technical society publication references, and years of satisfactory service, and other information necessary to establish contract compliance of each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval.

D. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data will result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.

E. Submit drawings a minimum of 14 inches by 20 inches in size using a minimum scale of 1/8 inch per foot except as specified otherwise. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

F. Where installation procedures or part of the installation procedures are required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

G. Submit manufacturer's certifications as required for products, materials, finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

H. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), Underwriters Laboratories Inc. (UL), and Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

I. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.10 QUALITY ASSURANCE

A. Material and Equipment Qualifications

1. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

B. Regulatory Requirements

1. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

C. Alternative Qualifications

1. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

D. Service Support

1. The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

E. Manufacturer's Nameplate

1. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

F. Modification of References

1. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Building Official or Inspector and/or Fire Marshal.

G. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

H. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

I. Design Seismic bracing and restraints under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Connecticut.

J. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

1.11 SEISMIC RESTRAINT

A. General: This project is in a seismic zone per State and/or Local Codes and Ordinances and all materials and equipment shall be installed, supported, and seismically restrained accordingly. Verify current seismic requirements based on project location and with Code requirements.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of vibration isolation bases and seismic restraints that are similar to those required for this Project in material, design, and extent.

C. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, design of seismic supports and selection of seismic restraints for all equipment and materials.

2. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to the structure and to the supported equipment. Include auxiliary motor slides and rails, and base weights.

3. Seismic Restraint Details: Detail fabrication and attachment of restraints, supports and snubbers.

4. Seismic Separation Assemblies: Refer to the Architectural and/or Structural drawings for locations of seismic joints.

D. Installation: Installation shall be carried out in strict accordance with the Seismic Engineer's submittal, current Code, accepted standards and the equipment and material manufacturers' recommendations.

1.12 COORDINATION WITH OTHER DIVISIONS

A. Carry out all work in conjunction with other trades and give full cooperation in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the General Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, access doors, etc. required by other trades, and to allow for serviceable access to equipment.

B. Mechanical contractors' shall initiate coordination drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner. The Contractors' shall prepare coordination drawings at a scale no less than 1/4"=1'-0", showing the work of all trades, including but not limited to, the following: proposed ductwork installation in detail, including ceiling heights, approved structural steel shop drawings, duct heights, access doors, light fixtures, registers and diffusers, sprinkler piping and heads, electrical distribution conduits, wires, panels and any other electrical work which may conflict with the sheet metal ducts or piping, waste and vent piping, water piping, storm piping, and rain leaders. Provide elevation details showing connections and equipment layout and configuration based on approved submittals. Each shall use a different color code. A coordination meeting of all Contractors involved is then to be held and all possible conflicts are to be resolved. All trades shall sign acceptance of the drawings and then shall submit two (2) prints of each drawing to the Engineer for record.

C. Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference. In general, ductwork, heating piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer regarding the arrangement of work, which cannot be agreed upon by the Contractors, will make final decisions. Service of equipment will take precedence.

D. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment.

E. If work is installed before coordinating with other Divisions or so as to cause interference with work of other Sections, the Contractor causing the interference will make necessary changes to correct the condition without extra charge to the Owner.

F. Initial contact and coordination has been conducted with utility entities for the purpose of the preparation of Bid Documents. The Contractor shall coordinate all final specific utility requirements.

1.13 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.14 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

B. Sequence installation to conform with the project phasing indicated on the Architectural drawings.

1.15 WARRANTY

A. See Section 017700 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

1.16 OPERATING INSTRUCTIONS

A. Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections. The operating instructions shall include the following:

1. Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

2. Start up, proper adjustment, operating, lubrication, and shutdown procedures.

3. Safety precautions.

4. The procedure in the event of equipment failure.

5. Other items of instruction as recommended by the manufacturer of each system or item of equipment.

B. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions where directed. For operating instructions exposed to the weather, provide weather-resistant materials or weatherproof enclosures. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.17 ELECTRICAL REQUIREMENTS

A. Electrical installations shall conform to ANSI C2, NFPA 70, and requirements specified herein.

B. Wiring and Conduit

1. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide power wiring and conduit for field-installed equipment, and motor control equipment, the conduit and wiring connecting such assemblies, or other power sources to equipment. Power and Control wiring and conduit shall be provided under Division 26 and shall conform to the requirements of the section specifying the associated equipment.

C. New Work

1. Provide electrical components of mechanical equipment, such as motors, motor starters, control or push-button stations, float or pressure switches, solenoid valves, integral disconnects, and other devices functioning to control mechanical equipment, as well as control wiring and conduit to conform with the requirements of the section covering the mechanical equipment. Extended voltage range motors shall not be permitted. The interconnecting power wiring and conduit, control wiring and conduit, the motor control equipment and the electrical power circuits shall be provided under Division 26, except internal wiring for components of packaged equipment shall be provided as an integral part of the equipment.

a. When motors and equipment furnished are larger than sizes indicated, provide any required changes to the electrical service as may be necessary and related work as a part of the work for the section specifying that motor or equipment.

D. Instruction To Owners Personnel

1. Where specified in the technical sections, furnish the services of competent instructors to give full instruction to designated Owner personnel in the adjustment, operation, and maintenance of the specified systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with equipment or system. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications. Instructions and/or training shall be video taped. Provide the owner with two copies of the video tape prior to project close out.

E. Lockout Requirements

1. Provide disconnecting means capable of being locked out for machines and other equipment to prevent unexpected startup or release of stored energy in accordance with 29 CFR 1910.147. Mechanical isolation of machines and other equipment shall be in accordance with requirements of Division 23, "Mechanical."

1.18 THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Refer to Division 7 Specification for additional and more specific information.

B. Fire-stopping systems shall be submitted as shop drawing.

C. Penetrations through fire-rated walls, ceiling or floors and penetrations through smoke barriers, smoke resistive construction, and construction enclosing compartmentalized areas involving both empty openings, openings containing penetration items, and openings due to flue decks shall be sealed with a U.L. approved fire-stop fitting classified for an hourly rating equivalent to the fire rating of the wall, ceiling or floor.

D. Thruwall and floor seals shall be used to provide a positive means of sealing pipes or ducts which pass through the concrete foundation of a structure below grade or below ground water level. Seals shall also be used at entry points through concrete walls or floors which must be sealed.

1.19 COMMISSIONING

A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 - General Commissioning Requirements.

B. Complete installation, startup checks and functional tests according to Section 01 91 13 - General Commissioning Requirements and manufacturers written instructions.

C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new ones and repeat the start up procedure.

D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 and manufacturers written instructions/requirements.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

3.3 STARTING EQUIPMENT AND SYSTEMS

A. Provide manufacturer's field representative to prepare and start equipment.

B. Adjust for proper operation within manufacturer's published tolerances.

C. Demonstrate proper operation of equipment to Owner's designated representative.

3.4 CLEANING

A. Clean the entire installation at substantial completion .

B. Protect installed equipment from subsequent construction operations.

END OF SECTION 26 05 02 260500

SECTION 260505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

1.2 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Additional requirements for alterations work.

B. Section 028400 - Polychlorinate Biphenyl (PCB) Remediation: Removal of equipment and materials containing substances regulated under the Federal Toxic Substances Control Act (TSCA), including but not limited to those containing PCBs and mercury.

1.3 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Engineer before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

1. Notify Owner before partially or completely disabling system.

2. Notify local fire service.

3. Make notifications at least 24 hours in advance.

4. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.

2. PCB- and DEHP-containing lighting ballasts.

3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.4 CLEANING AND REPAIR

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

END OF SECTION 260505

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Service entrance cable.

C. Metal-clad cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Wire pulling lubricant.

H. Cable ties.

I. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

F. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes.

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation.

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction.

H. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable.

I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

J. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

K. NFPA 70 - National Electrical Code.

L. UL 44 - Thermoset-Insulated Wires and Cables.

M. UL 83 - Thermoplastic-Insulated Wires and Cables.

N. UL 267 - Outline of Investigation for Wire-Pulling Compounds.

O. UL 486A-486B - Wire Connectors.

P. UL 486C - Splicing Wire Connectors.

Q. UL 486D - Sealed Wire Connector Systems.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.

S. UL 854 - Service-Entrance Cables.

T. UL 1569 - Metal-Clad Cables.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Service entrance cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

a. For underground service entrance, installed in raceway.

2. In addition to other applicable restrictions, may not be used:

a. Where exposed to damage.

D. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.

1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2. In addition to other applicable restrictions, may not be used:

a. Where not approved for use by the authority having jurisdiction.

b. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.

c. Where exposed to damage.

d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:

1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.

2. Color Coding Method: Integrally colored insulation.

a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. 208Y/120 V, 3 Phase, 4 Wire System:

1) Phase A: Black.

2) Phase B: Red.

3) Phase C: Blue.

4) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

a. Size 4 AWG and Larger: Type XHHW-2.

2.4 SERVICE ENTRANCE CABLE

A. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.

B. Conductor Stranding: Stranded.

C. Insulation Voltage Rating: 600 V.

2.5 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.

2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.

2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

5. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.7 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.

4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Include circuit lengths required to install connected devices within 10 ft of location indicated.

5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.

6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

b. Increase size of conductors as required to account for ampacity derating.

c. Size raceways, boxes, etc. to accommodate conductors.

7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.

2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.

4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):

a. Use listed fittings.

b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.

2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.

b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

3. Wet Locations: Use heat shrink tubing.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

Q. Identify conductors and cables in accordance with Section 260553.

R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is only required for services and feeders. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

E. NFPA 70 - National Electrical Code.

F. UL 467 - Grounding and Bonding Equipment.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

    a. Provide continuous grounding electrode conductors without splice or joint.

    b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

    a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.

    b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

    c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:

    a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

4. Concrete-Encased Electrode:

    a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.

5. Ground Rod Electrode(s):

    a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

    b. Space electrodes not less than 10 feet from each other and any other ground electrode.

    c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.

2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.

2. Provide equipment grounding conductor routed with supply conductors.

3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.

4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

b. Metal gas piping.

I. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2. Provide bonding jumper in raceway from building grounding electrode system to each communications room or backboard and provide ground bar for termination.

a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.

b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

J. Pole-Mounted Luminaires: Also comply with Section 265600.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.

2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.

a. Exceptions:

1) Use bare copper conductors where installed underground in direct contact with earth.

2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.

2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

D. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

E. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

D. MFMA-4 - Metal Framing Standards Publication.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction.

F. NFPA 70 - National Electrical Code.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.

2. Coordinate work to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.

4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.

5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for post-installed concrete/masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.6 QUALITY ASSURANCE

A. Installer Qualifications for Field Welding: See Section 055000.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Applicable building code.

c. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.

2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

4. Hollow Masonry: Use toggle bolts.

5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Plastic and lead anchors are not permitted.
9. Powder-actuated fasteners are not permitted.
10. Hammer-driven anchors and fasteners are not permitted.
11. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
    b. Comply with MFMA-4.
    c. Channel Material: Use galvanized steel.
12. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Engineer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Engineer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.

2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.

4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 033000.

5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: See Section 260533.13 for additional requirements.

J. Box Support and Attachment: See Section 260533.16 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.

L. Exterior Luminaire Support and Attachment: See Section 265600 for additional requirements.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 260529

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SECTION 260533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. PVC-coated galvanized steel rigid metal conduit (RMC).

C. Flexible metal conduit (FMC).

D. Galvanized steel electrical metallic tubing (EMT).

E. Rigid polyvinyl chloride (PVC) conduit.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 078400 - Firestopping.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260533.16 - Boxes for Electrical Systems.

G. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

H. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

I. Section 270533.13 - Conduit for Communications Systems.

J. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).

E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC).

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

J. NFPA 70 - National Electrical Code.

K. UL 1 - Flexible Metal Conduit.

L. UL 6 - Electrical Rigid Metal Conduit-Steel.

M. UL 514A - Metallic Outlet Boxes.

N. UL 514B - Conduit, Tubing, and Cable Fittings.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.

P. UL 797 - Electrical Metallic Tubing-Steel.

Q. UL 797A - Electrical Metallic Tubing - Aluminum and Stainless Steel.

R. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

5. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit.

2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit, galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit.

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit.

4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) where emerging from underground.

5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows or PVC-coated galvanized steel rigid metal conduit (RMC) elbows for bends.

6. Where galvanized steel electrical metallic tubing (EMT) is installed in direct contact with earth, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Embedded Within Concrete:

1. Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.

2. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit (RMC), or galvanized steel electrical metallic tubing (EMT) where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), PVC-coated galvanized steel rigid metal conduit (RMC), or galvanized steel electrical metallic tubing (EMT).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).

1. Locations subject to physical damage include, but are not limited to:

a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

K. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).

L. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or stainless steel intermediate metal conduit (IMC).

1. Exterior locations subject to severe physical damage include, but are not limited to:

a. Where exposed to vehicular traffic below 20 feet.

M. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC) or galvanized steel electrical metallic tubing (EMT).

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Electrical Service Conduits: See Section 262100 for additional requirements.

C. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil, 0.040 inch.

C. PVC-Coated Boxes and Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.

2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.

3. Material: Use steel or malleable iron.

4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch.

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.6 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use compression/gland or set-screw type.

a. Do not use indenter type connectors and couplings.

2.7 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Connectors and Couplings: Use compression/gland or set-screw type.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.

2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Foam Conduit Sealant:

1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.

2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.

3. Rated to hold minimum of 10 ft water head pressure.

F. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

G. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. PVC-Coated Galvanized Steel Rigid Metal Conduit (RMC): Install using only tools approved by manufacturer.

E. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

F. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.

c. Flues.

14. Group parallel conduits in same area on common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

4. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.

5. Use conduit clamp to support single conduit from beam clamp or threaded rod.

6. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.

7. Use of wire for support of conduits is not permitted.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.

4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.

5. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.

6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.

7. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.

4. Conceal bends for conduit risers emerging above ground.

5. Provide suitable sealing system where conduits penetrate exterior wall below grade.

6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.

8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

J. Underground Installation:

1. Provide trenching and backfilling; see Section 312316.13.

2. Minimum Cover, Unless Otherwise Indicated or Required:

a. Underground, Exterior: 18 inches.

b. Under Slab on Grade: 12 inches to bottom of slab.

3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 260553.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

1. Install conduits within middle one third of slab thickness.

2. Secure conduits to prevent floating or movement during pouring of concrete.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 033000.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.

2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where conduits are subject to earth movement by settlement or frost.

N. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
    a. Where conduits enter building from outside.
    b. Where service conduits enter building from underground distribution system.
    c. Where conduits enter building from underground.
    d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
    a. Where conduits pass from outdoors into conditioned interior spaces.
    b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
    c. Where conduits penetrate coolers or freezers.

O. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

P. Provide grounding and bonding; see Section 260526.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 260533.13

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SECTION 260533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Underground boxes/enclosures.

F. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

D. Section 262726 - Wiring Devices:

1. Wall plates.

2. Floor box service fittings.

3. Additional requirements for locating boxes for wiring devices.

E. Section 271000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.

G. NFPA 70 - National Electrical Code.

H. SCTE 77 - Specifications for Underground Enclosure Integrity.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

K. UL 508A - Industrial Control Panels.

L. UL 514A - Metallic Outlet Boxes.

M. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.

5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.

6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, junction and pull boxes, floor boxes, and underground boxes/enclosures.

C. Project Record Documents: Record actual locations for outlet and device boxes, floor boxes, and underground boxes/enclosures.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.

3. Provide products listed, classified, and labeled as suitable for the purpose intended.

4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit is used.

4. Use nonmetallic boxes where exposed rigid PVC conduit is used.

5. Use suitable concrete type boxes where flush-mounted in concrete.

6. Use suitable masonry type boxes where flush-mounted in masonry walls.

7. Use raised covers suitable for the type of wall construction and device configuration where required.

8. Use shallow boxes where required by the type of wall construction.

9. Do not use "through-wall" boxes designed for access from both sides of wall.

10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.

11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.

13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

15. Minimum Box Size, Unless Otherwise Indicated:

    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.

    b. Communications Systems Outlets: Comply with Section 271000.

16. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.

2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:

    a. Indoor Clean, Dry Locations: Type 1, painted steel.

    b. Outdoor Locations: Type 3R, painted steel.

3. Junction and Pull Boxes Larger Than 100 cubic inches:

    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.

E. Floor Boxes:

1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2. Use cast iron or nonmetallic floor boxes within slab on grade.

3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).

4. Manufacturer: Same as manufacturer of floor box service fittings.

F. Underground Boxes/Enclosures:

1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.

2. Size: As indicated on drawings.

3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.

4. Provide logo on cover to indicate type of service.

5. Applications:

a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.

b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.

c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

a. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

2.2 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.

2. Unless dimensioned, box locations indicated are approximate.

3. Locate boxes as required for devices installed under other sections or by others.

   a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.

   b. Communications Systems Outlets: Comply with Section 271000.

4. Locate boxes so that wall plates do not span different building finishes.

5. Locate boxes so that wall plates do not cross masonry joints.

6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.

8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.

9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

   a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.

   b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.

11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

    a. Concealed above accessible suspended ceilings.

    b. Within joists in areas with no ceiling.

    c. Electrical rooms.

    d. Mechanical equipment rooms.

G. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

H. Install boxes plumb and level.

I. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.

2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.

3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

J. Install boxes as required to preserve insulation integrity.

K. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

L. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches deep.

2. Flush-mount enclosures located in concrete or paved areas.

3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.

4. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 260526.

3.3 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 260533.16

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

E. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 260573 - Power System Studies: Arc flash hazard warning labels.

C. Section 262726 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

D. Section 271000 - Structured Cabling: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code.

B. UL 969 - Marking and Labeling Systems.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

a. Switchboards:

1) Identify power source and circuit number. Include location when not within sight of equipment.

2) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Panelboards:

1) Identify power source and circuit number. Include location when not within sight of equipment.

2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.

3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.

c. Enclosed switches:

1) Identify voltage and phase.

2) Identify power source and circuit number. Include location when not within sight of equipment.

3) Identify load(s) served. Include location when not within sight of equipment.

2. Service Equipment:

a. Use identification nameplate to identify each service disconnecting means.

3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.

   a. Service equipment.

   b. Industrial control panels.

   c. Motor control centers.

   d. Elevator control panels.

   e. Industrial machinery.

6. Arc Flash Hazard Warning Labels: Comply with Section 260573.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.

2. Identification for Communications Conductors and Cables: Comply with Section 271000.

3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

4. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

   a. At each source and load connection.

   b. Within boxes when more than one circuit is present.

   c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

5. Use underground warning tape to identify direct buried cables.

C. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 271000.

2. Wiring Device and Wallplate Finishes: Comply with Section 262726.

3. Use identification label to identify serving branch circuit for all receptacles.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
    a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
    a. Equipment Designation: 1/2 inch.
5. Color:
    a. Normal Power System: White text on black background.

D. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl self-laminating type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. Color:

1. Tape for Buried Power Lines: Black text on red background.

2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.5 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

2. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.

7. Conductors and Cables: Legible from the point of access.

8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 260553

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SECTION 260573 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Short-circuit study.

B. Protective device coordination study.

C. Arc flash and shock risk assessment.

1. Includes arc flash hazard warning labels.

D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.2 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

B. Section 262100 - Low-Voltage Electrical Service Entrance.

1. Includes Utility Company contact information.

C. Section 262413 - Switchboards.

D. Section 262416 - Panelboards.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels.

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants.

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations.

G. NEMA MG 00001 - Motors and Generators.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

I. NFPA 70 - National Electrical Code.

J. NFPA 70E - Standard for Electrical Safety in the Workplace.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.

2. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.

2. Do not order equipment until matching study reports and product submittals have both been evaluated by Engineer.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

C. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.

1. Include characteristic time-current trip curves for protective devices.

2. Include impedance data for busway.

3. Include impedance data for engine generators.

4. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

5. Include documentation of listed series ratings upon request.

6. Identify modifications made in accordance with studies that:

a. Can be made at no additional cost to Owner.

b. As submitted will involve a change to the contract sum.

D. Site-specific arc flash hazard warning labels.

E. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

F. Project Record Documents: Revise studies as required to reflect as-built conditions.

1. Include hard copies with operation and maintenance data submittals.

2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.6 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Perform analysis of new electrical distribution system as indicated on drawings.

2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).

3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

a. Known Operating Modes:

1) Utility as source.

2) Generator as source.

B. General Study Requirements:

1. Comply with NFPA 70.

2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.

1) Obtain up-to-date information from Utility Company.

2) Utility Company: See Section 262100 for Utility Company contact information.

b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.

c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.

d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.

e. Protective Devices:

1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).

2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).

f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.

g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.

2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:

a. Maximum utility fault currents.

b. Maximum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:

1. Comply with applicable portions of IEEE 242 and IEEE 399.

2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving full selective coordination.

F. Arc Flash and Shock Risk Assessment:

1. Comply with NFPA 70E.

2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.

a. Where reasonable, study preparer may assume a maximum clearing time of two seconds in accordance with IEEE 1584, provided that the conditions are such that a worker's egress from an arc flash event would not be inhibited.

3. For equipment with main devices mounted in separate compartmentalized sections, perform calculations on both the line and load side of the main device.

4. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:

a. Maximum and minimum utility fault currents.

b. Maximum and minimum motor contribution.

c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:

1. General Requirements:

a. Identify date of study and study preparer.

b. Identify study methodology and software product(s) used.

c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.

d. Identify base used for per unit values.

e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.

f. Include conclusions and recommendations.

2. Short-Circuit Study:

a. For each scenario, identify at each bus location:

1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).

2) Fault point X/R ratio.

3) Associated equipment short circuit current ratings.

b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.

3. Protective Device Coordination Study:

a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.

b. For each graph include (where applicable):

1) Partial single-line diagram identifying the portion of the system illustrated.

2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.

3) Conductors: Damage curves.

4) Transformers: Inrush points and damage curves.

5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.

6) Motors: Full load current, starting curves, and damage curves.

7) Capacitors: Full load current and damage curves.

c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.

1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.

2) Include ground fault pickup and delay.

3) Include fuse ratings.

4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.

d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

4. Arc Flash and Shock Risk Assessment:

a. For the worst case for each scenario, identify at each bus location:

1) Calculated incident energy and associated working distance.

2) Calculated arc flash boundary.

3) Bolted fault current.

4) Arcing fault current.

5) Clearing time.

6) Arc gap distance.

b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

1.7 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.

1. Study preparer may be employed by manufacturer of electrical distribution equipment.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.

1. Materials: Comply with Section 260553.

2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.

a. Include the following information:

1) Arc flash boundary.

2) Available incident energy and corresponding working distance.

3) Site-specific PPE (personnel protective equipment) requirements.

4) Nominal system voltage.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install arc flash warning labels in accordance with Section 260553.

3.2 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Engineer of any conflicts with or deviations from studies. Obtain direction before proceeding.

3.3 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

END OF SECTION 260573

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. Outdoor photo controls.

D. Digital load controllers.

1.2 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260529 - Hangers and Supports for Electrical Systems

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches and wall dimmers.

1. Includes finish requirements for wall controls specified in this section.

2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.

E. Section 265100 - Interior Lighting.

F. Section 265600 - Exterior Lighting.

1.3 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NFPA 70 - National Electrical Code.

F. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control.

G. UL 916 - Energy Management Equipment.

H. UL 917 - Clock-Operated Switches.

I. UL 1472 - Solid-State Dimming Controls.

J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.

2. Coordinate placement of wall switch occupancy sensors with installed door swings.

3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.

4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.

5. Coordinate lighting control device product selections with luminaire characteristics; see Section 265100 and lighting fixture schedule.

6. Notify Engineer of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Digital Load Controllers: Provide dimensioned plan views indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing factory and field connections. Include manufacturer product characteristics and application instructions for wired and wireless applications, including start-up and commissioning.

3. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Operation and Maintenance Data: Include detailed information on device programming and setup.

E. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for duration below. Complete forms in Owner's name and register with manufacturer.

1. Occupancy Sensors: 5 years.

2. Digital Load Controllers: 5 years.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.2 OCCUPANCY SENSORS

A. General Requirements:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.

2. Sensor Technology:

    a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.

4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.

5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.

6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.

7. Sensitivity: Field adjustable.

8. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.

9. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

10. Load Rating for Line Voltage Occupancy Sensors: As required to control load indicated on drawings.

11. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

B. Wall Switch Occupancy Sensors:

1. General Requirements:

    a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

    b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

    c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.

2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

C. Wall Dimmer Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.

b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.

d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

e. Provide field adjustable dimming preset for occupied state.

f. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.

D. Ceiling Mounted Occupancy Sensors:

1. General Requirements:

a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

d. Finish: White unless otherwise indicated.

2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.

E. Power Packs for Low-Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.

2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.

3. Input Supply Voltage: Dual rated for 120/277 V ac.

4. Load Rating: As required to control load indicated on drawings.

2.3 TIME SWITCHES

A. Digital Electronic Time Switches:

1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.

2. Program Capability:

a. Astronomic Time Switches: Single channel, capable of different schedule for each day of week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.

3. Schedule Capacity: Not less than 16 programmable on/off operations.

4. Provide automatic daylight savings time and leap year compensation.

5. Provide power outage backup to retain programming and maintain clock.

6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.

7. Provide remote photocell input with light level adjustment.

8. Input Supply Voltage: As indicated on the drawings.

9. Output Switch Configuration: As required to control load indicated on drawings.

10. Output Switch Contact Ratings: As required to control load indicated on drawings.

11. Provide lockable enclosure; environmental type per NEMA EN 10250 as specified for the following installation locations:

a. Indoor clean, dry locations: Type 1.

2.4 OUTDOOR PHOTO CONTROLS

A. Stem-Mounted Outdoor Photo Controls:

1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.

2. Housing: Weatherproof, impact resistant polycarbonate.

3. Photo Sensor: Cadmium sulfide.

4. Provide external sliding shield for field adjustment of light level activation.

5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.

6. Voltage: As required to control load indicated on drawings.

7. Failure Mode: Fails to the on position.

8. Load Rating: As required to control load indicated on drawings.

9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

2.5 DIGITAL LOAD CONTROLLERS

A. System Description:

1. Stand-alone system, including interconnected modules and accessories, for lighting and plug load low-voltage control as indicated on drawings, schedules, written sequences of operation, and reviewed shop drawings.

2. Product standard system configurations preconfigured out of box, plug-and-play, automatically self-addressing devices for communications, and without need to field configure or program features, or requiring device setting adjustments. LEDs on unit indicate operation and troubleshooting without software intervention.

3. Provide quantity and configuration of power and slave packs, communication modules, and load expansion modules, including associated wiring, wired and wireless components, and accessories to control loads indicated.

4. Also referred to as room, area, or architectural digital load controllers, as indicated, depending on space and functionality. Each controller includes one or more channels for load control, also referred to as zones.

5. Provide networkable digital load controllers and system components for future integration of luminaires and devices.

B. General Requirements:

1. Listed for powering and controlling line-voltage loads, power packs, contactors, relays, and other lighting control devices.

2. Input Supply Voltage: Dual rated for 120/277 VAC.

3. Cabling Terminations:

a. Provide field installed and tested control wiring.

b. Include two RJ 45 or mechanical screw-based terminal block wiring connections.

4. Compatibility:

a. Compatible with wired sensors and communication protocols for controlling line-voltage loads.

1) Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.

b. Configurable for single room control as indicated from single digital load controller.

5. Provide UL 2043 plenum rated control unit with self-contained relay(s) and low-voltage class 2 transformer, compatible with specified wired and wireless sensors, components, and ballasts/drivers.

a. Comply with NFPA 70 for use in plenum spaces.

b. Provide UL 2043 plenum rating for associated system control components for control indicated.

6. Surface Mounting: Standard junction box attachments.

7. Provide one auxiliary contact closure output where indicated.

8. Minimum Load Rating: As required to control load indicated on drawings.

9. Control Inputs:

a. Digital: Two.

b. Analog: One.

c. Include automatic-on and manual-on occupancy control wiring inputs.

d. Include wiring inputs for manual overrides as indicated.

10. Output Control Capability:

a. Single Zone Switching Modules: One programmable channel.

b. Multi-Zone Switching Modules: Up to three separately programmable channels.

c. Channel Dimming as Indicated:

1) Range: From 1 percent to 100 percent, allowing for precise control of light levels.

2) Method: 0-10 VDC protocol; coordinate maximum current draw as required.

C. Additional Integrated Requirements forDigital Load Controllers:

1. Central Monitoring and Management: Include programmable user interface for lighting system controllable features; control access locally by plugging into devices and LAN network via browser-based software with settings retained in nonvolatile memory.

2. Provide additional auxiliary contact closure outputs where required for functions and operating modes indicated.

3. Scheduling:

a. Include timer and clock configurator for full calendar year and daylight savings automatic adjustments based on time zone.

b. Provide function for hold-on, designed within time limitations or other restrictions of presiding energy code.

c. Demand Response: Load shed or hold-off capability.

4. Occupancy Controls:

a. Scene Control: Occupant selections by lighting control devices for controls as indicated.

b. Bi-level Switching: Multi-level lighting for controls as indicated.

c. Dimming: Occupancy controlled dimming, including blink warning; 50 percent light-level after programmed delay time.

d. Shade Control: Interfacing capability.

5. Energy Monitoring:

a. Include capability for integration with power monitoring system via BACnet/IP communications.

b. Include reporting and exporting in spreadsheet and PDF file formats.

6. Daylight Harvesting:

a. System Description:

1) Control system with compatible control modules, power packs, contactors, or relays as required for automatic control of load indicated according to available natural light.

2) System control responds to changes in measured light levels according to selected settings.

3) Capable of integrating with daylighting sensors, occupancy sensors, and manual override controls.

b. Daylighting Control Photo Sensors: Low-voltage class 2 photo sensor units with output signal proportional to measured light level and provision for zero or offset based signal.

1) Sensor Type: Filtered silicon photo diode.

2) Sensor Range:

(a) Indoor Photo Sensors: 5 to 100 footcandles.

3) Finish: White unless otherwise indicated.

c. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts/drivers, for direct continuous dimming of up to 50 ballasts/drivers.

d. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.

e. Daylight Control Switching Modules: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with no-switching dead band between set points to prevent unwanted cycling.

f. Daylight Control Dimming Module Operation:

1) Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.

2) Load to be turned off when available daylight is sufficient to fully dim load, after selected time delay.

3) Dimming and Fade Rates: Adjustable from 5 to 60 seconds.

4) Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.

5) Output Voltage: Compatible with specified dimming ballasts/drivers.

7. Accessories:

a. Where indicated, provide compatible accessory wall switches for manual override control.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switch Occupancy Sensors: 48 inches above finished floor.

2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.

3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Engineer to obtain direction prior to proceeding with work.

C. Maintain separation of remote-control, signaling, and power-limited circuits.

1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.

H. Provide required supports; see Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Occupancy Sensor Locations:

1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

K. Outdoor Photo Control Locations:

1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by photo control itself.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into photo control.

M. Daylighting Control Photo Sensor Locations:

1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize control and avoid conflicts or problems affecting proper detection of light levels.

2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.

N. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

O. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.

P. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

Q. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable.

G. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Engineer.

C. Adjust position of outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Engineer.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Engineer.

G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Engineer.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for commissioning requirements.

3.8 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Engineer, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of installed lighting control devices.

4. Location: At project site.

END OF SECTION 260923

SECTION 262100 - LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.13 - Conduit for Electrical Systems.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 262413 - Switchboards: Service entrance equipment.

1. Includes utility metering transformer compartment.

H. Section 264300 - Surge Protective Devices: Service entrance surge protective devices.

I. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

1.3 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.4 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NFPA 70 - National Electrical Code.

1.5 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:

1. Verify the following with Utility Company representative:

a. Utility Company requirements, including division of responsibility.

b. Exact location and details of utility point of connection.

c. Utility easement requirements.

d. Utility Company charges associated with providing service.

2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.

3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Owner.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:

1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Utility Company letter of availability for providing electrical service to project.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.

D. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.

1. Obtain Utility company approval of shop drawings prior to submittal.

E. Project Record Documents: Record actual locations of equipment and installed service routing.

1.7 QUALITY ASSURANCE

A. Comply with the following:

1. IEEE C2 (National Electrical Safety Code).

2. NFPA 70 (National Electrical Code).

3. The requirements of the Utility Company.

4. The requirements of the local authorities having jurisdiction.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: Eversource.

1. Point of Contact: Joseph Tribuzio.

2. Address: 705 W. Johnson Ave, Chesire, CT 06410.

3. Phone: 203-271-4735.

4. Email: joseph.tribuzio@eversource.com.

D. Division of Responsibility:

1. Pad-Mounted Utility Transformers:

a. Transformer Vaults and Pads: Furnished and installed by Contractor per Utility Company requirements.

b. Transformers: Furnished and installed by Utility Company.

c. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.

d. Transformer Protective Bollards: Furnished and installed by Contractor per Utility Company requirements.

e. Primary:

1) Trenching and Backfilling: Provided by Contractor.

2) Conduits: Furnished and installed by Contractor.

3) Conductors: Furnished and installed by Utility Company.

f. Secondary:

1) Trenching and Backfilling: Provided by Contractor.

2) Conduits: Furnished and installed by Contractor.

3) Conductors: Furnished and installed by Contractor (Service Point at transformer).

2. Terminations at Service Point: Provided by Utility Company.

3. Metering Provisions:

a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.

b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.

c. Metering Compartments in Service Entrance Equipment: Furnished and installed by Contractor per Utility Company requirements.

d. Metering Transformers: Furnished and installed by Utility Company.

e. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.

f. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.

g. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 312316.13.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 033000.

F. Provide required protective bollards in accordance with Utility Company requirements.

G. Provide required support and attachment components in accordance with Section 260529.

H. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.

I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

3.4 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION 262100

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SECTION 262413 - SWITCHBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 262100 - Low-Voltage Electrical Service Entrance.

G. Section 262713 - Electricity Metering: For interface with equipment specified in this section.

H. Section 264300 - Surge Protective Devices.

1.3 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NECA 400 - Standard for Installing and Maintaining Switchboards.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NEMA PB 2 - Deadfront Distribution Switchboards.

F. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

H. NFPA 70 - National Electrical Code.

I. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

J. UL 869A - Reference Standard for Service Equipment.

K. UL 891 - Switchboards.

L. UL 1053 - Ground-Fault Sensing and Relaying Equipment.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:

1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.

2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.

3. Obtain Utility Company approval of switchboard prior to fabrication.

4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.

5. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

4. Include documentation demonstrating selective coordination upon request.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:

1. Main Device(s): Individually-mounted.

2. Feeder Devices: Panel/group-mounted.

3. Arrangement: Front accessible only (not rear accessible), rear aligned.

4. Gutter Access: Bolted covers.

E. Service Entrance Switchboards:

1. Listed and labeled as suitable for use as service equipment according to UL 869A.

2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.

3. Comply with Utility Company requirements for electrical service.

4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.

5. See Section 262100 for additional requirements.

F. Service Conditions:

1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:

a. Altitude: Less than 6,600 feet.

b. Ambient Temperature:

1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.

2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

G. Short Circuit Current Rating:

1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

2. Minimum Rating: 65,000 rms symmetrical amperes.

H. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

J. Bussing: Sized in accordance with UL 891 temperature rise requirements.

1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.

2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

4. Phase and Neutral Bus Material: Aluminum.

5. Ground Bus Material: Aluminum.

K. Conductor Terminations: Suitable for use with the conductors to be installed.

1. Line Conductor Terminations:

a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

b. Main and Neutral Lug Type: Mechanical.

2. Load Conductor Terminations:

a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

b. Lug Type:

1) Provide mechanical lugs unless otherwise indicated.

L. Enclosures:

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).

2. Finish: Manufacturer's standard unless otherwise indicated.

M. Future Provisions:

1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.

N. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list switchboards as a complete assembly including surge protective device.

O. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

P. Arc Flash Energy-Reducing Maintenance Switching: For circuit breakers rated 1200 A or higher, provide a local accessory switch with status indicator light that permits selection of a maintenance mode with alternate electronic trip unit settings for reduced fault clearing time.

Q. Owner Metering: Comply with Section 262713.

R. Instrument Transformers:

1. Comply with IEEE C57.13.

2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Connect secondaries to shorting terminal blocks.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.2 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:

1. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

2. Molded Case Circuit Breakers:

a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.

1) Provide thermal magnetic circuit breakers unless otherwise indicated.

b. Minimum Interrupting Capacity:

1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

c. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

d. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2) Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.3 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:

1. Dielectric tests.

2. Mechanical operation tests.

3. Grounding of instrument transformer cases test.

4. Electrical operation and control wiring tests, including polarity and sequence tests.

5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment in accordance with Section 260529.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 033000.

H. Provide grounding and bonding in accordance with Section 260526.

I. Install all field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 260573.

L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

M. Provide filler plates to cover unused spaces in switchboards.

N. Identify switchboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

D. Inspect and test in accordance with NETA ATS, except Section 4.

E. Perform inspections and tests listed in NETA ATS, Section 7.1.

F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

G. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

H. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

I. Test shunt trips to verify proper operation.

J. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.5 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

C. Repair scratched or marred surfaces to match original factory finish.

3.6 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

3.7 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION 262413

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SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NECA 407 - Standard for Installing and Maintaining Panelboards.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NEMA PB 1 - Panelboards.

E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less.

F. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

G. NFPA 70 - National Electrical Code.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

J. UL 67 - Panelboards.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures.

L. UL 943 - Ground-Fault Circuit-Interrupters.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.

4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
    a. Indoor Clean, Dry Locations: Type 1.
2. Boxes: Galvanized steel unless otherwise indicated.
    a. Provide wiring gutters sized to accommodate the conductors to be installed.
    b. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
3. Fronts:
    a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
    b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

K. Load centers are not acceptable.

2.2 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.
2. Ground Bus Material: Aluminum.

D. Circuit Breakers:

1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted enclosures unless otherwise indicated.

2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

2.3 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Aluminum.

3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.

2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.

3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:

1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

6. Provide the following circuit breaker types where indicated:

a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

7. Do not use tandem circuit breakers.

8. Do not use handle ties in lieu of multi-pole circuit breakers.

9. Provide the following features and accessories where indicated or where required to complete installation:

a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.5 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling.

J. Provide grounding and bonding in accordance with Section 260526.

1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

K. Install all field-installed branch devices, components, and accessories.

L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

M. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 260573.

N. Provide filler plates to cover unused spaces in panelboards.

O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads. Also provide for the following:

1. Fire detection and alarm circuits.

2. Communications equipment circuits.

3. Intrusion detection and access control system circuits.

4. Video surveillance system circuits.

P. Identify panelboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Test shunt trips to verify proper operation.

F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262416

SECTION 26 2653 - ELECTRIC VEHICLE CHARGING EQUIPMENT

PART 1 GENERAL

1. GENERAL PROVISIONS

   A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections with DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

   B. Attention is directed Section 260400 – GENERAL CONDITIONS FOR ELECTRICAL TRADES, which is hereby made a part of this Section of the Specifications.

2. RELATED DOCUMENTS

   A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

3. SUMMARY

   A. Section includes EV charging equipment that provides Level 2 EV charging.

4. REFERENCES

   A. National Fire Protection Association:

      1. NFPA 70 - National Electrical Code.

   B. Definitions

      1. EV: Electric vehicle.

      2. EV Cable: The off-board cable containing the conductor(s) to connect the EV power controller to the EV that provides both power and communications during energy transfer.

      3. EV Capable: Parking spaces that include nearby termination of raceway (conduit) to a power source with sufficient electrical panel capacity designed for simultaneous charging of electric vehicles in all planned EV parking spaces. Electrical wiring need not be pulled through raceway (conduit) until charging station is installed.

      4. EV Charger or EV Charging Equipment: See "EVSE".

      5. EV Connector: A conductive device that, when electrically coupled to an EV inlet, establishes an electrical connection to the EV for the purpose of power transfer and information exchange. This device is part of the EV coupler.

      6. EV Coupler: A mating EV inlet and connector set.

7. EV Inlet: The device in the vehicle into which the EV connector is inserted, and a conductive connection is made for the transfer of power and communication. This device is part of the EV coupler.

8. EV Make Ready: Parking spaces that include nearby termination of raceway (conduit) and electrical wiring pulled to a power source with sufficient electrical panel capacity for simultaneous charging of electric vehicles in all EV parking spaces.

9. EVSE: Electric Vehicle Supply Equipment. It includes the EV charging equipment and conductors, including the ungrounded, grounded, and equipment grounding conductors and EV cables, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for transferring energy between the premise wiring and the EV.

C. Furnish and install electric vehicle charging equipment capable of supporting the following functions:

1. Level 2 EV charging

2. Be networked or internet addressable and capable of participating in a demand response program or time-of-use pricing to encourage off-peak charging.

D. Ensure that all locations of EV charging equipment is capable of receiving a CDMA or GSM cellular signal. The electrical contractor is responsible for this verification prior to purchasing or installing equipment. This does not apply if the installation uses Ethernet connectivity rather than cellular.

E. Provide the services of a manufacturer's technician to start and verify proper installation of all equipment.

5. ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1) Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.

2) Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

3) Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

4) Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

5) Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

6) Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

6. SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for EV charging equipment.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For EV charging equipment.

1. Include plans, elevations, sections, and mounting details.

2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Detail fabrication and assembly of mounting assemblies for EV charging equipment.

4. Include diagrams for power, signal, and control wiring.

C. Coordination Drawings: Area plans and details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Structural members to which equipment will be attached.

2. Electrical service.

3. Communications service, including wireless communications equipment.

D. Field quality-control reports.

7. CLOSEOUT SUBMITTALS

A. See Division 01 – General requirements.

B. Operation and Maintenance Data: For EV charging equipment to include in operation and maintenance manuals.

1. Programming data on installed system set-up.

2. Third party payment system contracts.

C. Software and Firmware Operational Documentation:

1. Online training and help documentation.

2. Station activation sticker where required for network activation.

3.

8. QUALIFICATIONS

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

C. Comply with UL 2231-1. UL 2231-2, UL 2594, and NEC Article 625.

D. Comply with SAE J1772.

E. Comply with FCC Part 15 Class A.

9. PRE-INSTALLATION MEETINGS

A. See Division 01 – General requirements.

B. Convene minimum one week prior to commencing work of this section.

10. DELIVERY, STORAGE, AND HANDLING

A. See Division 01 – General requirements.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

11. COORDINATION

A. See Division 01 – General requirements.

B. Coordinate exact location of charging equipment on site with concrete bases provided by Division 03.

C. Coordinate bolt pattern of bollard/pole mounted charging stations with supports provided by Division 03.

D. Wireless Survey: Complete wireless survey to determine if wireless provider signals meet or exceed manufacturer's recommended minimum values.

12. WARRANTY

A. See Division 01 warranty requirements.

B. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace components of EV charging units that fail(s) in materials or workmanship within specified warranty period.

1. Standard Warranty Period: One year from date of Substantial Completion for the installer and three years from the date of shipment for the manufacturer.

PART 2 PRODUCTS

1. MANUFACTURERS

A. Basis of Design: EVSE LLC

B. Acceptable Alternates: Chargepoint, Eaton.

C. Substitutions – See Division 01 – General Requirements.

D. Source Limitations: Obtain EV charging equipment from single manufacturer.

2. EV CHARGING EQUIPMENT DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Comply with NFPA 70.

C. ADA compliant.

D. Metering: +/- 2 percent from 2 percent to full scale of output.

E. EV Charging Equipment Mounting: Bollard, pole or wall mount – see drawings for mounting type.

F. Enclosures:

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.

b. Aluminum and UV-resistant plastic.

c. Paint and Anodized or powder coated aluminum.

d. Charging components protected by security screws.

e. Charging connectors in locking holsters or using motorized, retractable cable system which does not require holsters.

f. Meter, modem, and CPU, tamper resistant.

G. EV Cable and Connectors:

1. SAE J1772 connector.

2. Locking holster or using a motorized, retractable cable system which does not require holsters.

3. 18-foot cable with cable management system (mechanical or motorized retractable).

H. Status Indicators:

1. LEDs to indicate power, vehicle charging, charging complete, system status, faults, and service, as well as authorization.

I. Display Screen/LEDs:

1. Daylight-viewable LCD screen with UV protection. Daylight readable and fingerprint resistant. The screen may be integral or detached in a separate kiosk-like module.

2. Displays/indicates power, charging, charging complete, remote control, system status, faults, payment and pricing details, and service.

J. Networking:

1. WAN Communications: Cellular GSM/GPRS and CDMA or Ethernet.

2. LAN Communications: 2.4 GHz Wi-Fi 802.11b/g/n, ZigBee wireless or Ethernet Bridge.

3. Capable of remote configuration, diagnostics and reporting.

4. Capable of remote software updates.

K. Payment System:

1. RFID (ISO 15693, ISO 14443), NFC, Contactless or insertion style credit card reader.

2. PCI (Payment Card Industry) compliant.

3. Capable of remote control and authorization including mobile phone application or toll free phone number.

4. Capable of allowing free charging.

5. Include all required network and port license fees.

L. Charging Network: Compatible with the Open Charge Point Protocol (OCPP) charging network.

1. Multiple units shall independently connect to charging network.

2. Multiple units shall have one unit designated as a master unit that is configured as a gateway unit between the EV charging equipment (or a kiosk-like module serving the same function) and the charging network.

3. Individual units shall be capable of indicating station status and availability providing or connecting user to customer support and remote control, if networked, and via QR code or smartphone app.

3. PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

B. Surge Withstand: 6 kV at 3000A.

C. Integral GFCI.

D. Auto-GFCI fault retry.

E. Input Power:

1. As specified on drawings.

2. Dual circuits do not need to be interlocked.

F. EV Charging Levels:

1. Single vehicle: AC Level 2 maximum charging rate between 7.2 kW and 9.6 kW.

2. Dual vehicles, AC Level 2 maximum charging rate between 7.2 kW and 9.6 kW.

G. Multiple vehicles simultaneously charging at a site using Automatic Power Load Management may be charged up to 9.6 kW. Using Power Sharing of dual chargers, two vehicles charging simultaneously will allow each 4.8 kW per hour of charge, reverting to 9.6 kW per hour if one of two vehicles is no longer charging. Multiple pairs of vehicles can follow this pattern.

4. GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping or otherwise protecting exposed finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 EXECUTION

1. EXAMINATION

A. See Division 01 – General requirements.

B. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Examine roughing-in for EV charging equipment electrical conduit to verify actual locations of conduit connections before equipment installation.

D. Examine walls, floors, and pavement for suitable conditions where EV charging equipment will be installed.

E. Notify the Architect or Engineer of any unsuitable conditions. Do not proceed with installation until unsuitable conditions have been corrected.

2. INSTALLATION

A. Comply with NECA 1 and NECA 413.

B. Concrete Base Mounting:

1. Install EV charging equipment on a concrete base per manufacturers installation requirements or as indicated on drawings. Comply with requirements for concrete base specified in Division 03.

a. Install dowel rods to connect concrete base to concrete floor or sidewalk where applicable. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

b. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

c. Install anchor bolts to elevations required for proper attachment to supported equipment.

d. Secure EV charging equipment to concrete base according to manufacturer's written instructions.

C. Wiring Method: Install cables in raceways and cable trays. Conceal raceway and cables except in unfinished spaces.

1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors.

E. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

F. Circuit Breakers: Comply with Section 262816 "Enclosed Switches and Circuit Breakers."

G. Secure covers to enclosure.

3. CONNECTIONS

A. Connect wiring according to Section 260519 “Electrical Power Conductors and Cable.”

B. Comply with grounding requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

C. Comply with requirements for installation of conduit in Section 260533 "Raceways and Boxes for Electrical Systems." Drawings indicate general arrangement of conduit, fittings, and specialties.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

4. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

5. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. For each unit of EV charging equipment, perform the following tests and inspections:

a. Unit self-test.

b. Operation test with load bank.

c. Operation test with EV.

d. Network communications test.

D. EV charging equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

6. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

7. SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for the duration of an active Network Service Plan.

B. Upgrade Service: At Substantial Completion, remotely update software to latest version. Install and program software upgrades that become available while an active Network Service Plan is maintained. Upgrading software shall include operating system and new or revised licenses for using software.

8. TRAINING:

A. The Owner may assign personnel to participate with the contractor during installation. Without delaying the work, familiarize the Owner's personnel with the installation, equipment, and maintenance.

B. Provide training to personnel selected by the Owner on operation and basic maintenance of all systems and equipment.

C. Include 4 hours of training Owner’s staff.

END OF SECTION

SECTION 262713 - ELECTRICITY METERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment for Owner electricity metering:

1. Single circuit electricity meters.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems: Cabinets and enclosures for metering system components.

D. Section 262813 - Fuses.

E. Section 271000 - Structured Cabling: Data cables for IP network connections.

1.3 REFERENCE STANDARDS

A. ANSI C12.1 - Electric Meters - Code for Electricity Metering.

B. IEC 62053-21 - Electricity Metering Equipment - Particular Requirements - Part 21: Static Meters for AC Active Energy (Classes 0,5, 1 and 2).

C. IEC 62053-23 - Electricity Metering Equipment - Particular Requirements - Part 23: Static Meters for Reactive Energy (Classes 2 and 3).

D. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction.

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

H. NFPA 70 - National Electrical Code.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate work to provide equipment suitable for interface with electricity metering systems to be provided.

2. Coordinate the work with other installers to provide communication lines required for electricity metering system interface.

3. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Conduct meeting with facility representative and other related equipment manufacturers to discuss electricity metering system interface requirements.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.

C. Shop Drawings: Include system interconnection schematic diagrams showing all factory and field connections. Include requirements for interface with other systems.

D. Project Record Documents: Record actual installed locations of meters and final equipment settings.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.1 EQUIPMENT FOR OWNER ELECTRICITY METERING

A. Provide microprocessor-based digital electricity metering systems including all instrument transformers, wiring, and connections necessary for measurements specified.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.

D. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.

E. Enclosures:

1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 260533.16.

2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

3. Finish: Manufacturer's standard unless otherwise indicated.

F. Instrument Transformers:

1. Comply with IEEE C57.13, where applicable.

2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.

4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

G. Accessories:

1. Wiring: Provide manufacturer's recommended cables as indicated or as required for connections between system components.

2. IP Network Connections:

a. Unless otherwise indicated, network switches required for network connections to system components provided by others.

b. Unless otherwise indicated, network cables required for network connections to system components provided by Contractor.

1) Network Cables: Unshielded twisted pair (UTP), minimum Category 5e.

2) See Section 271000.

H. Interface with Other Work:

1. Interface with building automation system.

2.2 SINGLE CIRCUIT ELECTRICITY METERS

A. Single Circuit Electricity Meter:

1. Accuracy:

a. Real/Active Power/Energy: Revenue grade; plus/minus 1.0 percent; complying with ANSI C12.1 and/or IEC 62053-21 Class 1.

b. Reactive Power/Energy: Plus/minus 2.0 percent, complying with IEC 62053-23 Class 2.

2. Measured Parameters:

a. Voltage (Volts AC); line-to-line and line-to-neutral; per phase.

b. Current (Amps); per phase.

c. Frequency (Hz).

d. Real/active power (kW); per phase and total of all phases.

e. Reactive power (kVAR); per phase and total of all phases.

f. Apparent power (kVA); per phase and total of all phases.

g. Power factor; per phase and total of all phases.

h. Real/active energy (kWh).

i. Reactive energy (kVARh).

j. Apparent energy (kVAh).

k. Current demand.

3. Data logging.

4. Communications: Compatible with connected systems. Provide all accessories necessary for proper interface.

a. Ethernet Communications: Support for Modbus TCP and BACnet IP protocol.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of metering systems and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive meters.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment components in accordance with Section 260529.

D. Provide grounding and bonding in accordance with Section 260526.

E. Provide fuses complying with Section 262813 as required.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

D. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

E. Correct deficiencies and replace damaged or defective metering system components.

3.4 ADJUSTING

A. Program system parameters according to requirements of Owner.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION 262713

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SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates and covers.

E. Floor box service fittings.

1.2 RELATED REQUIREMENTS

A. Section 260533.16 - Boxes for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 271000 - Structured Cabling: Voice and data jacks.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices.

C. NEMA WD 1 - General Color Requirements for Wiring Devices.

D. NEMA WD 6 - Wiring Devices - Dimensional Specifications.

E. NFPA 70 - National Electrical Code.

F. UL 20 - General-Use Snap Switches.

G. UL 498 - Attachment Plugs and Receptacles.

H. UL 514D - Cover Plates for Flush-Mounted Wiring Devices.

I. UL 943 - Ground-Fault Circuit-Interrupters.

J. UL 1310 - Class 2 Power Units.

K. UL 1472 - Solid-State Dimming Controls.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:

1. Wall Dimmers: Include information on operation and setting of presets.
2. GFCI Receptacles: Include information on status indicators.

D. Project Record Documents: Record actual installed locations of wiring devices.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Wiring Device Applications:

1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.

2. Provide GFCI protection for:

   a. Receptacles installed within 6 feet of sinks.

   b. Receptacles installed in kitchens.

   c. Receptacles serving electric drinking fountains.

3. Single Receptacles Installed on Individual Branch Circuits: Provide receptacle ampere rating equal to branch circuit rating.

4. Flush Floor Service Fittings in Tile Floors: Use tile rings.

5. Flush Floor Service Fittings in Carpeted Floors: Use carpet flanges.

C. Wiring Device Finishes:

1. Provide wiring device finishes as described below, unless otherwise indicated.

2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

3. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

4. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

5. Wiring Devices Installed in Wet or Damp Locations: White with weatherproof cover.

6. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

2.2 WALL SWITCHES

A. General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with decorator style rocker type switch actuator and maintained contacts; single pole single throw or three way as indicated on the drawings.

2.3 WALL DIMMERS

A. General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

2.4 RECEPTACLES

A. General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.

2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:

1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Automatically Controlled Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, split-wired; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.

3. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

4. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.

2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

4. Tamper Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

D. USB Charging Devices:

1. General Requirements: Listed as complying with UL 1310.

a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.

2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

2.5 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Size: Standard.

3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Receptacle Covers for Wet Locations: Gasketed, thermoplastic, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.6 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

B. Flush Floor Service Fittings:

1. Dual Service Flush Combination Outlets:

a. Cover: Rectangular.

b. Configuration:

1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2) Voice and Data Jacks: As specified in Section 271000.

2. Accessories:

a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.

b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:

a. Wall Switches: 48 inches above finished floor.

b. Wall Dimmers: 48 inches above finished floor.

c. Receptacles: 18 inches above finished floor or 6 inches above counter.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Engineer to obtain direction prior to proceeding with work.

5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Q. Identify wiring devices in accordance with Section 260553.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch and wall dimmer with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Engineer.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

SECTION 262816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum).

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

E. NFPA 70 - National Electrical Code.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations.

H. UL 98 - Enclosed and Dead-Front Switches.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Project Record Documents: Record actual locations of enclosed switches.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 1.

b. Outdoor Locations: Type 3R.

2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:

1. Comply with NEMA BS 31047.

2. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Identify enclosed switches in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262816.16

SECTION 263213 - ENGINE GENERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:

1. Engine and engine accessory equipment.
2. Alternator (generator).
3. Generator set control system.
4. Generator set enclosure.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 231113 - Facility Fuel-Oil Piping:

1. Diesel fuel piping.

C. Section 235100 - Breechings, Chimneys, and Stacks: Engine exhaust piping.

1. Includes installation of exhaust silencer specified in this section.

D. Section 260526 - Grounding and Bonding for Electrical Systems.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 263600 - Transfer Switches.

1.3 REFERENCE STANDARDS

A. ASTM D975 - Standard Specification for Diesel Fuel.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NECA/EGSA 404 - Standard for Installing Generator Sets.

D. NEMA MG 00001 - Motors and Generators.

E. NFPA 30 - Flammable and Combustible Liquids Code.

F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.

G. NFPA 70 - National Electrical Code.

H. NFPA 99 - Health Care Facilities Code.

I. NFPA 110 - Standard for Emergency and Standby Power Systems.

J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids.

K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries.

L. UL 2200 - Stationary Engine Generator Assemblies.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.

a. Transfer Switches: See Section 263600.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.

E. Manufacturer's factory emissions certification.

F. Source quality control test reports.

G. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:

1. Certified prototype tests.

2. Torsional vibration compatibility certification.

3. NFPA 110 compliance certification.

4. Certified rated load test at rated power factor.

H. Manufacturer’s detailed field testing procedures.

I. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

J. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

K. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 016000 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems).

3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

4. NFPA 30 (Flammable and Combustible Liquids Code).

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with engine generator systems of similar size, type, and complexity; manufacturer's authorized installer.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:

1. Application: Emergency/standby.

2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:

1. Type: Diesel (compression ignition).

2. Power Rating: 150 kW, standby.

3. Voltage: 208Y/120 V, 3 phase, 60 Hz.

4. Main Line Circuit Breaker:

a. Type: Thermal magnetic.

b. Trip Rating: Select according to generator set rating.

E. Generator Set General Requirements:

1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
2. Factory-assembled, with components mounted on suitable base.
3. List and label engine generator assembly as complying with UL 2200.
4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:

1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:

1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.2 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Diesel (Compression Ignition):

1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
2. Fuel Storage: Sub-base fuel tank.

3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.

4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.

5. Sub-Base Fuel Tank:

    a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.

    b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable codes.

    c. Features:

        1) Direct reading fuel level gauge.

        2) Normal atmospheric vent.

        3) Emergency pressure relief vent.

        4) Fuel fill opening with lockable cap.

        5) Dedicated electrical conduit stub-up area.

C. Engine Starting System:

1. System Type: Electric, with DC solenoid-activated starting motor(s).

2. Battery(s):

    a. Battery Type: Lead-acid.

    b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.

    c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.

3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.

4. Battery Charger:

    a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.

b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.

c. Listed as complying with UL 1236.

d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.

e. Provide integral DC output ammeter and voltmeter with five percent accuracy.

f. Provide alarm output contacts as necessary for alarm indications.

5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):

1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.

2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:

1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

F. Engine Cooling System:

1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.

2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.

G. Engine Air Intake and Exhaust System:

1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.

2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

3. Exhaust Silencer: Provide critical grade or better exhaust silencer; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.3 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 00001; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:

1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.

2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.

3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 00001, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 00001, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.

2.4 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.

B. Control Panel:

1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.

2. Generator Set Control Functions:

a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).

b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.

c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.

d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.

e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.

f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).

g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.

3. Generator Set Status Indications:

a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.

b. Current (Amps): For each phase.

c. Frequency (Hz).

d. Real power (W/kW).

e. Reactive power (VAR/kVAR).

f. Apparent power (VA/kVA).

g. Power factor.

h. Duty Level: Actual load as percentage of rated power.

i. Engine speed (RPM).

j. Battery voltage (Volts DC).

k. Engine oil pressure.

l. Engine coolant temperature.

m. Engine run time.

n. Generator powering load (position signal from transfer switch).

4. Generator Set Protection and Warning/Shutdown Indications:

a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:

1) Overcrank (shutdown).

2) Low coolant temperature (warning).

3) High coolant temperature (warning).

4) High coolant temperature (shutdown).

5) Low oil pressure (shutdown).

6) Overspeed (shutdown).

7) Low fuel level (warning).

8) Low coolant level (warning/shutdown).

9) Generator control not in automatic mode (warning).

10) High battery voltage (warning).

11) Low cranking voltage (warning).

12) Low battery voltage (warning).

13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:

1) High AC voltage (shutdown).

2) Low AC voltage (shutdown).

3) High frequency (shutdown).

4) Low frequency (shutdown).

5) Overcurrent (shutdown).

c. Provide contacts for local and remote common alarm.

d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:

a. Event log.

C. Remote Annunciator:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.

2. Generator Set Status Indications:

a. Generator powering load (via position signal from transfer switch).

b. Communication functional.

3. Generator Set Warning/Shutdown Indications:

a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:

1) Overcrank (shutdown).

2) Low coolant temperature (warning).

3) High coolant temperature (warning).

4) High coolant temperature (shutdown).

5) Low oil pressure (shutdown).

6) Overspeed (shutdown).

7) Low fuel level (warning).

8) Low coolant level (warning/shutdown).

9) Generator control not in automatic mode (warning).

10) High battery voltage (warning).

11) Low cranking voltage (warning).

12) Low battery voltage (warning).

13) Battery charger failure (warning).

b. Provide audible alarm with silence function.

c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.5 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.

E. Access Doors: Lockable, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

2.6 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

C. Diesel Fuel Storage Tanks: Perform pressurized leak test prior to shipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive equipment.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 033000.

F. Provide required support and attachment in accordance with Section 260529.

G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.

H. Provide diesel fuel piping and venting in accordance with Section 231113, where not factory installed.

I. Provide engine exhaust piping in accordance with Section 235100, where not factory installed.

1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.

2. Do not exceed manufacturer's maximum back pressure requirements.

J. Do not insulate piping for engine components restricted by manufacturer.

K. Install exhaust silencer in accordance with Section 235100, where not factory installed.

L. Provide grounding and bonding in accordance with Section 260526.

M. Identify system wiring and components in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Notify Owner and Engineer at least two weeks prior to scheduled inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.

F. Preliminary inspection and testing to include, at a minimum:

1. Inspect each system component for damage and defects.

2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.

3. Check for proper oil and coolant levels.

G. Prepare and start system in accordance with manufacturer's instructions.

H. Perform acceptance test in accordance with NFPA 110.

I. Inspection and testing to include, at a minimum:

1. Verify compliance with starting and load acceptance requirements.

2. Verify voltage and frequency; make required adjustments as necessary.

3. Verify phase sequence.

4. Verify control system operation, including safety shutdowns.

5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).

6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).

J. Provide field emissions testing where necessary for certification.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of four hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

E. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.6 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.7 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 263213

SECTION 263600 - TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

F. Section 263213 - Engine Generators: For interface with transfer switches.

1. Includes code requirements applicable to work of this section.

2. Includes additional testing requirements.

3. Includes related demonstration and training requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment.

D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

E. NFPA 70 - National Electrical Code.

F. NFPA 110 - Standard for Emergency and Standby Power Systems.

G. UL 1008 - Transfer Switch Equipment.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.

a. Engine Generators: See Section 263213.

2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.

4. Coordinate the work with placement of supports, anchors, etc. required for mounting.

5. Notify Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

C. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Source quality control test reports.

E. Manufacturer’s detailed field testing procedures.

F. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

G. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

H. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

1.6 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 263213.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:

1. Utilize open transition transfer unless otherwise indicated or required.

2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):

a. Unless otherwise indicated or required, provide solid (unswitched) neutral.

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:

1. Transfer Switch Type: Automatic transfer switch.

2. Transition Configuration: Open-transition (no neutral position).

3. Voltage: As indicated on the drawings.

4. Ampere Rating: As indicated on the drawings.

5. Neutral Configuration: Solid neutral (unswitched), except as indicated.

6. Load Served: As indicated on the drawings.

7. Primary Source: As indicated on the drawings.

8. Alternate Source: As indicated on the drawings.

F. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:

1. Open Transition:

a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.

2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Outdoor Locations: Type 3R or Type 4.

2. Provide lockable door(s) for outdoor locations.

3. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.

M. Automatic Transfer Switches:

1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.

2. Control Functions:

a. Automatic mode.

b. Test Mode: Simulates failure of primary/normal source.

c. Voltage and Frequency Sensing:

1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.

2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.

3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:

1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).

2) Auxiliary contacts; one set(s) for each switch position.

e. Adjustable Time Delays:

1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.

2) Transfer to alternate/emergency source time delay.

3) Retransfer to primary/normal source time delay.

4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.

g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

4. Automatic Sequence of Operations:

a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.

b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.

c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.

d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Remote Annunciators:

1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.

2. Transfer Switch Status Indications:

a. Connected to alternate/emergency source.

b. Connected to primary/normal source.

c. Alternate/emergency source available.

O. Interface with Other Work:

1. Interface with engine generators as specified in Section 263213.

2.2 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 4 inch high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.

2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

E. Provide additional inspection and testing as required for completion of associated engine generator testing as specified in Section 263213.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of four hours of training.

3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

E. Coordinate with related generator demonstration and training as specified in Section 263213.

3.6 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.7 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 263600

SECTION 264300 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 262413 - Switchboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems.

D. NFPA 70 - National Electrical Code.

E. UL 1449 - Standard for Surge Protective Devices.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Project Record Documents: Record actual connections and locations of surge protective devices.

1.7 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide factory-installed, internally-mounted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):

1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

1. Indoor clean, dry locations: Type 1.

H. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.

1. Switchboards: See Section 262413.

2.2 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device:

1. Protection Circuits: Field-replaceable modular or non-modular.

2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.

3. UL 1449 Nominal Discharge Current (I-n): 20 kA.

4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

5. Diagnostics:

a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.

b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

c. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

D. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.

E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

G. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.3 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Section 7.19.1.

3.4 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 264300

SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

C. Ballasts and drivers.

1.2 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260923 - Lighting Control Devices.

1. Includes automatic controls for lighting including occupancy sensors and daylighting controls.

1.3 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources.

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.

E. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility.

F. NFPA 70 - National Electrical Code.

G. NFPA 101 - Life Safety Code.

H. UL 924 - Emergency Lighting and Power Equipment.

I. UL 1598 - Luminaires.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.

3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

4. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

D. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting) and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

C. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

H. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

1. Self-Powered Exit Signs:

a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.

c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

d. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.4 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to one percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.5 ACCESSORIES

A. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.

2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.

3. Secure surface-mounted and recessed luminaires to building structure.

4. Secure pendant-mounted luminaires to building structure.

5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.

6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.

H. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.

2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Install canopies tight to mounting surface.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

M. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Engineer or authority having jurisdiction.

3.6 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting) and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265100

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SECTION 265600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260923 - Lighting Control Devices.

1. Includes automatic controls for lighting including time switches and outdoor photo controls.

E. Section 262726 - Wiring Devices: Receptacles for installation in poles.

1.3 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

B. IEEE C2 - National Electrical Safety Code(R) (NESC(R)).

C. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products.

D. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction.

F. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems.

G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.

H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility.

I. NFPA 70 - National Electrical Code.

J. UL 1598 - Luminaires.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.

2. Notify Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

a. Include estimated useful life, calculated based on IES LM-80 test data.

2. Lamps: Include rated life and initial and mean lumen output.

3. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.

3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

J. Exposed Hardware: Stainless steel.

2.3 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).

2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.

2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

2. Structural Design Criteria:

a. Comply with AASHTO LTS.

b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.

c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.

3. Material: Steel, unless otherwise indicated.

4. Shape: Square straight, unless otherwise indicated.

5. Finish: Match luminaire finish, unless otherwise indicated.

6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.

7. Unless otherwise indicated, provide with the following features/accessories:

a. Handhole.

b. Anchor bolts with leveling nuts or leveling shims.

c. Anchor base cover.

d. Provision for pole-mounted weatherproof GFI receptacle where indicated.

B. Metal Poles: Provide ground lug, accessible from handhole.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

H. Pole-Mounted Luminaires:

1. Maintain the following minimum clearances:

a. Comply with IEEE C2.

b. Comply with utility company requirements.

2. Foundation-Mounted Poles:

a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 033000.

1) Install anchor bolts plumb per template furnished by pole manufacturer.

2) Position conduits to enter pole shaft.

b. Install foundations plumb.

c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.

d. Tighten anchor bolt nuts to manufacturer's recommended torque.

e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.

3. Grounding:

a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.

4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

5. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 262726 in designated poles.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Engineer.

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Engineer, and correct deficiencies or make adjustments as directed.

3.8 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265600

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SECTION 271000 - STRUCTURED CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Communication Cabling System Installation requirements.
B. Horizontal and Backbone Cabling Systems.
C. Communications pathways.
D. Cable Trays
E. Copper cable and terminations.
F. Fiber optic cable, terminations, and interconnecting devices.
G. Communications equipment room fittings.
H. Communications outlets.
I. Communications grounding and bonding.
J. Communications identification.
K. Cabling testing procedures.

1.3 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Division 07 - Firestopping.
C. Division 26 - Grounding and Bonding for Electrical Systems.

1. Includes intersystem bonding termination.
2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

D. Division 26 - Conduit for Electrical Systems.
E. Division 26 - Cable Trays for Electrical Systems.
F. Division 26 - Boxes for Electrical Systems.
G. Division 26 - Underfloor Raceways for Electrical Systems.
H. Division 26 - Identification for Electrical Systems: Identification products.
I. Division 26 - Wiring Devices.

1.4 DEFINITIONS

A. BICSI: Building Industry Consulting Services International
B. EIA: Electronic Industries Association
C. TIA: Telecommunications Industries Association
D. UL: Underwriters Laboratory

E. NFPA: National Fire Protection Association

1.5 REFERENCE STANDARDS

A. ANSI/TIA-1152-A - Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling.
B. ANSI/TIA-568-0.D - Generic Telecommunications Cabling for Customer Premises.
C. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.
D. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment Revision E, 2005.
E. FM (AG) - FM Approval Guide current edition.
F. ICEA S-83-596 - Indoor Optical Fiber Cables 2016.
G. ICEA S-90-661 - Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cables (With or Without An Overall Shield) For Use in General Purpose and LAN Communications Wiring Systems Technical Requirements 2012.
H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices 1988a (Reaffirmed 2012).
J. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Singlemode Optical Fibers 1998 (Reaffirmed 2002).
K. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Singlemode Optical Fibers with Low Water Peak 2000 (Reaffirmed 2005).
L. TIA-526-7 - Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant 2015a.
M. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2019.
N. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standard 2018d.
O. TIA-568.3 - Optical Fiber Cabling and Components Standard 2016d.
P. TIA-569 - Telecommunications Pathways and Spaces 2019e.
Q. TIA-598 - Optical Fiber Cable Color Coding 2014d.
R. TIA-606 - Administration Standard for Telecommunications Infrastructure 2017c.
S. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
T. UL (DIR) - Online Certifications Directory Current Edition.
U. UL 444 - Communications Cables Current Edition, Including All Revisions, and Edition 5, 2017.
V. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
W. UL 1651 - Fiber Optic Cable Current Edition, Including All Revisions.
X. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.
C. Preinstallation Meeting: Convene prior to commencing work of this section, as requested of the GC or Owner, to review service requirements and details with Communications Service Provider representative.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Evidence of qualifications from Manufacturer for installer to install and warranty submitted products.
D. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
G. Copper and Fiber Test reports. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
H. Upon completion of testing and any corrections required, the installation contractor shall register all copper and fiber test results with the manufacturer(s) to attain the manufacturer’s extended warranty on labor an material. The manufacturer's approved documentation shall be delivered to the Owner.

    1. Evidence from Manufacturer offering extended warranty on Labor and Material confirming all submitted manufacturers are included with this warranty.

I. Cable Tray submittals shall include Delegated-Design Submittal: For seismic restraints.

    1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.
    2. Design Calculations: Calculate requirements for selecting seismic restraints.
    3. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

J. Field Test Reports.
K. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

    1. Record actual locations of outlet boxes and Data Rooms.
    2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
    3. Identify Data Rooms and equipment rooms by room number on drawings.

L. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents

1.8 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
B. Manufacturer Qualifications: At least 3 years' experience manufacturing products of the type specified. experience in the installation and testing of the type of system specified, and:
C. Installer Qualifications: A company having at least 3 years' experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
2. Supervisors and installers factory certified by manufacturers of products to be installed.
3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.
E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
F. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
G. Grounding: Comply with ANSI-J-STD-607-A.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Keep stored products clean, dry and in a temperature permitted by the manufacturer.
C. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical loss test set.
2. Test optical fiber cable while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice, data, audio visual, and security communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
2. Comply with Communications Service Provider requirements.
3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.

4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:

1. Building Entrance / Service Provider Cable: By others.
2. Horizontal - Provide Category 6A plenum voice and data cabling, termination devices, and outlets per drawings.
3. Provide Ethernet cabling and outlets as indicated on T-drawings.
4. Backbone Cabling -Between ER/MDF and each TR/IDF within building:

a. Copper, Category 3, 25 Pair, plenum rated cable.
b. OS2 Singlemode plenum rated, armored Fiber, 12 Strand.

C. Equipment Room (ER)/ Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
D. Telecommunication Rooms (TRs)/ Intermediate Distribution Frame (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting Telecommunication Rooms (TRs/IDFs) with Equipment Room (ER/MDF), wired in star topology with Equipment Room (ER) at center hub of star.
F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to Equipment Room or Telecommunication Room located at center hub of star; also referred to as "links".

2.2 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-C.
B. Cable Support: NRTL labeled for support of Category 5E and above cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Conduit: As specified in Division 260533.13; provide pull cords in all conduits.
D. Cable Trays: As specified in Division 260536.
E. Underfloor Ducts: As specified in Division 260539.
F. Overhead Service Entrance: Weatherhead or service entrance fitting located on outside of building with galvanized rigid steel or intermediate metallic conduit running to entrance facility.
G. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.
H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:

a. Hilti Fire Stopping Products; www.hilti.com
b. STI Fire Stopping Products; www.stifirestop.com
c. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
d. Approved Equivalents
e. Substitutions: See Section 016000 - Product Requirements.

2.3 CABLE TRAYS

A. Include Ladder Cable Trays, Wire-Basket Cable Trays, and Single Rail Cable Trays.
B. GENERAL REQUIREMENTS FOR CABLE TRAYS

1. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

a. Source Limitations: Obtain cable trays and components from single manufacturer.

2. Sizes and Configurations: See the Cable Tray details on Drawings for specific requirements for types, materials, sizes, and configurations.
3. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

a. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
b. Concentrated Load: A load applied at midpoint of span and centerline of tray.
c. Load and Safety Factors: Applicable to both side rails and rung capacities.

C. LADDER CABLE TRAYS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, as indicated on the T-drawings or comparable product by one of the following:

a. Cooper B-Line, Inc.
b. Chatsworth
c. Wiremaid Products Division; Vutec Corporation.

3. Description:

a. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
b. Rung Spacing: 12 inches o.c.
c. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
d. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
e. No portion of the rungs shall protrude below the bottom plane of side rails.
f. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
g. Minimum Usable Load Depth: 6 inches.
h. Straight Section Lengths: 10 feet except where shorter lengths are required to facilitate tray assembly.
i. Width: 12 inches unless otherwise indicated on Drawings.
j. Fitting Minimum Radius: 12 inches.
k. Class Designation: Comply with NEMA VE 1.
l. Splicing Assemblies: Bolted type using serrated flange locknuts.
m. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
n. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

D. WIRE-BASKET CABLE TRAYS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, as indicated on the T-drawings or comparable product by one of the following:

    a. Cooper B-Line, Inc.
    b. Chatsworth
    c. Snaketray.
    d. Wiremaid Products Division; Vutec Corporation.

3. Description:

    a. Configuration: Wires are formed into a standard 2-by-4-inch wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.
    b. Materials: High-strength-steel longitudinal wires with no bends.
    c. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
    d. Sizes:

        1) Straight sections shall be furnished in standard 118-inch lengths.
        2) Wire-Basket Depth: 12 inches wide.
        3) Wire-Basket Depth: 4 wide or as required.

    e. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
    f. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

4. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.

E. SINGLE-RAIL CABLE TRAYS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
2. Basis-of-Design Product: Subject to compliance with requirements, as indicated on the T-drawings or comparable product by one of the following:

    a. Cooper B-Line, Inc.
    b. Chatsworth
    c. Wiremaid Products Division; Vutec Corporation.

3. Description:

    a. Configuration: Center rail with extruded-aluminum rungs arranged symmetrically about the center rail.
    b. Construction: Aluminum rungs mechanically connected to aluminum center rail in at least two places, with ends finished to protect installers and cables.
    c. Rung Spacing: 12 inches o.c.
    d. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
    e. Straight Section Lengths: 10 feet except where shorter lengths are required to facilitate tray assembly.
    f. Width: 12 inches unless otherwise indicated on Drawings.
    g. Support Point: Splice fittings shall be hanger support point.

h. Support Spacing: Support each section at midpoint. Support wall-mounted sections a maximum of one-sixth of the section length from each end.
i. Loading Depth: 4 inches
j. Maximum Loads: 50 lb/ft.
k. Unbalanced Loads: Maintain cable tray rungs within six degrees of horizontal under all loading conditions.
l. Splicing Assemblies: Bolted type using serrated flange locknuts.
m. Splicing Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
n. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
o. Splices and Connectors: Protect cables from edges of center rail and do not intrude into cable fill area.

F. MATERIALS AND FINISHES

1. Steel:

a. Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1008/A 1008M, Grade 33, Type 2.
b. Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.
c. Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.
d. Finish: Electrogalvanized before fabrication.

1) Standard: Comply with ASTM B 633.
2) Hardware: Galvanized, ASTM B 633.

e. Finish: [poxy-resin or Powder-coat enamel paint.

1) Powder-Coat Enamel: Cable tray manufacturer's recommended primer and corrosion-inhibiting treatment, with factory-applied powder-coat paint.
2) Epoxy-Resin Prime Coat: Cold-curing epoxy primer, MPI# 101.
3) Epoxy-Resin Topcoat: Epoxy, cold-cured, gloss, MPI# 77.
4) Hardware: Chromium-zinc plated, ASTM F 1136.

f. Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D 769.

2. Aluminum:

a. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 5052-H32] or Alloy 6061-T6 according to ANSI H 35.1/H 35.1M for fabricated parts.
b. Hardware: Chromium-zinc-plated steel, ASTM F 1136.
c. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

3. Stainless Steel:

a. Materials: Low-carbon, passivated, stainless steel, Type 304L or Type 316L, ASTM F 593 and ASTM F 594.
b. Hardware for Stainless-Steel Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

G. CABLE TRAY ACCESSORIES

1. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
2. Covers: Ventilated-hat type made of same materials and with same finishes as cable tray.
3. Barrier Strips: Same materials and finishes as for cable tray.
4. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

H. WARNING SIGNS

1. Lettering: 1-1/2-inch high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."
2. Comply with requirements for fasteners in Section 260553 "Identification for Electrical Systems."

I. SOURCE QUALITY CONTROL

1. Testing: Test and inspect cable trays according to NEMA FG 1.

2.4 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."
B. Comply with TIA/EIA-569-C.
C. Comply with BICSI TDMM, "Firestopping System" Article.

2.5 COPPER CABLE AND TERMINATIONS

A. Manufacturers:

1. Berk-Tek
2. Superior Essex
3. Belden
4. Leviton
5. Hubbell Premise Wiring
6. Panduit
7. Siemon
8. Substitutions: See Section 016000 - Product Requirements.

B. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type: Voice and Data: TIA-568.2 Category 6A UTP; 23 AWG.
3. Cable Type - Voice: TIA-568.2 Category 5e UTP (unshielded twisted pair); 24 AWG.
4. Cable Capacity: 4-pair.

C. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

1. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
E. Jacks and Connectors: Modular 8P8C (RJ-45), non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.

1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

F. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:

a. Quantity: One for each pair of patch panel ports.
b. Length: 10 feet.

2.6 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Manufacturers:

1. Berk-Tek
2. Superior Essex
3. Belden
4. Panduit
5. Hubbell Premise Wiring
6. Corning
7. Substitutions: See Section 016000 - Product Requirements.

B. Fiber Optic Backbone Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Singlemode, laser-optimized 50/125 um (OS2) complying with TIA-492CAAD.
3. Cable Capacity: Quantity of fibers as indicated on drawings; 24-fiber.
4. Cable Applications:

a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.

5. Cable Jacket Color:

a. Singlemode Fiber (OS2): Yellow.

C. Fiber Optic Horizontal Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Singlemode, laser-optimized 50/125 um (OS2) complying with TIA-492CAAD
3. Cable Capacity: 12-fiber; Quantity of fibers as indicated on drawings.

4. Cable Applications: Use listed NFPA 70 Type OFNP plenum cable unless otherwise indicated.
5. Cable Jacket Color:

    a. Singlemode Fiber (OS2): Yellow.

D. Fiber Optic Interconnecting Devices:

1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3dB.

2.7 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Manufacturers:

    a. Belden
    b. Leviton
    c. Hubbell Premise Wiring
    d. Panduit
    e. Siemon
    f. Substitutions: See Section 016000 - Product Requirements.

2. Connector Blocks for Category 3 Cabling: Type 66 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.

    a. Jacks: Non-keyed 8P8C (RJ-45), suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
    b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
    c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    d. Provide incoming cable strain relief and routing guides on back of panel.

B. Fiber Optic Cross-Connection Equipment:

1. Manufacturers:

    a. Belden
    b. Leviton
    c. Hubbell Premise Wiring
    d. Panduit
    e. Siemon
    f. Substitutions: See Section 016000 - Product Requirements.

2. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum.

a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
c. Provide incoming cable strain relief and routing guides on back of panel.
d. Provide rear cable management tray at least 8 inches (203 mm) deep with removable cover.
e. Provide dust covers for unused adapters.

C. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.

1. Size: As indicated on drawings.
2. Do not paint over UL label.

D. Equipment Frames, Racks and Cabinets:

1. Manufacturers:

a. Chatsworth
b. Great Lakes
c. Hubbell Premise Wiring
d. Panduit
e. Siemon
f. Substitutions: See Section 016000 - Product Requirements.

2. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
3. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.

a. Load Rating: 300 pounds.

4. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

a. Load rating: pounds (kg).

5. Freestanding Cabinets: Front and rear doors with locks; removable side panels with locks; vented top and rear door; adjustable leveling feet; cable access in roof and base; grounding bar.

a. Load rating: 1,500 pounds.
b. Roof mounted fan, capacity: 4.

6. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.

a. Cover inside of cabinet back with plywood backboard as specified.
b. Load rating: 300 pounds.
c. Roof mounted fan, capacity: 2.
d. Duplex AC power outlet inside cabinet.

7. Cabinets: Steel construction with corrosion resistant finish.

8. Locks: Keyed alike.

E. Cable Management:

1. Manufacturers:

a. Chatsworth
b. Great Lakes
c. Hubbell Premise Wiring
d. Panduit
e. Siemon
f. Substitutions: See Section 016000 - Product Requirements.

2.8 COMMUNICATIONS OUTLETS

A. Manufacturers:

1. Belden
2. Leviton
3. Hubbell Premise Wiring
4. Panduit
5. Siemon
6. Substitutions: See Section 016000 - Product Requirements.

B. Outlet Boxes: Comply with Section 26 0533.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:

a. Wall Phone Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
b. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
c. Fiber Optic Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

C. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.

D. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, color to be selected by Architect during submittals.

E. GROUNDING AND BONDING COMPONENTS

1. Comply with TIA-607.
2. Comply with Section 260526.

F. IDENTIFICATION PRODUCTS

1. Comply with TIA-606.
2. Comply with Section 260553.

G. SOURCE QUALITY CONTROL

1. See Section 014000 - Quality Requirements, for additional requirements.
2. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Description

1. This project shall be as phased approach as specified within the phasing section of this bid manual. The scope of work required shall include temporary backbone cabling between each existing telecommunication room and the new main equipment room. This temporary cabling shall be replaced with permanent backbone cabling as specified during the phased renovations of this project.

2. This temporary backbone cabling shall include the following:

a. 2 pairs of fiber optic cabling between each existing telecommunication room(s) and the new main equipment room so that all occupied spaces shall have data connectivity to the existing LAN/WAN.
b. Copper cabling between the existing PBX and telephone service provider demarcation point and all new equipment room spaces so that no occupied section of this facility shall be without voice connectivity to the existing PBX and the service provider.
c. After renovation to each phased section, all temporary cabling shall be removed and the new cabling shall be utilized for all the above connectivity between the main equipment room and each telecommunication room.

B. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
C. Coordinate backbone cabling with required protectors and demarcation point provided by the communications service provider.
D. Comply with Communication Service Provider requirements.
E. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches (300 mm) from power conduits and cables and panelboards.
3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
4. 6 inches (150mm) from flues, hot water pipes, and steam pipes.

B. Conduit, in Addition to Requirements of Section 26 0533.13:

1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
3. Arrange conduit to provide no more than 100 feet (30 m) between pull points.
4. Do not use conduit bodies.
5. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

D. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of telecommunications outlets provided under this section.

a. Mounting Heights: Unless otherwise indicated, as follows:

1) Voice and Data Outlets: 18 inches (450 mm) above finished floor.
2) Wall mounted Telephone Outlets: 48 inches (1.2 m) above finished floor to top of telephone.
3) Refer to T-drawings for mounting required heights.

b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
e. Locate outlet boxes so that wall plate does not span different building finishes.
f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Wiring Method: Install cables in raceways and J-hooks except where cable trays are required in Drawings. Conceal raceway and cables except in unfinished spaces.

1. 1. Install plenum cable in environmental air spaces, including plenum and non-plenum ceilings.

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
D. All exposed cabling shall be installed within conduit. Conduit in exposed areas shall match the color of the wall or ceiling it is attached to. Only exceptions are in data rooms, mechanical spaces, and above concealed ceilings.

1. Exposes Areas include but are not limited to:

a. Gymnasiums.
b. All open ceiling spaces.
c. Cabling that is visible above specially designed ceilings.

E. Pre-terminated fiber optic cabling will be accepted. All devices mandated within this specification shall be used to make up this pre-terminated cable.
F. Cabling Installation:

1. Install 110-style IDC termination hardware unless otherwise indicated.
2. MUTOA shall not be used as a cross-connect point.
3. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors.
4. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
5. Locate consolidation points for UTP at least 49 feet from communications equipment room.
6. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
11. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.

G. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 120 inches (3000 mm).
2. At Outlets - Copper: 12 inches (305 mm).
3. At Outlets - Optical Fiber: 39 inches (1000 mm).

H. Copper Cabling:

1. Category 3 and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.

3. Use T568B wiring configuration.

I. Fiber Optic Cabling:

1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

J. Wall-Mounted Racks and Enclosures:

1. Install onto plywood backboards only, unless otherwise indicated.
2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

K. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
L. Floor-Mounted Enclosures: Connect adjacent cabinets together and remove interior side panels.
M. Identification:

1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wall plate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.
4. Labels shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969.
5. Labels shall be preprinted using a mechanical means of printing (e.g. laser printer)
6. Where used for cable marking, provide vinyl substrate with a white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable. If cable jacket is white, provide cable label with printing area that is any other color than white, preferable orange or yellow - so that labels are easily distinguishable.
7. Where insert type labels are used provide clear plastic cover over label.
8. Provide plastic warning tape 6 inches wide continuously printed and bright colored 18" above all direct buried services, underground conduits, and duct-banks.

3.4 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA FG 1.
B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.
C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
D. Remove burrs and sharp edges from cable trays.
E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.
F. Fasten cable tray supports to building structure.
G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems."
H. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.
I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

J. Support bus assembly to prevent twisting from eccentric loading.
K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.
L. Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.
M. Support wire-basket cable trays with center support hangers or trapeze hangers or wall brackets.
N. Support center support hangers or trapeze hangers for wire-basket trays with 1/4-inch diameter rods.
O. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.
P. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA FG 1. Space connectors and set gaps according to applicable standard.
Q. Make changes in direction and elevation using manufacturer's recommended fittings.
R. Make cable tray connections using manufacturer's recommended fittings.
S. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."
T. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.
U. Install cable trays with enough workspace to permit access for installing cables.
V. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.
W. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.
X. Clamp covers on cable trays installed outdoors with heavy-duty clamps.
Y. Install warning signs in visible locations on or near cable trays after cable tray installation.
Z. CABLE TRAY GROUNDING

1. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."
2. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

AA. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

1. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.
2. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.5 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.
B. Comply with inspection and testing requirements of specified installation standards.
C. Provide all labor, materials, tools, field-test instruments and equipment required for the complete testing, identification, and administration of the work called for in the Contract Documents.

D. Only test results with a PASS will be accepted. Field-test results with a *PASS will be rejected.
E. Testing shall be performed on each cabling link. (100% Testing)
F. All Tests shall be documented.
G. Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

1. Manufacturer of the connectors or cable.
2. Manufacturer of the test equipment used for the field certification.
3. Training Organizations (BICSI, Equivalent)

H. The Owner or the Owner's representative may select a random sample of five percent of the installed service links. The Owner or the Owner's representative shall test these randomly selected links. The results obtained shall be compared to the data provided by the installation contractor. If more than two percent of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the representative shall repeat 100 percent testing at no cost to the Owner.
I. Engage a qualified testing agency to evaluate cables.
J. Cable will be considered defective if it does not pass tests and inspections.
K. Visual Inspection:

1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.
4. Inspect patch cords for complete labels.
5. Inspect cable placement, cable termination, grounding and bonding, equipment, and patch cords, and labeling of all components.

L. Category 6A Modular Plug Termination Link Testing Requirements:

1. Each cabling link shall be tested for:

a. Wire Map
b. Length
c. Propagation Delay
d. Delay Skew
e. DC Loop Resistance
f. Insertion Loss
g. NEXT (Near-End Cross Talk)
h. PS NEXT (Power Sum Near-End Cross Talk)
i. ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End)
j. ACR-F (Attenuation to Crosstalk Ratio Far-End)
k. PS ACR-F (Power Sum Attenuation to Crosstalk Ratio Far-End)
l. Return Loss

2. All installed cabling Modular Plug Terminated Links shall be field-tested and pass the test requirements and analysis as dictated by the Manufacturer to achieve the extended warranty. Any Modular Plug Terminated Link that fails these requirements shall be diagnosed and corrected until the Modular Plug Terminated Links meets the performance requirements. The final and passing results of the tests for all Modular Plug Terminated Links shall be provided in the test results documentation.
3. Modular Plug Terminated Links shall comply with the Permanent Link transmission requirements of the ANSI/TIA-568-2.D standard.

a. The MPTL shall be tested with a Permanent Link Adapter on the Main Unit and a Patch Cord Adapter suitable for Category 6A testing on the Far End or Remote Test Equipment

4. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with the Contract Documents and to the satisfaction of the Owner.

M. Category 5e and Above Permanent Link Testing Requirements:

1. Each Cabling Link shall be tested for:

a. Wire Map
b. Length
c. Propagation Delay
d. Delay Skew
e. DC Loop Resistance
f. DC Resistance Unbalance within a pair
g. DC Resistance Unbalance between pairs
h. Insertion Loss
i. NEXT (Near-End Cross Talk)
j. PS NEXT (Power Sum Near-End Crosstalk)
k. ACR-N (Attenuation to Crosstalk Ratio Near-End)
l. PS ACR-N (Power Sum Attenuation to Crosstalk Ratio Near-End)
m. ACR-F (Attenuation to Crosstalk Ratio Far-End)
n. Return Loss
o. TCL (Transverse Conversion Loss)
p. ELTCTL (Equal Level Transverse Conversion Transfer Loss)

2. All installed cabling Permanent Links shall be field-tested and pass the test requirements and analysis as dictated by the Manufacturer for the extended warranty. Any Permanent Link that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected Permanent Link meets performance requirements. The final and passing result of the tests for all Permanent Links shall be provided in the test results documentation.
3. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with the Contract Documents and to the satisfaction of the Owner.

N. Fiber Optic Cabling Test Requirements:

1. All tests performed on optical fiber cabling that uses a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
2. The tests must be carried out by trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof. These certificates may have been issued by any of the following organizations or an equivalent organization:

a. Manufacturer of the fiber optic cable and/or fiber optic connectors.
b. Manufacturer of the test equipment used for the field certification.
c. Training Organizations (e.g. BICSI).

3. Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.

4. Fiber end faces shall be inspected at 200X and 400X magnification. 200X magnification is suitable for inspecting singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted, or dirty connectors shall be diagnosed and corrected.
5. Testing shall be performed on each cabling segment (connector to connector)Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the owner's instructions.
6. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1m and 4m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.
7. Optical Loss Testing:

    a. Horizontal/Backbone Link:

        1) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper equivalent method.
        2) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

    b. ODTR Testing:

        1) Fiber links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
            (a) Singlemode: 1310 and 1550 nm
        2) Each fiber link and channel shall be tested in both directions.
        3) A launch cable shall be installed between the OTDR and the first link connection.
        4) A receive cable shall be installed after the last link connection.

    c. Magnified End Face Inspection:

        1) Fibers shall be inspected at 250X or 400X magnification.

    d. Length Measurement:

        1) The length of each fiber shall be recorded.
        2) The optical length shall be measured using an OLTS or OTDR.

    e. Polarity Testing

        1) Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with Clause E.5.3 of ANSI/TIA-568-C.0. The polarity of the paired duplex fibers shall be verified using an OLTS.

8. Each cabling link shall be tested in compliance with the following Test Limits
9. Singlemode Backbone: Perform tests in accordance with TIA-526-7.
10. Links: Perform optical fiber end-to-end attenuation tests and field reel tests.

O. Cable Testers:

1. The field-test instrument shall be within the calibration period recommended by the manufacturer. Minimum calibration is 12 months prior to testing.
2. The tester shall have Level IIIe accuracy in accordance with ANSI/TIA-1152-A
3. The tester must be capable of storing > 10,000 results for all measurements listed above.
4. Acceptable Manufacturers:

    a. Fluke Networks
    b. Prior approved manufacturer.

P. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

1. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
2. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.

END OF SECTION 271000

SECTION 274100 - AUDIO VIDEO SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
C. Related Drawings:

1. Audio Video (AV) Drawings
2. Theatrical Drawings
3. Electrical Drawings
4. Architectural Drawings
5. Technology Drawings
6. Theatrical Rigging Drawings

D. Coordinate work with other trades to properly execute the work within this specification.
E. System features mentioned in this specification, or shown on the AV drawings, are required, whether they are listed in both places. Where there is conflict between this specification or the AV drawings, the more stringent requirement shall apply.

1.2 BIDDER RESPONSIBILITY

A. This specification and the AV drawings are detailed only to the extent necessary to show design intent and signal flow. The bidder shall examine and be thoroughly familiar with all contract drawings, design intent, systems specified, their installation, configuration, and industry best practices. The contractor is responsible for all devices and configuration required to produce a fully functional system, including devices that may not be documented on either this specification or the AV drawings. Equipment required to meet this stipulation shall be provided without claim for additional payment. Specific products to meet the required functionality are listed within this specification and notated within the AV drawing package.

1.3 SUMMARY

A. furnish and install sound, video, and communication systems as shown on drawings and as specified herein, complete with all apparatus, equipment, power supplies, wiring, labor, and services necessary to ensure a complete working system. Verify completeness of equipment listed and correctness of type numbers. Furnish and install supplementary equipment needed to meet system requirements, without claim for added payment. Labor furnished shall be specialized and experienced in systems installation.
B. Furnish any engineering services to provide a complete and professionally installed systems.
C. All areas shall receive new cabling as specified.
D. This work includes, but is not limited to the following:

1. Furnish all back boxes and enclosures.

2. Deliver to the job site all back boxes which are to be installed by others.
3. Furnish and install all wire and cable.
4. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include hardware, transformers, line/distribution amplifiers, and other devices for proper installation, interface, isolation or gain structure.
5. Programming and documenting of all software-controlled devices. Provide DSP and control system programming prior to final testing, if requested by the Consultant.
6. Refer to Submittals section of this specification for all submittal requirements.
7. Provide frequency scanning and coordination for all AV system wireless transmitters and receivers. Account for local frequencies used by others within the surrounding area.
8. Setup and adjustment of signal processing, system tests and adjustments, written report, demonstration for approval, participation in acceptance tests and final adjustments where required.
9. Submission of shop drawings prior to fabrication.
10. Verification of dimensions and conditions at the job site.
11. Installation in accordance with these specifications, manufacturer's recommendations, and all applicable code requirements.
12. Setup and adjustment of signal processing, system tests and adjustments, written report, demonstration for approval, participation in acceptance tests, and final adjustments as required.
13. Coordination with the Electrical Contractor is required to assure correct Systems conduit routing, Systems backbox locations, and clean power circuit locations as specified in Division 26 – Electrical.
14. Coordination with the Lighting Contractor
15. Coordination with the Fire Alarm Systems Contractor
16. Coordination with the Tel/Data Contractor and other Low Voltage Contractors
17. Coordination with the Owner's IT department and installers
18. Performance standards, without claim for additional payment
19. System Documentation
20. Instruction of owner's operating personnel
21. Maintenance and services for one year
22. Guarantee all equipment and components for the specified period from the date of acceptance.

E. All work described within this section must be coordinated with other trades to ensure a successful installation.

1.4 SUBMITTALS

A. Provide Submittals in accordance with requirements of Division 01 – General Requirements and as described within this specification.
B. Bidder Qualifications (Pre-Bid Submittal):

1. Perspective bidders must be thoroughly experienced in installing, engineering, configuring and testing systems of the scope and size specified. Bidders must be a system integrator, normally engaged in the business of audiovisual and sound reinforcement system installation. Bidder shall provide a list of systems their company has furnished and installed of similar size and scope within the last (5) years. Indicate project name, address, and reference.
2. Bidder shall have qualified CTS, CTS-D, and CTS-I engineers, technicians, and project managers who will be assigned to this project. A CTS-D and CTS-I shall be employed on this project for the entirety of the installation and close-out.

3. The bidder shall have a qualified and certified system programmer who will program the system. Submit any and all manufacturer certifications related to system programming, DSP programming, and control programming.

C. Bid Submittals:

1. In conjunction with the bidding requirements set forth in the Division 01 documents, the bidder shall submit itemized unit prices for all devices, or their equivalents, listed within this specification or documented on the AV drawings.
2. The bid price shall include any Add-Alternates described.

D. Product Data: Submit manufacturer's technical data, product specifications, installation instructions, and other pertinent information as applicable for each product or material specified or required. Do not procure material or begin work until product data and shop drawing submittals have been approved. All product data shall be submitted in one submission, in PDF format, with manufacturer provided specifications and cutsheets.

E. Shop Drawings: Shop drawings shall be created in ACAD or equivalent and submitted electronically in DWG and PDF.

1. Include plan view locations, elevations, installation details, and accessories.
2. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes. Show all transformers, switches, relays, and control circuits.
3. Drawings of loudspeaker mounting arrangements, equipment rack layouts, and receptacle and control plates and boxes.
4. Plate and panel schedule listing all plates individually with size, mounting condition, backbox size, and plate finish color.
5. Drawings of projector mounting arrangement and line of sight studies showing proper alignment and dimensions with the projection screen and projection equipment.
6. Complete list of wire run numbers and termination locations of each end.
7. Schematic diagrams of patch bays.
8. Drawings of final assemblies of loudspeaker, screen, and projector suspension equipment stamped by a certified structural engineer. Each system solution must be separately engineered, verified, and stamped.
9. Provide IP address table and addressing protocol in coordination with Owner's IT department.
10. Provide mockup of all system graphical user interface screens. Supply narrative and demonstration of all touch panel programming. Supply panel layouts and button functions listed.
11. Submit equipment rack layouts.
12. Submit samples of lettering/label size and typeface for custom plates, panels, or other equipment where required.
13. Provide EDID and HDCP management plan for all video signals.
14. Consultant and Architect shall approve all panel and furniture finishes. The Consultant and Architect may request samples of finishes which the Contractor shall provide at no additional cost to the project.
15. Provide conduit riser documented in plan and elevation view.

F. Closeout Submittals:

1. Create user manuals for all devices within the system, including instructions for how to use the device.
2. Create and mount a simplified line diagram protected in a plastic sheath and mount behind each AV cabinet.

3. Create floor plans showing locations of all faceplates, interconnections, speakers, projectors, and their cable paths, including cable identification on 11x17 drawings. Deliver to owner upon completion of the installation.
4. Create record drawings on 30x42 drawings of as-built conditions in ACAD or equivalent and deliver electronically and in PDF format.
5. Operating and Maintenance instructions for each product. O&Ms shall be complete for each device.
6. Contractor's written warranty for all parts and labor for a period of one year from project acceptance.
7. Manufacturer's standard product warranty. Extend all special warranties to project where available.
8. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation.
9. List of spare and replacement parts recommended to be stored at the site for ready access.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain all materials from one source from a single approved manufacturer for each different product required.
B. All materials shall be new and shall conform to applicable provisions of Underwriters Laboratories and the American Standards Association.
C. The contractor awarded this project is responsible for all permits, licenses, and inspections unless otherwise noted.
D. Follow latest federal, state, and local electrical and safety codes. Where conflicts exist, apply the most stringent requirement.
E. Certification: CE, FCC Class A
F. Contributing Organizations – The Organizations listed below have published standards used to establish the technical references to be followed under this scope of work.

1. Acoustical Society of America (ASA) (ASC S1)
2. Alliance for Telecommunications Industry (ATIS) (ASC T1)
3. American Society of Safety Engineers (ASSE) (ASC A1264)
4. Audio Engineering Society (AES) (ASC S4)
5. Electronics Industry Alliance (EIA) (CEMA)
6. Entertainment Services and Technology Association (ESTA) (ASC E1)
7. Institute of Electrical and Electronics Engineers (IEEE) (ASC C136) (802.1)
8. International Cable Engineers Association (ICEA) Formerly IPCEA
9. International Standards Organization (ISO)
10. National Electrical Manufacturer's Association (NEMA) (ASC C119)
11. National Fire Protection Associations (NFPA)
12. National Safety Council (NSC) (ASC A10)
13. Photographic and Imaging Manufacturer's Association (PIMA)
14. Society of Motion Picture and Television Engineers (SMPTE)
15. Telecommunications Industry Association (TIA)
16. Underwriters Laboratories (UL) (ASC C101) (CE)
17. NTSC
18. National Association of Broadcasters (NAB) – System technical standards for video and RF compliance are listed in the most recent edition of the NAB Handbook

G. Applicable Performance Standards – Execute all Division work in accordance with the following standards:

1. ANSI S4.48-1992 (R1998): Recommended Practice for the Application of Connectors, Part 1, XLR-Type polarity, and gender
2. ANSI S4.55-1997: Recommended Practice for conservation of the Polarity of Audio Signals
3. ANSI S4.56-1997: Recommended Practice for the subjective evaluation of Loudspeakers
4. ANSI S12.2-1995 (R1999): Criteria for Evaluating Room Noise
5. ANSI T1.217-1991 (R1998): Integrated Services Digital Network (ISDN) Management – Primary Rate Physical Layer
6. ANSI T1.522-2000: Quality of Service (QOS) for Business Multimedia Conferencing. Specifies classes of Service for conferencing on IP Networks
7. AES15: ANSI S4.49: AES Recommended practice for Sound Reinforcement Systems – Communications Interface PA-422.
8. AES-R1-1997 AES project report for professional audio: Specifications for audio on high capacity media
9. AES14-1992 (r1998) AES standard for professional audio equipment --Application of connectors, part 1, XLR-type polarity and gender
10. AES24-1-1999, (Revision of AES24-1-1995) AES standard for sound system control - Application protocol for controlling and monitoring audio devices via digital data networks
11. AES26-2001 (Revision of AES26-1995) AES recommended practice for professional audio -- Conservation of the polarity of audio signals
12. ANSI/TIA/EIA 606-1993: Standard for the Telecommunications Infrastructure of Commercial Buildings
13. ANSI/TIA/EIA 607-1994: Commercial Building Grounding and Bonding Requirements for Telecommunications
14. IEEE 149-1979 (R1990): Test Procedure for Antennas
15. IEEE 1100-1999: Powering and Grounding Sensitive Electronic Equipment
16. NEMA 250-2001: Enclosures for Electrical Equipment
17. SMPTE 292M: SMPTE 292M defines the base 1.485Gbps HD-SDI. Note: This standard can handle all HD formats except 1920*1080 @ 50P and 60P.
18. SMPTE 372M: Uncompressed Dual-Link HD-SDI for 50P & 60P
19. SMPTE 424M: 2.97 Gbps HD-SDI for 50P & 60P
20. TIA/EIA-568-B: Digital audio over Cat5 audio cable
21. UL 1047-1999: Isolated Power Systems Equipment
22. UL 1581-1998: Reference Standard for Electrical Wires, Cables, and Flexible Cords
23. UL 1682-1998: Standard for Safety for Plugs, Receptacles, and Cable Connectors, of the Pin and Sleeve Type up to 800 Amperes and up to 600 volts ac or dc.
24. UL 467-1998: Grounding and Bonding Equipment
25. UL 813-1999: Commercial Audio Equipment and accessories for use in commercial enterprises… this standard was originally listed for public review in the October 13, 1995 issue of Standards Action. It is being resubmitted owing to substantive changes in the text.
26. ANSI/TIA/EIA-568-A: Commercial Building Telecommunications Cabling
27. ANSI/TIA/EIA-569-A: Commercial Building Standard for Telecommunications Pathways and Spaces
28. ANSI/TIA/EIA-607: Commercial Building Grounding and Bonding Requirements for Telecommunications
29. ANSI/TIA/EIA TSB-72: Centralized Optical Fiber Cabling Guidelines
30. ANSI/TIA/EIA-526-14A: Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
31. ANSI/TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single mode Fiber Cable Plant
32. ANSI/IEEE C-2 National Electrical Safety Code how to install cabling in accordance with the most recent edition of BICSI® publications:
33. BICSI Telecommunications Distribution Methods Manual
34. BICSI Cabling Installation Manual

1.6 DELIVERY, STORAGE AND HANDLING

A. Take care in handling products in accordance with manufacturer's instructions.
B. Store indoors in original undamaged packaging, in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Store products upright in secure, protected area. Do not stack! Verify with manufacturer that site conditions are acceptable before receiving material.
C. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity.
2. Drop shipping of equipment to the Owner's site is not allowed.

1.7 WARRANTY AND GUARANTEE

A. All systems and components shall be guaranteed free of defects in materials and workmanship for a period of one (1) year (or to the length of the Manufacturer's warranty if longer) from the date of acceptance and shall be repaired or replaced within forty-eight (48) hours following report of such defects by the owner.
B. The Contractor shall be available on call and on eight (8) hour notice during the first month following acceptance of the system, to assist the Owner's representatives in any problems which may arise during the initial period of operation. If corrective measures on-site are required, they will be performed within 12 hours of the determination of a need for a site visit.
C. If, during the Guarantee period, any component is out of service for more than seven (7) days due to unavailability of parts or service, Contractor shall supply and install an identical new component. If an identical component is not available, Contractor will substitute equivalent equipment, with the approval of the Owner.
D. During the course of the Guarantee period, the Systems Contractor will provide the Owner with a 24 hour service phone number for emergency calls. A service engineer will respond to all emergency calls within one (1) hour. The personnel answering this call must be fully qualified to troubleshoot problems and propose solutions. A qualifying emergency event is defined as an event that may cause severe hardship or cause the systems to be inoperable or unusable for a scheduled class or event.
E. During the course of the Guarantee period, the Contractor shall provide a minimum of three (3) service visits to the site for inspection and adjustment of equipment. Contractor shall submit proposed schedule for these visits and shall notify Owner and Systems Designer in writing at least one month in advance of each visit.
F. During the course of the guarantee period, the Systems Contractor will supply the Owner with any published updates of manufacturer provided operating programs for any and all software-controlled equipment that are issued to correct "bugs". During the Guarantee period, the Owner will rely on the Systems Contractor to determine when to update the software, unless it is needed to correct a situation that renders the systems unstable, non-functional, or otherwise affects operations.
G. Repeated device failures, defined as the failure of a device or a single type of device three or more times over three contiguous months, will be considered as a failure of a manufactured system and all items of this type shall be replaced at no charge to the Owner.
H. At least one representative of the Systems Contractor, well versed in the installation and the operation of the systems, shall be on site in support of the Owner for the first significant public event in each space (as determined by the Owner) where the system will be used. The Contractor representative(s) for this event shall also be competent in show operations.
I. Contractor is to coordinate ongoing remote access to AV Systems Networks for support and troubleshooting. Owner to provide the access at their discretion.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Certain items of equipment are specified by the manufacturer's type numbers to indicate an acceptable standard of quality and performance. Substitutions of equal equipment beyond the alternatives listed will be permitted only if such equipment is listed in an addendum to this specification. Address request for listing substitutions to the Architect. With any request for substitution, include measured data proving the equivalence of the proposed substitute in quality and performance. The Consultant shall be the final judge of the validity of the data submitted.
B. The substitution request shall include the following:

1. List of advantages to the system
2. Cost savings
3. Printed Specifications
4. Previous field experience using the substitution

2.2 GENERAL EQUIPMENT

A. Whenever any equipment is specified by manufacturer and model number, it is for purposes of establishing a standard of quality, performance, construction and function.
B. All materials and equipment shall be new and of the latest design or model offered for sale by the manufacturer.
C. Equipment models provided shall operate at the required AC line voltage and frequency.
D. Contractor shall provide quantities as indicated in the equipment list, detail drawings, location drawings, schedule of terminations, and as required for a complete installation.

2.03 CAFETERIA LOUDSPEAKER

A. The cafeteria loudspeaker shall be:
1. Fulcrum Acoustic #DX1295 or equivalent.
2. QTY (2) required.
3. Approved Alternate Manufacturers:
1) QSC

4. Include all mounting hardware, including suspension and U-Brackets, as required.

2.04 CAFETERIA PROJECTOR

A. The cafeteria projector shall be:
1. Epson #EB-PU1008W or equivalent
2. QTY (1) required.
3. Approved alternate manufacturers:
1) Christie

4. Include all mounting hardware for ceiling mounted projector.

5. Include required lens, contractor shall field verify throw distance prior to procurement.

2.05 GYMNASIUM LOUDSPEAKER

A. The gymnasium loudspeaker shall be:
1. EV #SX100+
2. QTY (6) required.

3. Approved alternate manufacturers:
    1) Community
    2) QSC
4. Include all mounting hardware, including suspension and U-Brackets, as required.

2.06 BAND & CHORUS ROOM LOUDSPEAKER

A. The auditorium loudspeaker shall be:
1. Fulcrum Acoustic #DX896 or equivalent.
2. QTY (A/R)
3. Approved Alternate Manufacturers:
    1) QSC
4. Include all mounting hardware, including suspension and U-Brackets, as required.

2.07 AVOIP ENCODER

A. The AVoIP encoder shall be:
1. Visionary Solutions #DUET-WP-H or equivalent
2. QTY required as shown on plans.
3. Approved alternate manufacturers:
    1) AV ProEDGE

2.08 AVOIP DECODER

A. The AVoIP decoder shall be:
1. Visionary Solutions #D4100 or equivalent
2. QTY (1) required in gymnasium.
3. QTY (1) required in auditorium.
4. Approved alternate manufacturers:
    1) AV ProEDGE

2.09 TOUCH SCREEN CONTROL PANEL

A. The touchscreen control panel shall be:
1. QSYS #TSC-70-G3 or equivalent
2. QTY required as shown on plans
3. Approved alternate manufacturer:
    1) As approved for use with the submitted DSP and control processor.

2.10 DIGITAL AUDIO PANEL

A. The digital audio panel shall be:
1. QSYS #D2i & QSYS #unD6IOBT or equivalent
2. QTY required as shown on plans
3. Approved alternate manufacturer:
    1) Symetrix

2.11 DIGITAL XLR PANEL

A. The digital XLR panel shall be:
1. QSYS #unDX4I
2. QTY required as shown on plans

2.12 AV NETWORK SWITCH

A. The AV network switch shall be QSYS or equivalent

B. Approved model numbers are shown on plans. Switch shall be sized to accommodate quantity of devices and sufficient POE++ to support devices required.

C. Approve alternate manufacturers:
1. Netgear

2.13 DIGITAL SIGNAL PROCESSOR / CONTROL PROCESSOR

A. The digital signal processor and control processor shall be:
1. QSYS #Core110F or equivalent
2. QTY (1) required in Commons
3. QTY (1) required in Gymnasium

B. Approved alternate manufacturers:
1. Symetrix
2. Biamp

C. Include all required I/O devices to meet the requirements shown on the plans.

D. Include all required QSYS licenses for Dante channels, configuration, and maximum processing power.

2.14 BAND & CHORAL ROOM MIXING BOARD

A. The mixing board shall be Zoom #Livetrak L-12 or equivalent.

2.15 AMPLIFIERS

A. The amplifiers shall be QSYS or equivalent.

B. The approved model numbers are shown on plans. Amplifiers shall be sized to accommodate speakers and channels they are supporting.

C. Approved alternate manufacturers:
1. APEX

2.16 ELECTRIC SCREENS
1. Refer to drawings for Commons electric screen.

B. Include all mounting hardware, control, and power requirements for a fully functional system.

C. Approved alternate manufacturers:
1. Draper
2. Alternates must meet or exceed the size, housing, and display material of the basis of design screens.

2.17 AV CABINETS

A. The AV cabinets shall be Middle Atlantic or equivalent:
1. Gymnasium #SR-40-28
2. Auditorium #SR-40-28
3. Band Room #BGR-25SA27MDK (confirm color with Architect)

4. Chorus Room #BGR-25SA27MDK (confirm color with Architect)

B. AV Cabinets shall have locking front doors.

C. Approved alternate manufacturers:
1. Lowell
2. Legrand

2.18 WIRELESS MICROPHONE SYSTEM

A. The wireless microphone systems shall be Shure ULX or equivalent.
1. Approve alternate manufacturers:
1) Sennheiser

B. Commons Wireless Microphone System:
1. QTY (1) ULXD4Q
2. QTY (2) U864 Antennae
3. Shure active antenna amplifiers as required
4. QTY (4) ULXD2/SM58
5. QTY (4) ULXD1
6. QTY (4) MX185
7. QTY (4) SBC220

C. Gymnasium Wireless Microphone System:
1. QTY (1) ULXD4Q
2. QTY (4) U864 Antennae
3. Shure active antenna amplifiers as required
4. QTY (4) ULXD2/SM58
5. QTY (4) ULXD1
6. QTY (4) MX185
7. QTY (4) SBC220

D. Band & Chorus Room Ceiling Mounted Microphones::
1. Shure #MX202 or equivalent
2. QTY (per drawings)

2.19 ASSISTED LISTENING SYSTEMS

A. Contractor shall provide a system for the hearing impaired for the gymnasium, cafeteria, and Auditorium.

B. Provide wireless assisted listening system consisting of FM transmitter, antenna, portable battery-operated receivers with earphones and inductive couplers. Provide frequencies separate and free from interference with other FM systems. Provide all assistive listening system components from the same manufacturer.

C. Assisted Listening System basis of design: Listen Technologies.
1. Approved Alternate Manufacturer: Williams AV

D. Commons Assisted Listening System
1. QTY (1) #LT800-072 with LA-326 rack mounting kit.
2. QT (2) #LA-122 antennae
3. QTY (10) #LR-4200-072 receivers
4. QTY (10) #LA-403 headphones
5. QTY (10) #LA-430 neckloop induction coil
6. QTY (1) #LA-381 12-unit charging tray.

E. Gymnasium Assisted Listening System
   1. QTY (1) #LT800-072 with LA-326 rack mounting kit.
   2. QT (2) #LA-122 antennae
   3. QTY (31) #LR-4200-072 receivers
   4. QTY (31) #LA-403 headphones
   5. QTY (8) #LA-430 neckloop induction coil
   6. QTY (3) #LA-381 12-unit charging tray.

2.20 AUDIO & VIDEO WIRE AND CABLE

A. All wire numbers listed in the drawings are Belden unless otherwise noted.
B. THHN wire is not an allowable substitute for twisted pair stranded loudspeaker wiring.
C. Approved manufacturers: Belden, Canare, Gepco, West Penn, Whirlwind
D. Where conflict exists with any codes or ordinances, such codes and ordinances shall take precedence.
E. Where conflict exists with electrical specifications, the higher standard or more stringent requirement shall apply.

2.21 SPECIFICATIONS – RACK MOUNT PANELS

A. Material: 11 gauge steel or 1/8" Aluminum, minimum thickness Finish: Black or to match adjacent equipment
B. Size: 19" wide, standard EIA mounting hole spacing, height as specified

2.22 SPECIFICATIONS – BACK BOX ENCLOSURES

A. Material: Code grade steel
B. Finish: Black or galvanized Size: As specified

2.23 SPECIFICATIONS – PLUG BOX AND TERMINATION PANELS

A. Material: 11 gauge steel or 1/8" Aluminum, minimum thickness Finish: Black (unless instructed otherwise by Architect)
B. Size: As specified
C. Approved Manufacturers: Steel City, Raco, Hoffman, Whirlwind, Pro Co, Wireworks

2.24 AUDIO TRANSFORMERS

A. All transformers shall be selected for proper interface and loading in the circuits as required by as-built conditions and per manufacturer's recommendations.

2.25 LOUDSPEAKER RIGGING EQUIPMENT:

A. Provide rigging for loudspeakers and suspended loudspeakers. Provide with sufficient number of suspension points for field adjustment of loudspeaker aiming. Color to determine color. Verify that adequate clearance from all other hanging components and adequate clearance from structural steel is provided. Provide all required hardware necessary for the safe and proper installation of loudspeakers.

B. Available manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work, include but are not limited to:

1. APE Rigging
2. Polar Focus

C. MAJOR EQUIPMENT
D. Equipment provided shall be as specified herein or an approved substitute.
E. Detailed performance specifications shall be those published by the manufacturer effective on the date of this document for all equipment listed.

2.26 DETAIL DRAWINGS

A. Furnish all materials and labor to provide complete and finished work even though not specifically shown on the drawings.
B. Detail drawings are located in large format AV drawings.

PART 3 - EXECUTION

3.1 AUDIO SYSTEM REQUIREMENTS

A. Requirements herein refer to materials and work which are related to or part of the Systems. Where conflict exists with other specifications concerning such work or materials, this specification takes precedence unless otherwise approved in writing by the Owner.

3.2 INSTALLATION OF SYSTEMS

A. Locate all apparatus requiring adjustments, cleaning or similar attention so that it will be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.
B. Furnish and install brackets, braces and supports. All mounting hardware shall be included.
C. All bolts and fasteners must be Grade 5 or better.
D. All bolted attachments to have lock washers or other self-locking fasteners.
E. Provide all required mounting brackets and framing, hardware and components, safety systems and rigging systems using the following minimum design factors (given as ratio of working load limit (WWL) : rated breaking load):

1. 5:1 – Minimum design factor for all mounting components regardless of mounting condition.
2. 5:1-8:1 – Minimum design factor for manufacturer provided mounts & assemblies where engineered stamped documentation and destructive testing data is provided by manufacturer.
3. 10:1 – For all hardware and connecting assemblies between manufacturer rated assemblies when equipment is hung above the general public. This includes but is not limited to wire rope, bolts, shackles, turnbuckles, beam clamps, supplemental steel provided by Systems contractor and other connecting hardware.
4. Design factor calculations to be provided with all equipment mounting details.
5. Systems Contractor shall coordinate required additional blocking, supplemental steel or channel strut supports with Main Contractor & specific trade contractors.
6. All mounting systems not provided as a complete package from a single manufacturer must be engineered, approved, and have drawings stamped by a professional rigging engineer or licensed structural engineer, as approved by the Main Contractor. The

engineer shall verify that the design meets or exceeds design criteria for this particular use case. Each mounting system solution must be separately engineered, verified, and stamped.

F. All supporting structures and enclosures supplied by the Contractor not having a standard factory paint finish shall be painted. Paint specifications will be supplied by the Architect or indicated herein.
G. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors and finishes may be specified herein.
H. Finish of blank panels and custom assembly panels shall match adjacent equipment panels. Verify all panel colors with Architect. All color choices should be clearly indicated on panel drawing submittals, and on the panel schedule.
I. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.
J. Protect equipment and related wiring where construction conditions may cause damage or environmental conditions exceed manufacturer’s specifications.
K. The standard reference for the layout and construction of the system shall be:

1. Giddings, Philip. Audio Systems Design and Installation.

L. All cables, connectors and peripheral equipment’s required to attain a fully functional system shall be furnished, installed and performed by the contractor awarded this project.
M. Locate all apparatus requiring adjustments, cleaning or similar attention so that it will be accessible for such attention.
N. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors and finishes may be specified herein.
O. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.
P. The equipment specified herein is designed to operate in environments of normal humidity, dust and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.
Q. Secure equipment firmly in place, including control panels, loudspeakers, conduit, amplifiers, racks, and cables. Make fasteners and supports to support their loads with a safety factor of at least three.
R. Take precautions to prevent electromagnetic and electrostatic hum. Install equipment to provide safe operation.
S. Clearly, consistently, logically, and permanently mark connectors, jacks, relays, receptacles, cables, and cable terminations.
T. All wall mounted devices shall be mounted, secured and installed in accordance with SEI/ASCE 7 and shall additionally withstand the effects of any motions within the building as determined by SEI/ASCE 7.
U. The term “WITHSTAND” means “THE UNITS WILL REMAIN IN PLACE WITHOUT SEPARATION OF ANY PARTS FROM THE DEVICE WHEN SUBJECTED TO THE SEISMIC FORCES SPECIFIED AND THE UNIT WILL BE FULLY OPERATIONAL AFTER THE SEISMIC EVENT.”

V. SECURE ATTACHMENT OF AUDIO VISUAL ITEMS

1. To ensure proper attachment of Fixtures, Furnishings & Equipment items, including and Technology items, where “items” are attached to wall, ceiling, overhead structure, and/or floor, Contractor shall provide information adequate for architect to verify items, attached to wall, ceiling, and/or floor are attached securely and per manufacturer’s recommendations. Architect’s review may be implemented during submittal process.
2. Contractor shall provide struts, hangers, fasteners, safety harnesses, channels, bolts, screws, rods, etc. to securely attach items to existing structure as required to meet field conditions and meet applicable codes.

W. CONDUIT

X. Review and coordinate Systems conduit installation with the electrical contractor to ensure proper operation of the Systems.

Y. All wiring shall be in conduit unless authorized by the Architect, approved by the Systems Designer, and permitted by code. Exceptions are short runs at rack terminations where there is no means of connecting conduit to the equipment.

Z. Where installed exposed, conduits shall be parallel with or at right angles to walls or ceilings and shall be supported from walls or ceilings by means of approved galvanized iron clamps or hangers. Conduit connections to equipment racks shall be insulated.

AA. Minimum size conduit shall be 3/4 inch. All conduit shall be sized for maximum 40% fill or less if required by code.

BB. No conduit run between pull boxes/termination boxes may exceed 100 feet in length.

CC. No conduit run shall have more than 180 degrees of combined turns between pull boxes/termination boxes, and no single turn may exceed 90 degrees.

DD. Conduit containing STP, UTP, and COAX wire types must be installed so that the final length of the cable runs does not exceed maximum allowable cable lengths.

3.3 CONDUIT SEPARATION

A. Systems wiring is divided into wiring groups according to their nominal voltage levels (refer to Schedule of Terminations):

	Wiring Type
Group A	Microphones and other sensitive wiring (0 mV to 100 mV)
Group B	Line level wiring (100 mV to 10 V)
Group C	Loudspeaker and control wiring (10 V to 70 V)
Group D	Telephone, video, control and digital circuits
Group E	Fiber optic cable
Group F	Spare Conduit

1. Note: These wiring groups must never be intermixed within a given conduit run or junction box.

B. Minimum conduit separation between conduits carrying wiring of different groups is:

	Group A	Group B	Group C	Group D	Group E
Group A	adjacent	6"	12"	12"	adjacent
Group B	-	adjacent	12"	6"	adjacent
Group C	-	-	adjacent	6"	adjacent
Group D	-	-	-	adjacent	adjacent
Group E	-	-	-	-	adjacent

Group F	12”	12”	12”	12”	adjacent

1. Note: Ninety degree crossings in close proximity are acceptable. Separations must be maintained until within six feet of box or gutter entry.

C. Minimum conduit separation between conduits carrying Systems wiring and other electrical service conduit is:

	Group A	Group B	Group C	Group D	Group E	Group F
Dimmer controlled lighting	24"	12"	6"	12"	adjacent	24”
SCR controlled services	24"	12"	6"	12"	adjacent	24”
220/440V circuits	6"	6"	adjacent	adjacent	adjacent	24”
All other services	6"	6"	adjacent	adjacent	adjacent	24”

1. Note: Heavy current demands in or long parallel runs with the above services may dictate greater separations to avoid interference in the Systems. Separations must be maintained until within six feet of box or gutter entry.

D. Contractor must have written authorization from the Systems Designer for any conduit installation which does not conform to these requirements. The conduit separations above are based on the use of EMT conduit for all AV and other signals. Separations where Rigid conduit is utilized for AV systems and/or other adjacent systems may be halved. Separations where PVC conduit is utilized for AV systems and/or other adjacent systems must be doubled. The Contractor must request information on separation adjustments for each instance where a different type of conduit than what is listed above is used.

1. ELECTRICAL POWER

E. Review and coordinate electrical power system installation including grounding with the electrical contractor to ensure proper operation of the Systems.
F. Verify that all AC power circuits designated for Systems equipment are wired with correct polarity and isolated ground. Report in writing any discrepancies found to the Architect for corrective action.
G. Provide distribution of electrical power within the equipment racks with a minimum of one spare AC receptacle for each four in use per branch circuit.

3.4 STEEL SUPPORTS

A. Fabricate and install any supports so that the installation does not weaken or overload the building structure. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems. No drilling or cutting of concrete beams, joists, or structural steel, nor welding to structural steel, will be permitted except as authorized, in writing, by the Architect.

3.5 BOXES

A. With the exception of portable equipment, all boxes, conduits, cabinets, equipment and related wiring shall be held in place and the mounting shall be plumb and square.
B. All boxes shall be securely mounted to building structure. All boxes shall be installed so that wiring contained in them is accessible. Install blanking devices or threaded plugs in all unused holes.
C. Wiring groups and circuits shall be isolated as indicated herein. Common pull or junction boxes are not permitted except as authorized, in writing, by the Systems Designer.
D. Clean all box interiors before installing plates, panels or covers.
E. Using permanent marker on the box or on wire tags, indicate the lengths of installed cable for all COAX and Category wiring inside the box.
F. Using permanent marker, inside the box, indicate the box name, for example “AA”.

3.6 WIRING METHODS AND PRACTICES

A. Provide installation of all Systems wire and cable, ensuring proper:
B. Pulling Tensions
C. Quantities
D. Types
E. Lengths

1. Routing

F. Wire Group Separation

1. Identification

G. The interconnection of equipment in a rack shall use the same wire by type as specified for runs external to racks unless otherwise indicated on AV single line drawings. All wiring within racks shall be direct between devices without splices.
H. Connector polarity shall be maintained except for terminations at equipment manufactured to other standards. In the event that manufactured equipment can be ordered with, or internally set to, various standards, the equipment shall be configured as follows:

1. Polarity for XLR style connector shall be: pin 2-high, pin 3-low, and pin 1-shield.

I. Polarity for TRS style connector shall be: tip-high, ring-low, and sleeve-shield.
J. Spare wire runs of each group and type shall be pulled to each termination location. The number of spares shall be ten percent of those in actual use or one, whichever is greater.
K. Splicing of cables is not permitted between terminations of specified equipment.
L. Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs without written approval from the Systems Designer; do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, and rollers to protect cables from excess tension, abrasion or damaging bending during installation.
M. Provide wire pulling lubricants and pulling tensions in accordance with the wire and cable manufacturer's recommendations.
N. All wires shall be permanently identified at each wire end by marking with self-laminating adhesive labels fully covered with clear heat shrink tubing, and a chart kept of each wire's function. This applies to wire within a rack assembly as well as wire running in conduit.
O. Wire ends should be wrapped with heat shrink tubing. Each shield or drain wire should be covered with heat shrink to avoid unintentional connections.
P. Use Wago or Entrelec DIN rail mounted terminal blocks for all terminal block wiring connections. Do not exceed one wire per terminal connection point. Do not cut strands from conductors to fit

lugs or terminals. Spare terminal blocks, equivalent to 10% of those in actual use, shall be provided.

Q. Form, in an orderly manner, all conductors in enclosures and boxes, wire ways and wiring troughs, providing circuit and conductor identification. Tie using wraps of appropriate size and type. Limit spacing between ties to six (6) inches and provide circuit and conductor identification at least once in each enclosure.

R. Provide service loops, minimum 6', at each termination so that plates, panels, patch bays, and equipment can be dismounted and placed on an adjacent horizontal work surface allowing for safe service and inspection without disconnection.

S. Maximum installed length of Category cables is 200'

T. Maximum installed length of Coaxial cable for HD-SDI, 3G-SDI, 6G-SDI, and 12G-SDI is 200'

U. Provide lengths of installed cables marked inside each termination back box using legible and permanent markings.

3.7 GROUNDING

A. Audio system wiring shall conform to the following procedures:

1. Audio equipment AC ground pins shall connect to AC isolated ground.
2. Audio equipment chassis shall connect to AC isolated ground or rack frames.
3. Audio rack frames shall connect to AC isolated ground bus in panelboard by means of #2 gauge (minimum) conductor.
4. Audio shields between AC powered pieces of equipment, where signal shield is tied to chassis ground, shall be directly connected to ground at the initiating end only. Capacitively terminate the receiving end with a 0.1µF capacitor.
5. Audio signal paths between AC powered pieces of equipment shall be connected using balanced lines and/or transformer isolation as required. No unbalanced signal paths may be connected to the patch bay.
6. Isolate all Systems wiring from racks, back boxes and conduit.
7. Isolate all Systems racks from conduit and other conductive surfaces. Use insulated bushings for conduit connections and a dielectric plinth between racks and conductive flooring materials.
8. AC isolated ground system shall be isolated from all other facility grounds except at the single point of connection at the AV isolation Transformer.
9. All metallic conduit, boxes and enclosures shall be grounded in accordance with the current National Electrical Code.

B. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provision of grounding conductors separate from the AC ground.

3.8 EQUIPMENT RACKS

A. The equipment racks shall be considered as custom assemblies and shall be assembled, wired and tested in the Contractor's shop. Assembly of racks on-site will not be permitted, without written approval from the Systems Designer (except for system wiring which must terminate directly to the patch bays via soldering, punch-down or other non-connectorized termination process).

B. Placement of equipment in equipment racks, as shown in the drawings, is for maximum operator convenience. Verify any changes in placement of the equipment with the Systems Designer before assembly.

C. Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks.

D. All wire, cable, terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system. Labeling on manufactured equipment shall be by engraved plastic laminate or by thermal printer on adhesive tape, with white lettering on black background or dark background that is similar to panel finish.
E. Provide stiffeners to custom panels to prevent panel deformation during normal plugging or switching operations.
F. All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted engineering practice.
G. Harnessed cables shall be combed straight, wrapped every six (6) to ten (10) inches, and attached to the structure as necessary. Each cable that breaks out from a harness for termination shall be provided with an ample service loop so that panels, patch bays, and equipment can be dismounted and placed on an adjacent horizontal work surface allowing for safe service and inspection without disconnecting.
H. Harnessed cables shall be formed in either a vertical or a horizontal relationship to equipment, controls, components or terminations.
I. Cable shields shall be connected to the isolated ground system with due regard for ground loops. (See Giddings reference book, Chapter 10)
J. All system components and related wiring shall be located with due regard for the minimization of induced electro-magnetic and electrostatic noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience for the operator.
K. All rack mounted equipment, with front panel controls, shall be provided with security covers to avoid tampering with preset levels. If specific security covers are not included in the equipment list, the Contractor will provide the manufacturer's security cover for each specified device or a suitable alternate.
L. Every device shall be installed with regard for proper polarity. Absolute polarity shall be maintained through the entire Systems signal chain.
M. Any permanently mounted electronic device must be balanced. Contractor will provide balancing transformers for unbalanced equipment connections where necessary.
N. System Power Control

1. Provide a relay-controlled power switching system with a master power switch and power-on indicator for the system. Connect the master power switch to control each receptacle in the rack except for one of the spare receptacles. Label unswitched receptacles "UNSWITCHED".
2. Middle Atlantic USC-6R
3. Atlas Sound SACR-191
4. Juice Goose CQ1520

    1) Quantity: A/R

O. Remote Power ON/OFF Switch:
P. Provide a single-Rackspace mounted remote power key switch with LED status indicators.

    a. Middle Atlantic K-DEC in rack panel
    b. Juice Goose Equal
    c. Equal

        1) Quantity: A/R

2. VERIFICATION TESTS

Q. Test each point to point wire segment individually, and test any linkage of multiple point to point cables that form an end to end link.

R. Contractor must document all verification test requirements and results for submission (see 3.13.A below).
S. Confirm that each individual wire and cable run (whether in a rack or in conduit) is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.
T. Verify all circuits and extensions for correct connection, continuity and polarity. Absolute polarity must be maintained between all points in the system.
U. Identify installed length of all copper and fiber cabling.
V. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.

1. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.

W. For all microphone lines, tie lines, return lines and effect loudspeaker lines, confirm:

1. Proper circuits appearing at each termination location
2. Proper circuits appearing at each jack bay position
3. Continuity of all conductors
4. Proper polarity is maintained
5. Absence of shorts between conductors within each circuit
6. Absence of shorts between circuit conductors and conduit

X. Perform a sweep test to 0.5MHz
Y. For RF Coaxial cabling confirm:

1. Receptacles output does not exceed +15dBmv (50-400MHz - +6 dBmv minimum, above 400MHz - +3dBmv minimum)
2. For each modulated video output, tap to meet +9dBmv (+/- 3dBmv)
3. Verify that all TV channels are visible and free of any interference or signal distortion
4. Frequency sweep test from 5MHz to 1000MHz.

Z. For all other Coaxial cabling confirm:

1. Verify that the installed cable meets, at a minimum, the requirements set forth in SMPTE ST 2081 for 6G-SDI single-link and 12G-SDI dual-link.
2. Verify that TDR impedance is 75 +/-3 ohms
3. Frequency sweep test from 5MHz to 6GHz.

AA. For Category Cabling:

1. Use Category 6A cable pair tester to verify compliance with TIA/EIA standards referenced above (including all current addendums)
2. Test each cable using the permanent link procedure for opens, shorts, reversals, cross twists and mis-wiring. Check NEXT, ELFEXT, Delay Skew, Return Loss, and Alien Crosstalk.

BB. Report all mis-wiring or failures found and report retests as needed.
CC. If any conductors report open or short, replace the entire wire and re-test.
DD. For Fiber cabling:

1. Using appropriate test devices and proper factory terminated jumpers, measure all fiber optic line attenuations, end to end, as required by TIA/EIA-526-14A.

2. Optical budget may not exceed the cable performance by length plus splice and connector losses (0.03 dB for each fusion splice, 0.3dB for each mechanical splice, and/or 0.4 dB for each connector).
3. Overall attenuation must meet TIA/EIA-568B standards. Perform attenuation tests at 850nm and 1300nm.

EE. Confirm that loudspeakers and mountings are free of buzzes and rattles when the loudspeaker is swept with sine wave tones over its rated bandwidth at one-half (1/2) its maximum rated power.

FF. For all permanently mounted loudspeaker terminations, provide impedance measurement of each pair of loudspeaker lines with all loudspeakers connected and all amplifiers disconnected. These measurements shall be documented as editable tabular data listing impedance for each 1/3 octave band from 20 Hz to 20 kHz and shall be accurate to the nearest tenth of an Ohm.

GG. For all intercom terminations, confirm proper operation by initiating and receiving audio communication and call light. For single lines connected to a matrix, test each line with each channel in the matrix. Verify that all channels are quiet and without spurious noise.

HH. For all electronic devices mounted in racks and connected to patch bays, confirm:

1. Every input and output is balanced.
2. Proper polarity is maintained throughout the entire audio path.
3. Tip connection of each TRS jack is connected to the positive terminal of each corresponding input or output.

II. For all devices requiring IP addressing:

1. IP addressing scheme must make use of subnets such that all devices, regardless on which network (Audio, Video, Control, or House) they reside, have a unique IP address to eliminate the possibility of duplicate IP addresses if networks are inadvertently cross-patched.
2. All devices must have static IP addresses.
3. Create a spreadsheet of all devices and their IP addresses, Subnet Masks, MAC Addresses, and other pertinent IP configuration information.
4. Coordinate all IP addressing schemes with the Owner.

JJ. If the Audio, Video, and Control network switches are dedicated to these systems and the systems do not rely on Owner furnished and configured network switches:

1. Configure network switches to operate properly and provide the proper network configurations to support the network devices and protocols used by those devices.
2. Configure, as needed, VLANS, IGMP, QOS, and other protocols requiring configuration to provide a fully functioning and robust network system.
3. With all networks configured and operating, and all network devices configured and operating, confirm that the networks are behaving as expected and as required.

KK. Electrical Contractor, coordinating with the Systems Contractor must confirm that there are no shorts between the Neutral and Isolated Ground conductors, and between the isolated ground conductor and building ground for each AV Technical Power circuit. Electrical Contractor, coordinating with the Systems Contractor must confirm there are no Bootleg Grounds or Neutral-Ground Reversals on each AV Technical Power circuit.

LL. The Contractor is responsible for the programming and configuration of all DSP systems and control systems necessary as specified in this project specification and AV large format drawings.

1. Programming and configuration must be complete and ready prior to System Designer’s arrival for verification of functionality and acceptance testing.

2. Programming for the DSP systems must contain control pages to support normal operations, and to support Acceptance Testing and System Tuning operations, as described in this specification and the large format AV drawings.
3. Programming for the Control Systems must include all master controller code and touch panel code and graphics, working together to provide the function as described in this specification and the large format AV drawings.

MM. Test all Audio, Video, and Control system controls, including but not limited to mixing consoles, switchers, routers, touch panels, paging stations, volume controls, and source selectors for proper operation.
NN. Test proper operation of any portable controls at each designated control location (Stage Manager's rack, for example).

3.9 INITIAL ADJUSTMENT

A. All initial adjustments must be documented and submitted as part of the Verification Test Reports (see 3.13).
B. Make all adjustments and modifications so that the system is operational and fully functional including but not limited to:
C. Update all device software and firmware to the latest manufacturer's recommended release that allows for proper operation with ALL OTHER DEVICES in the systems.

1. Make all adjustments and modifications for system gain structure per recommendations of major component manufacturers.
2. Properly configure all EDID and HDCP settings to allow for proper function of all video systems.
3. Install all programming for digital mixing consoles, DSP, Control and any other software based devices in the systems, and verify that audio and video signal passes as designed through these systems. Verify that control systems function as specified. Contractor to provide initial DSP and control system programming prior to acceptance testing, one full set of programming changes and adjustments, prior to handover to the Owner, and one additional set of changes and adjustments during the initial warranty period, as part of the base scope of work.
4. Properly balance all 70 Volt loudspeaker zones to be consistent from zone to zone using amplifier settings and loudspeaker taps to adjust for differing loudspeakers or installation height. All 70 Volt loudspeakers within a given zone must not have a broadband SPL variation of greater than +/- 2dB.
5. Properly adjust delay and equalization for all loudspeaker systems using SIM, SMAART or other similar dual FFT type measurement devices. All testing and adjustment shall be in accordance with all manufacturer recommendations and industry standard practice. Contact the Systems Designer for further system delay and equalization requirements.
6. Capture traces showing magnitude and phase response for each loudspeaker or loudspeaker cluster before and after equalization and delay adjustments.
7. Capture traces showing magnitude and phase response for the systems operating as a whole from 3 locations in each major seating area. One of these areas should be the House Mix Position, if applicable.
8. Equalization and timing of the loudspeaker systems shall be further adjusted as required by the Systems Designer and Owner during Acceptance Testing.

3.10 VERIFICATION TEST REPORT

A. Submit written report detailing the results of Initial Adjustments and Verification Tests. Report to include, at minimum, the following:

1. Copies of all relevant drawings, charts, test instrument data, and photographs.

    a. PDF copies of all available manufacturers' operation and service literature for each major system component.
    b. Copy of all programming files including, but not limited to, Audio DSP programming and Graphic User Interface (GUI) files, Control system Touch Panel GUI files and control system control programming files including un-compiled source codes.
    c. All other documentation and results of testing and initial settings as referenced in 3.11, and 3.12 above.
    d. Written certification that the installation conforms to the requirements stated herein, is complete in all respects, and is ready for inspection, Acceptance Testing, and tuning.

2. Prepare and submit an InfoComm standard Commissioning Checklist for each system in this specification.
3. Prepare and submit a training syllabus for Owner training (see section 3.15).

B. This report shall be completed and submitted to the Systems Designer for review a minimum of five (5) days prior to Acceptance Testing and final tuning.

3.11 ACCEPTANCE TESTING

A. Acceptance Testing shall be performed by the Systems Designer and Contractor during a period designated by the Architect. Contractor shall furnish a minimum of two (2) technicians or one technician per Systems Designer commissioning team, for the acceptance testing period, and one or more engineers fully capable of programming DSP and Control systems and making any other engineering adjustments to equipment in the systems. Contact Systems Designer for number of commissioning teams that will be deployed. For Bid purposes assume there will be 1 commissioning team.
B. The minimum time required for Acceptance Testing is 2 working days, including 1 days of dedicated quiet time. Coordinate this time so that free access, work lighting, and electrical power are available on the site.
C. Ensure that Systems areas are in a clean and orderly condition ready for acceptance testing.
D. Be prepared to verify the performance of any portion of the system by demonstration, listening tests and instrumented measurements.
E. Be prepared to facilitate the visual inspection of system components and wiring, including removal of termination panels for inspection of wiring termination and wire management practices.
F. Be prepared to demonstrate all software and control systems.
G. Be prepared to go through the commissioning checklist and verify all items as complete.
H. Make additional mechanical and electrical adjustments within the scope of the work and which are deemed necessary by the Systems Designer as a result of the Acceptance Tests. This may include realigning of loudspeaker systems, changes in system gain structures, grounding, filtering or interfaces.
I. Final acceptance will be contingent upon issuance by the Systems Designer of a letter of acceptance stating that the work has been completed and is in accordance with the contract documents.
J. Contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for Systems Designer's Acceptance Testing.
K. Confirm that each individual wire and cable run is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.
L. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.

M. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.
N. For all microphone lines, tie lines, return lines and effect loudspeaker lines, confirm:

1. Proper circuits appearing at each termination location.
2. Proper circuits appearing at each jack bay position.
3. Continuity of all conductors.
4. Proper polarity is maintained.
5. Absence of shorts between conductors within each circuit.
6. Absence of shorts between circuit conductors and conduit.

O. Confirm that speakers and mountings are free of buzzes and rattles when the speaker is swept with sine wave tones over its rated bandwidth at one-half its maximum rated power.
P. For each installed data network cable or fiber optic cable confirm conformance to the specified TIA/EIA performance standards

3.12 USER TRAINING

A. Contractor will provide in-depth training in operation and regular maintenance of all systems and on all equipment included in the scope of work contained in this specification and the AV large format drawings.
B. Training to include (but is not limited to):

1. Detailed operation of mixing consoles, video switchers and routers, computer control systems and other essential system elements as relevant to their installation in this project.
2. Maintenance and repair of system equipment, including replacement procedures for user-replaceable parts.
3. Review of Operation and Maintenance Manual (See 3.16)

C. Contractor will provide a minimum of (2) training sessions of four hours each with times and dates to be approved by the Owner.
D. The first session shall take place in the presence of the Systems Designer and shall occur directly after the completion of Acceptance Testing. If the Systems Designer, Owner, and/or Architect judge any work to be deficient and/or not substantially complete at the time scheduled for training, the training will be postponed until the Systems Designer, Owner, and Architect judge the entire AV system conforms to this specification and the AV large format drawings.
E. Contractor will bear any costs incurred for additional Systems Designer's time and expenses due to failure to have the system functioning in accordance with specification requirements at the times scheduled for User Training.

3.13 SYSTEM DOCUMENTATION

A. Within thirty (30) days of the Acceptance Testing, prepare and submit a CD-ROM of the preliminary Operation and Maintenance manual for approval by the Systems Designer. Manual to include, at minimum, the following documents in PDF format:

1. Table of contents
2. Written Guarantee and service policy
3. Basic power on/off and operational procedure
4. Copies of all shop drawings which have been updated to include any changes made during the installation process

5. All available manufacturers' operation and service literature for each major system component
6. One line signal flow diagram with all cable runs and patch points identified by alpha-numeric character
7. Copy of the Verification Test report
8. Copy of conduit riser diagram
9. Copy of the final tuning settings as provided by the Systems Designer
10. Copy of the IP Addressing table
11. Copy of all uncompiled source codes and configuration files which have been updated to include any changes made during the installation process.

B. Systems Designer will review the above system documentation. Upon approval, Contractor shall prepare and submit to the Owner:

1. Five (5) copies of the final Operation and Maintenance manual on CD-ROM or DVD.
2. Two (2) hard copies of the final Operation and Maintenance manual printed and neatly bound

C. Provide framed or laminated copy of the as-built signal flow diagram for each theater to be mounted in each control room. This diagram shall have all cable runs and patch points identified by alpha-numeric character.

END OF SECTION 274100

SECTION 274100.16 - CLASSROOM AV SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.3 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”
B. Related Drawings:

1. “TN” Drawings – Technology Plans

1.4 FUNCTIONAL REQUIREMENTS

A. The typical classroom room AV system shall have the following functionality:

1. Reproduction of AV media from AV input faceplate to the interactive display.
2. Distribution of sound from the interactive display to dedicated AV speakers throughout the space.
3. Control of the interactive display and signal input from an AV control panel in the classroom.
4. Storage of the classroom AV amplifier & headend unit in a plenum rated ceiling enclosure.
5. Capability to mute the AV system upon activation of a public address signal.
6. Distribution of the program audio to a faceplate for connection to a mobile ADA Assisted Listening System.
7. Student and Teacher Wireless Microphone signal over DECT or IR technology.

B. The typical conference room AV system shall have the following functionality:

1. Reproduction of AV media from AV input faceplate to the interactive display.
2. Distribution of sound from the interactive display to dedicated AV speakers throughout the space.
3. Control of the interactive display and signal input from an AV control panel in the classroom.
4. Storage of the AV amplifier & headend unit in a plenum rated ceiling enclosure.

5. Capability to mute the AV system upon activation of a public address signal.

1.5 SUMMARY

A. Furnish and install sound, video, and communication systems as shown on drawings and as specified herein, complete with all apparatus, equipment, power supplies, wiring, labor, and services necessary to ensure a complete working system. Verify completeness of equipment listed and correctness of type numbers. Furnish and install supplementary equipment needed to meet system requirements, without claim for added payment. Labor furnished shall be specialized and experienced in systems installation.
B. Interconnection from/to all devices and teachers station outlets, testing, all configurations and training are part of this section.
C. All areas shall receive new cabling as specified.
D. This work includes, but is not limited to the following:

1. Furnish all back boxes and enclosures.
2. Deliver to the job site all back boxes which are to be installed by others.
3. Furnish and install all wire and cable.
4. Furnish any additional items, not specifically mentioned herein, to meet system requirements as specified, without claim for additional payment. Such items may include hardware, transformers, line/distribution amplifiers, and other devices for proper installation, interface, isolation or gain structure.
5. Submission of shop drawings prior to fabrication.
6. Verification of dimensions and conditions at the job site.
7. Installation in accordance with these specifications, manufacturer’s recommendations, and all applicable code requirements.
8. Setup and adjustment of signal processing, system tests and adjustments, written report, demonstration for approval, participation in acceptance tests, and final adjustments as required.
9. Coordination with the Electrical Contractor is required to assure correct Systems conduit routing, Systems backbox locations, and clean power circuit locations as specified in Division 26 – Electrical.
10. Coordination with the Lighting Contractor
11. Coordination with the Fire Alarm Systems Contractor
12. Coordination with the Tel/Data Contractor and other Low Voltage Contractors
13. Coordination with the Owner’s IT department and installers
14. Performance standards, without claim for additional payment
15. System Documentation
16. Instruction of owner’s operating personnel
17. Maintenance and services for two years
18. Guarantee all equipment and components for the specified period from the date of acceptance.

E. All work described within this section must be coordinated with other trades to ensure a successful installation.
F. Section Includes

1. Interactive Display, Mount, & Backbox
2. Classroom & Conference Room Speaker System
3. Classroom & Conference Room AV Cabling & Faceplates
4. Cabling

1.6 SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: From approved manufacturer for each type of device required. Include plan view locations, elevations, installation details, and accessories.

1. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.

C. Product Data: Submit manufacturer's technical data, product specifications, installation instructions, and other pertinent information as applicable for each product or material specified.
D. Operating and Maintenance instructions for each product.
E. Samples of Manufacturer's standard and extended Warranties.
F. Equipment List: Include every piece of equipment by model number, manufacturer, serial number, location, and date of original installation.
G. Operation and Maintenance Data: For Interactive Whiteboards, Projectors and speakers.

1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.7 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain all materials from one source from a single approved manufacturer for each different product required.
B. Certification: CE, FCC Class A

1.8 DELIVERY, STORAGE AND HANDLING

A. Take care in handling products in accordance with manufacturer's instructions.
B. Store indoors in original undamaged packaging, in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. Store products upright in secure, protected area. Do not stack! Verify with manufacturer that site conditions are acceptable before receiving material.
C. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of any device and equipment related to operation, and equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Unless stated otherwise within product descriptions, a [One] 1 year warranty from date of Substantial Completion shall be provided.
2. Provide information on available extended warranties.

PART 2 - PRODUCTS

2.1 CLASSROOM AV DEVICES

A. INTERACTIVE DISPLAY, MOUNT, & BACKBOX

1. The interactive display shall be provided by the Owner and installed by the contractor awarded this section.

a. The model provided by the owner shall be SMART #SBID-MX275-V4.

B. The interactive display location shall, at a minimum, have the following:

1. QTY (3) HDMI, 3.5mm, & USB Inputs
2. RS-232 Control Interface
3. Capability to wirelessly transmit signal from Student BYO Devices to the Display

C. The interactive display mount shall be

1. Balance Box: https://balanceboxmounts.com

a. BalanceBox® 400 Medium
b. Part #480A12
c. Balancing weight range: 90.4 - 152 lbs
d. Screen Size: 42" - 86"
e. Product dimensions: 21.9”W x 23.3”H x 3.2”D

2. Alternates shall be accepted if all characteristics are similar.

D. Each classroom Interactive Display shall receive QTY (2) Category 6A rated RJ45 jack with associated Category 6A cabling terminated onto a patch panel in the designated MER/TR.

1. Coordinate the location of this data drop with the Communications Contractor.
2. Refer to the plans for more information on location and requirements.

E. The interactive display backbox shall be:

1. Chief PAC525FW

a. The AV contractor shall coordinate power in each In-Wall storage box with the electrician.
b. Include and install cover for in-wall storage box.

2. Acceptable alternate manufacturers will be considered, providing the equipment meets or exceeds the quality specified and that the contractor and manufacturer can provide examples of the product used on past projects of similar size and scope.

2.2 CLASSROOM AND CONFERENCE ROOM SPEAKER SYSTEM

A. The classroom and conference room speaker system shall be obtained from a single manufacturer. Alternates must meet or exceed the specifications of the basis of design.
B. The classroom and conference room sound system basis of design shall be Front Row.
C. The classroom sound system shall, minimally, meet the following functional requirements:

1. Capability to amplify program audio throughout the space.
2. Capability to be controlled via a dedicated control panel in the space.
3. Capability to accept multiple signal types (microphone / line / control) and distribute multiple output signal types (amplified audio to speakers / line output to assisted listening devices, etc.).
4. Wireless microphone receiving capability over DECT or IR technology. Other technologies will be considered providing the manufacturer and contractor can show with examples that the wireless technology is suitable for a classroom setting and does not transmit signals between rooms.
5. Capability to mute the system upon activation of the public address system.

D. Plenum Rated Ceiling Enclosure: Front Row #1000-00094
E. Page Override: Front Row #1010-00004
F. Ceiling Power Strip: Front Row #1010-00017
G. Ceiling Speakers: Front Row #SP-C

1. Provide speaker quantities as shown on drawings

H. Provide any additional material as required by the manufacturer for a fully-functional system.
I. Refer to signal flow for additional devices.

2.3 CLASSROOM & CONFERENCE ROOM AV FACEPLATES

A. AV input faceplate basis of design shall be:

1. C2G #03725
2. Each AV input faceplate shall receive QTY (1) C2G faceplates to meet the following functionality:

a. QTY (1) HDMI inputs
b. QTY (1) USB inputs
c. QTY (1) 3.5mm inputs

3. AV Faceplate acceptable alternate manufacturers include:

a. Custom Covid Faceplates
b. Custom Liberty Faceplates

4. Faceplates shall be constructed as a single device. Modular systems shall not be approved.

2.4 CABLING

A. All Cabling Shall Be Plenum Rated.
B. Audio Input Lines:

1. Use cable with a foil shielded pair of stranded #22 AWG conductors, with a stranded shield drain wire. For single pair, use a miniature cable nominal outside diameter 0.135”. Use of a multi-pair cable is optional. All cabling shall be plenum rated.

a. Belden
b. Mohawk
c. West Penn

C. Loudspeaker Wiring:

1. Provide unshielded loudspeaker wiring for connection to loudspeakers and loudspeaker receptacles. For lines in rigid conduit or electrical tubing, use stranded or solid conductors. For lines in flexible conduit or electrical tubing and for all wiring to equipment within equipment racks, use only stranded conductors.
2. Use color-coded #12 AWG conductors for all loudspeakers and except for 70 V ceiling-mounted loudspeakers and loudspeaker receptacles. All cabling shall be plenum rated.

    a. Belden
    b. West Penn
    c. Approved Equal

3. For all ceiling-mounted loudspeaker wiring using 70 Volt lines provide color-coded #18 AWG loudspeaker wiring.

    a. Belden
    b. West Penn
    c. Approved Equal

4. Use color-coded #14 AWG conductors for all loudspeaker receptacle wiring

    a. Belden
    b. West Penn

D. Category Wiring:

1. Provide Category 6 8-conductor unshielded twisted pair cable with 23 AWG solid conductors and bandwidth of 250 Mhz for computer data and audio-visual transport wiring. All cabling shall be plenum rated.

    a. Berk-Tek
    b. Superior Essex
    c. Belden

E. HDMI Wiring: All classroom & conference in-wall AV cabling shall be plenum rated.

1. HDMI Cable approved manufacturers:

    a. AV ProEdge
    b. FSR Digital Ribbon
    c. Chromis

F. USB Wiring:

1. USB cable shall be Liberty Pro AV, plenum rated, USB cable.

    a. Length of this cable must conform the length of the intended use.

G. All Audio Visual and associated cabling required for each system specified within this document is to be furnished, installed, terminated and tested as part of this section.
H. Wiring Method: Install cables in raceways unless otherwise indicated.
I. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

J. Splices, Taps, and Terminations: For control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. This specification shall include all installation and setup labor and configuration of all devices to furnish a complete, efficient and effective system.
B. All cables, connectors and peripheral equipment's required to attain a fully functional system shall be furnished, installed and performed by the contractor awarded this project.
C. Locate all apparatus requiring adjustments, cleaning or similar attention so that it will be accessible for such attention.
D. Furnish and install brackets, braces and supports. Minimum fastening or support safety factor shall be at least three (3). Design shall be to the approval of the Architect.
E. Provide custom color or finish for any equipment or materials supplied which are exposed to public view. Color and finish of all such equipment or materials shall be approved in writing by the Architect. This does not exclude equipment or materials where standard colors and finishes may be specified herein.
F. Switches, connectors, jacks, receptacles, outlets, cables and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched or screened. Markings for these items are detailed in the drawings to ensure consistency and clarity. Verify any changes in working type size and/or placement with the Systems Designer prior to marking.
G. The equipment specified herein is designed to operate in environments of normal humidity, dust and temperature. Protect equipment and related wiring where extreme environmental conditions can occur.
H. Secure equipment firmly in place, including control panels, loudspeakers, conduit, amplifiers, racks, and cables. Make fasteners and supports to support their loads with a safety factor of at least three.
I. Take precautions to prevent electromagnetic and electrostatic hum. Install equipment to provide safe operation.
J. Clearly, consistently, logically, and permanently mark connectors, jacks, relays, receptacles, cables, and cable terminations.
K. All wall mounted devices shall be mounted, secured and installed in accordance with SEI/ASCE 7 and shall additionally withstand the effects of any motions within the building as determined by SEI/ASCE 7.

    1. The term "WITHSTAND" means "THE UNITS WILL REMAIN IN PLACE WITHOUT SEPARATION OF ANY PARTS FROM THE DEVICE WHEN SUBJECTED TO THE SEISMIC FORCES SPECIFIED AND THE UNIT WILL BE FULLY OPERATIONAL AFTER THE SEISMIC EVENT."

L. SECURE ATTACHMENT OF AUDIO VISUAL ITEMS

    1. To ensure proper attachment of Fixtures, Furnishings & Equipment items, including and Technology items, where "items" are attached to wall, ceiling, overhead structure, and/or floor, Contractor shall provide information adequate for architect to verify items, attached to wall, ceiling, and/or floor are attached securely and per manufacturer's recommendations. Architect's review may be implemented during submittal process.

M. Contractor shall provide struts, hangers, fasteners, safety harnesses, channels, bolts, screws, rods, etc. to securely attach items to existing structure as required to meet field conditions and meet applicable codes.

3.2 VERIFICATION TESTS

A. Confirm that each individual wire and cable run is identified with a unique number. These numbers are affixed to both ends of each cable and are clearly visible. Provide a complete list of these numbers along with the termination location of each end of the wire run.
B. Confirm that all system outputs are free of spurious signals including oscillations and radio frequency signals. A wide band oscilloscope shall be used to verify this condition.
C. Confirm that the system is free of audible clicks, pops, and other noises when any operating control is activated, with or without input signal.
D. For all microphone lines, tie lines, return lines and effect loudspeaker lines, confirm:

    1. Proper circuits appearing at each termination location.
    2. Proper circuits appearing at each jack bay position.
    3. Continuity of all conductors.
    4. Proper polarity is maintained.
    5. Absence of shorts between conductors within each circuit.
    6. Absence of shorts between circuit conductors and conduit.

E. Confirm that speakers and mountings are free of buzzes and rattles when the speaker is swept with sine wave tones over its rated bandwidth at one-half its maximum rated power.
F. For each installed data network cable or fiber optic cable confirm conformance to the specified TIA/EIA performance standards.

3.3 GROUNDING

A. Audio system wiring shall conform to the following procedures:

    1. Audio equipment AC ground pins shall connect to AC isolated ground.
    2. Audio equipment chassis shall connect to AC isolated ground or rack frames.
    3. Audio shields between AC powered pieces of equipment shall be connected to ground at one end only. Capacitive terminate as required.
    4. Isolate all Systems wiring from racks, back boxes and conduit.
    5. AC isolated ground system shall be isolated from all other facility grounds.

B. All metallic conduit, boxes and enclosures shall be grounded in accordance with the current National Electrical Code.
C. Metallic enclosures containing active equipment shall be grounded with due regard for the minimization of electrical noise. This may include the provision of grounding conductors separate from the AC ground.

3.4 COMMISSIONING OF SYSTEMS AND EQUIPMENT

A. Engage a factory-authorized service representative or technician who is familiar with this project to participate and assist, if necessary, in the functional performance testing of the equipment include in this Division with the Commissioning Agent.

3.5 EXAMINATION

A. Examine room conditions, ceiling and wall surfaces to assure they are in compliance with requirements and other conditions affecting installation and operation of Interactive Whiteboards projectors and speakers.

B. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to A/V cabling and other conditions affecting installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.6 FIELD QUALITY CONTROL

A. Verify that accessories required for each unit have been properly installed.
B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
3. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation.

3.7 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.
B. Clean installed items using methods and materials recommended in writing by manufacturer.

3.8 DEMONSTRATION

A. Bidding contractor shall engage a factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain each system described within this specification for the audio-visual equipment. This training shall include (8) hours, in the blocks of hours that shall be described by the Owner.
B. Upon approval of the above test report by the Architect and at a mutually agreeable time, demonstrate operation of each major component and of the complete installation. After demonstration, assist as required in acceptance testes.
C. Listening Tests:

1. Tests will include subjective evaluation by observers listening at various positions under various operating conditions of the system, intended to test its operation in conformance with its functional requirements.

D. Equipment Tests:

1. Perform any measurements of frequency response, distortion, noise or other characteristics and any operational tests deemed necessary by the Architect to determine conformity with these requirements.

2. If the need for adjustment or modification becomes evident during demonstration and testing, continue working until the installation operates properly.
3. Perform testing to demonstrate the Priority Override Function from the Public Address system.

E. Final Adjustments:

1. Make control adjustments as directed by the Architect. Make a record of these control settings. Provide covers, caps, or shaft locks for controls not used in system operation.

3.9 COMPLETION

A. Warranty service shall commence from 2 years after acceptance. Warranty service shall be provided during standard business hours within 24 hours after notice of concern.
B. Labor and materials provided under scope of project shall be covered under 2 year warranty. Devices shall be free of defects from installation of manufacturer. If an item requires replacement, this shall be provided at no additional cost to owner. If items are abused or rendered inoperable from misuse they shall not be covered under said warranty.
C. A/V integrator shall provide “As Built” documents, 2 sets, to owner. This shall include equipment list, as installed, equipment manuals, and detailed drawings showing as installed wiring details.

1. Provide a digital PDF copy of documentation on a USB Memory stick or CD/DVD for owner.

D. Bidding contractor shall engage a factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain each system described within this specification for the audio-visual equipment. This training shall include Sixteen (16) hours, in the blocks of hours that shall be described by the Owner. These services shall be considered as part of the contract and at no additional fees charged to owner.

END OF SECTION 274100.16

SECTION 275116 - PUBLIC ADDRESS SYSTEM

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Central Control sound system
B. Volume limiter/compressors
C. Speakers
D. Preamplifiers
E. Power amplifiers
F. Equipment cabinet
G. Equipment rack
H. Telephone paging adapters
I. Noise-operated gain controllers
J. Battery backup power unit
K. Conductors and cables

1.3 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”
B. Related Drawings
C. “T” Drawings – Technology Plans
D. Related Sections:
E. Section 271000 – “Structured Cabling”
F. Section 275313 – "Clock Systems"
G. Section 274100 – “Audio Visual Systems”

1.4 GENERAL REQUIREMENTS

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.
B. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the basis-of-design: Bogen Nyquist E7000 Series IP-Based Communications System.

    1. Approved Alternates:
    2. Telecor Equivalent

C. Contractors who wish to submit alternative equipment shall provide the specifying authority with the appropriate documentation at least 10 business days prior to bid opening. The submitted documentation must provide a feature-by-feature comparison identifying how the proposed equipment meets the operation and functionality of the system described in this specification. Prior to bid date, the contractor shall provide adequate and complete submittal information, which shall include but not be limited to specification sheets, working drawings, shop drawings, and system demonstration. The alternative supplier-contractor must also provide a list to include six installations identical to the proposed system.
D. The contractor shall provide the FCC registration number of the proposed system, where applicable.
E. Final approval of the alternative system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternative system at the contractor's expense.
F. The contractor for this work shall have read all the bidding requirements, the general requirements of division xx, and the contract proposal forms, and shall be held to the execution of this work. The contractor shall be bound by all the conditions and requirements therein.
G. The contractor shall be responsible for providing a complete functional system, including all necessary components whether included in this specification or not.
H. In preparing the bid, the contractor should consider that no claim will be made against the owner for any costs incurred by the contractor for any equipment demonstrations requested by the owner.

1.5 REFERENCE STANDARDS

A. NFPA 70 – National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.6 SCOPE OF WORK

A. The contractor shall supply and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating IP-Based Communications System including but not limited to:

1. The platform shall provide complete Nyquist E7000 intercom and employ state of the art IP Technology including the minimum functions listed.

    a. Intercom call between staff locations and classrooms with Unlimited Station capacity
    b. Interactive Facility Maps
    c. User customizable Announcements with priority
    d. Text-to-Speech Announcements
    e. Emergency Classroom Check-In can be used to enhances campus security
    f. Emergency or Normal Announcements are capable of being recorded and activated by a speed dial on an administrative console, DTMF, wireless panic button, mobile app, web browser or external IP networked system using HTTPS URL-based Application Programming Interface (API)
    g. Internal clock is synchronized with NTP network time server whether on the LAN, WAN or Internet keeping the Scheduled events (Bells) and Announcements accurate within milliseconds.
    h. Audio distribution allow for scheduled or manually activated audio to be activated from the Admin Web UI, contact closure, Admin phone and/or by use of Routines
    i. Unlimited Schedules
    j. Unlimited Time, Paging, and Audio Zones
    k. Unlimited Page Stacking/Queueing

l. Unlimited Scheduled events
m. Unlimited Scheduled Audio events
n. Integrated Internet Radio Source
o. Email Notifications and Alerts the system can send an email with a system event, contact closure, or when a Routine has been activated to name a few
p. Supervised Station Status system can be setup to send an email when a Nyquist device goes offline.
q. Clock / Messaging Display capability improves school communications
r. Alert Filters – Allow facilities to monitor for such as weather events, earthquakes, tornados, tsunami, volcanoes, public health, power outages, and many other National Weather Alerts emergencies and warnings.
s. Multi-Site All Call paging allows authorized users to make normal district wide pages
t. Multi-Facility Emergency All-Call paging allows authorized users to make emergency district wide pages
u. Administrative Graphical User Interface or GUI that can be used by technicians or Administrative: CoS and Roles define who has access to what parts of the GUI
v. Push-to-Talk Microphone
w. Ambient Noise Sensing

B. The system shall have a Routines feature that allows staff to activate via Admin Web UI, dial string, panic button, mobile app, API or with an Admin phone touch interface. Routines can automatically launch a procedure, or sequence of actions, that the E7000 system executes as a result of an input trigger. Routines are designed with school security plans and can support crisis plans for situations such as school lockdown, weather events, or emergency evacuation.

1. Direct Inward Station Access or DISA allows administrator or first responder or emergency personnel with proper login codes to call into the system from outside the school into any classroom, zone, or entire facility with customer supplied SIP enabled Telephone Network. DISA is designed to allow remote monitoring, Facility All-Call or Zone Paging, and two-way conversation from outside the facility.
2. Authorized staff can use the Admin Web UI to configure the Clock/Messaging Display function. They can use it to create messages that will display on monitors connected to the 10-Watt plenum-rated Intercom Modules with HDMI 1.3 (max. 1920 x 1080 @ 24/30 Hz) output or the NQ-GA10PV devices in a selected zone, multiple zones, or to specific stations. When creating the message, you can set several options, including when and how long the messages are displayed, priority of messages, and the appearance of the messages. The schedule programming allows the event names to be displayed analog or digital clock along with day and date on an NQ-GA10PV Display. You can also remove messages from the message queue either manually or via a Routine.
3. The ADA requires that title II entities (State and local governments) and title III entities (businesses and nonprofit organizations that serve the public) communicate effectively with people who have communication disabilities. The goal is to ensure that communication with people with these disabilities is equally effective as communication with people without disabilities. With this in mind the Bogen Nyquist E7000 helps people who have vision disabilities with clear audio paging, messaging and hearing disabilities with visual messaging to any display to assist in communicating.
4. Interactive Facility Maps that are intuitive to use. Simply click on a classroom or area of the GUI and it can initiate an intercom, page or drill to another map level. I addition when the system is in Check-In mode the classroom has a pop up of a room's video feed via the Maps view if equipped. The system shall allow authorized staff to use the Map-based Audio/Video room monitoring during emergency check-in. Systems that don’t have provisions for this are not considered equal.
5. In the event of wide area network or WAN outage every facility must be capable of operating standalone and allow for all features listed within this specification to work. Systems that rely on the WAN to operate shall not be considered for comparison in this bid.

6. Manage Check-In functionality that allows staff to quickly verify that they are aware that a check-in event is underway and are reporting classroom status for their assigned classrooms or areas. For staff to check-in all they have to do is press their Call Switch after they have completed their required check-in procedure. Examples of check-in events include but are not limited to weather related shelter-in-place, safety related lockdown, fire evacuation, room occupancy.
7. The E7000 has a Disable Audio feature that can be activated via contact closure from fire alarm or security system, Admin Web UI, dial string, panic button, mobile app., API or with an Admin phone touch interface. When the E7000 has its Audio Disabled the follow features are disabled: programmed or manually activated audio distribution, Zone Paging, normal announcement files, All-Call Paging, manual normal tones and scheduled event tones.
8. Optional password protection for multi-site emergency all-Call, multi-site all-call, facility page. Emergency all-call page, all-call page, emergency announcement, announcement, zone page, alarm, and tone are used to prevent unauthorized use of the system.
9. Text-to-Speech option allows Admin Web UI users to add custom announcements into the system by simply typing the text that you want converted to speech for this announcement. The system will then generate a .wav file that can be used by the E7000 system. Systems that don't offer Text-to-Speech options shall not be equivalent.
10. Installation Wizards are available for installers to reduce the setup time on major components in the system programming. Included wizards are as follows: Customer Information, Dialing Length, Station, User, Time Zone, Network Time Server, and Zones as a minimum.
11. The public address system shall integrate with the PBX/VoIP within the school for complete access to this system from any handset part of the PBX/VoIP.
12. The public address system shall integrate with the access control system. Upon activation of threat levels in the access control system, the public address system shall broadcast emergency announcements pre-recorded by the Owner. The contractor shall coordinate the pre-recorded messages, testing with the access control system, and configuration of what threat level activates what announcement. Configure these messages with the security consultant, public address designer, and Owner.
13. The public address system shall integrate with the Fire Alarm annunciation system to announce emergencies from the fire-alarm system through the public address system.

1.7 SUBMITTALS

A. Product Data: Provide data showing electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of field wiring to speakers and remote input devices.
B. Test Results: Indicate satisfactory completion of each recommended by the manufacturer.
C. Manufacturer's installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
D. Manufacturer's Certificate: Certify that products meet or exceed the specified requirements.
E. Manufacturer's Field Reports: Indicate that installation is complete and system performs according to specified requirements.
F. Project Record Documents: Record actual locations of speakers, control equipment, and outlets for input/outlet connectors.
G. Operation Data: Include instructions for adjusting, operating, and extending the system.
H. Maintenance Data: Include repair procedures and spare parts documentation.
I. Specification sheets on all items including cable types
J. Outline drawing of system control cabinet showing relative position of all major components
K. Shop drawings, detailing integrated electronic communications network system including, but not limited to, the following:

1. Station wiring arrangement
2. Equipment cabinet detail drawing

L. Wiring diagrams showing typical connections for all equipment
M. Numbered Certificate of Completion for installation, programming, and service training, which identifies the installing technician(s) as having successfully completed the Nyquist E7000 technical training course provided by the Bogen Communications, Inc.

1.8 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70 and Federal Communications Commission.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with field service facilities within 100 miles of the project.
C. Supplier Qualifications: Authorized distributor of specified manufacturer with minimum three years documented experience.
D. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 100 miles of the project.
E. Products: Listed, classified, and labeled as suitable for the purpose intended.
F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
G. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
H. The contractor shall be an established communications and electronics contractor that maintains a locally run and operated business and has done so for at least 10 years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.
I. The contractor shall show satisfactory evidence, upon request, that he or she maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his or her facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

1.9 SINGLE SOURCE RESPONSIBILITY

A. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and a minimum of 30 years of experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service training classes. A certificate of this training shall be provided with the contractor's submittal.

1.10 SAFETY / COMPLIANCE TESTING

A. The communications system and its components shall, where applicable, bear the label of a Nationally Recognized Testing Laboratory (NRTL), such as Environmental Technology Laboratory (ETL), and shall be listed by their re-examination service. All work must be completed in strict accordance with all applicable electrical codes, under direction of a qualified and factory-approved contractor, and to the approval of the owner.

B. Bogen's Nyquist E7000 solution is consistent with those NEMA SB 40-2015 requirements that specifically apply to school paging and intercom systems only as outlined within the ANSI/NEMA SB 40-2015 standards publication.

1.11 IN-SERVICE TRAINING

A. The contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system including Admin Web UI Dashboard operation, Scheduling, and Audio Distribution as a minimum. Operation manuals shall be provided at the time of this training.

1.12 WIRING

A. System wiring and equipment installation shall be in accordance with generally accepted engineering best practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall be tested to be free from grounds and shorts.
B. All system wiring shall be labeled at both ends of the cable. All labeling shall be based on the room 1numbers as indicated in the architectural graphics package.
C. Wiring shall be done per manufacturer's recommendation (Cat 5 or West Penn #357) depending on speaker type. All terminal connections are to be on barrier strips.

1.13 PROTECTION

A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
B. The contractor shall note on their system drawings, the type and location of these protection devices and all wiring information. Such devices are not to be installed above the ceiling.

1.14 SERVICE AND MAINTENANCE

A. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial hardware and software warranty periods.
B. System shall include software maintenance that includes bug fixes and new feature releases for a period of five years. In addition, the contractor shall provide at the owner's request additional maintenance contracts that are available as one-year, three-year, and five-year extensions. The contractor shall provide a 24-hour response time from call by customer.
C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.15 WARRANTY

A. The Bogen Nyquist hardware products identified in this specification shall be warranted to be free from defects in materials and workmanship for five (5) years from the date of sale to the original purchaser; except for the NQ-SYSCTRL, NQ-T1100 and NQ-T1000 which each carry a two (2) year warranty. The Bogen Nyquist software products identified on this specification are warranted to be free from defects in material and workmanship for ninety (90) days from the date of sale to the original purchaser.

PART 2 - SYSTEM SPECIFICATION

2.1 MANUFACTURERS

A. Manufacturers, subject to compliance with requirements specifications, provide the following system:

1. Bogen Nyquist E7000 IP-based paging and intercom solution manufactured by Bogen Communications, Inc.

B. The specifying authority must approve any alternative system 10 days prior to bid day.
C. The intent is to establish a standard of quality, function, and features. It is the responsibility of the contractor to ensure that the proposed product meets or exceeds every standard set forth in these specifications.
D. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

2.2 EQUIPMENT

A. Install and configure the equipment below as required by the Contract Drawings and functionality of the system in order to furnish a complete, fully-functional Public Address system.

1. Nyquist NQ-SYSCTRL System Controller

a. Configuration and management via a Web-based Graphical User Interface (GUI)
b. Wizard based setup for quick installation
c. Remote access from virtually any PC/MAC, tablet, or mobile device
d. Continuous monitoring of stations and appliances to ensure system operation
e. Dual network adapters to allow the System Controller to operate on two separate networks
f. Music automatically added to music library and playlist from USB port
g. Network-based audio that can be sourced (input) from any number of Nyquist appliances (NQ-P0100, NQ-A2xxx, NQ-A4xxx, etc.)
h. Ample storage for music files, recorded announcements, and call recordings
i. G722 and OPUS audio codec support to deliver superior HD audio quality
j. Convection air cooled; fan-less design for quiet, maintenance-free operation
k. Wall, rack, or shelf mountable

2. Nyquist NQ-E7030 Analog Station Bridge (ASB)

a. 24 station interface supporting analog speakers and call switches
b. 120-Watts of available power at 25-Volts
c. Two dynamic talk paths/amplification channels
d. Support Category G wiring or better
e. 25/70-volt speaker(s), ceiling-mounted, wall-mounted, and paging horns
f. CAN Bus 2.0 interface designed for support of Nyquist Digital Call Switch (DCS) NQ-E7020 that can initiate Normal, Urgent, or Emergency priority calls, all with options for Privacy Mode
g. Analog/Mechanical Call Switches capable of placing Normal, Urgent, or Emergency priority calls, Bogen CA15C rocker style momentary call button
h. Wall, rack, or shelf mountable

3. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

    a. No less than four Mic/Line inputs used for analog audio input like AM/FM Tuner or CD Player
    b. Channel 4 configurable for Push-to-Talk MIC application
    c. Line Level output to drive external amplifier
    d. Software programmable configuration and operation

        1) Push-to-Talk Channel
        2) Push-to-Talk Type
        3) Push-to-Talk Zone
        4) Mixer Channels

    e. Configurable built-in DSP

        1) Noise Gate
        2) Compressor/Limiter functions, etc.
        3) Tone Controls: Low Shelving, Mid Bandpass and Hi Shelving
        4) Multi-band Parametric EQ
        5) Variable Low-Cut/High-Pass filters
        6) CH1 can be configured as a digital AES/EBU (AES3) input

    f. USB 2.0 host port, Type-A connector (future use)
    g. Powered by 100V – 240V Universal AC Mains
    h. Wall, rack, or shelf mountable

4. The Nyquist two and four channel amplifiers available in the following number of channels and watts

    a. NQ-A2060 two channel with 60 watts per channel
    b. NQ-A2120 two channel with 120 watts per channel
    c. NQ-A2300 two channel with 300 watts per channel
    d. NQ-A4060 four channel with 60 watts per channel
    e. NQ-A4120 four channel with 120 watts per channel
    f. NQ-A4300 four channel with 300 watts per channel
    g. These amplifiers shall include GUI based DSP controls; 16-band Graphic Equalizer; Signal Present and Clip Monitor; Adjustable High Pass, Low Pass, and Bandpass Filters; Noise Gate; Compressor/Limiter; and 7-band Parametric Equalizer. Outputs shall be provided for 4-, 8-ohm, 25V, and 70V distributed systems.
    h. Bridged or Mono Mode
    i. Integrated Digital Signal Processor

        1) Noise Gate
        2) Compressor/Limiter functions, etc.
        3) Tone Controls: Low Shelving, Mid Bandpass and Hi Shelving
        4) Multi-band Parametric EQ
        5) Variable Low-Cut/High-Pass filters

    j. One Line-Level Input on two channel amplifiers
    k. Two Line-Level Inputs on the four channel amplifiers
    l. 100/1000 GB ethernet connection
    m. USB 2.0 host port, Type-A connector (future use)
    n. 100V – 240V Universal AC Mains
    o. Wall, rack, or shelf mountable

p. The amplifiers shall carry the necessary safety agency listings for both the US and Canada. The amplifier shall employ convection air cooling. Amplifiers that require fans for cooling shall not be considered equal.

5. Nyquist NQ-E7010 Input/Output Controller

a. Power over Ethernet 802.3af compliant
b. 8 x Dry Contact Closure Inputs
c. 8 x Relay Driver Outputs (Open-Collector)
d. USB 2.0 host port, Type-A connector (future use)
e. Software programmable configuration and operation including; Contact Type, Extension, Name, Close Interval, Actions (911, Audio, Alarm, Announcement, All-Call, Multi-Site-Emergency-All-Call, Emergency-Call, Emergency-All-Call, Hourly, Audio-Disabled, No Action, Page, Tone, Enable-Audio and Manual), Action ID, Zones, Close Extension, Dashboard Type, Dashboard Title, Dashboard Scope, Dashboard Text, Dashboard Style, Email and Routines
f. Wall, rack, or shelf mountable

6. Nyquist NQ-GA10P 10-Watt Intercom Module

a. Power over Ethernet 802.3af compliant
b. Low-impedance (8-ohm) speaker output. Designed for use with Drop-In Ceiling Speaker CSD2X2L/U
c. Network-based audio output (paging, intercom, audio distribution)
d. Talkback support
e. Push-to-Talk Microphone that can be routed anywhere over Bogen’s Nyquist network
f. Ambient Noise Sensor connection for Amplifier volume output control
g. DSP-based noise rejection and voice bandwidth optimization
h. Web-based configuration
i. Analog Call Switch support (Bogen CA15C, or equivalent)
j. Digital Call Switch support (Bogen NQ-E7020)
k. Audio Active Control SPDT Relay Output Rated at 2A
l. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
m. Integrated slotted mounting flanges
n. Available PS4815W 48VDC External Power Supply when PoE isn't available

7. Nyquist NQ-GA10PV 10-Watt Intercom Module with HDMI Clock/Messaging Display.

a. HDMI 1.3 (max. 1920 x 1080 @ 24/30 Hz) output that can be configured many ways:

1) Analog Clock with Messaging
2) Digital Clock with Messaging
3) Single Column Messaging
4) Two Column Messaging
5) Three Column Messaging
6) Priority Fullscreen Messaging

b. Power over Ethernet 802.3af compliant
c. Low-impedance (8-ohm) speaker output. Designed for use with Drop-In Ceiling Speaker CSD2X2L/U
d. Network-based audio output (paging, intercom, audio distribution)
e. Talkback support
f. Push-to-Talk Microphone that can be routed anywhere over Bogen’s Nyquist network
g. Ambient Noise Sensor connection for Amplifier volume output control
h. DSP-based noise rejection and voice bandwidth optimization

i. Web-based configuration
j. Analog Call Switch support (Bogen CA15C, or equivalent)
k. Digital Call Switch support (Bogen NQ-E7020)
l. Audio Active Control SPDT Relay Output Rated at 2A
m. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
n. Integrated slotted mounting flanges
o. Available PS4815W 48VDC External Power Supply when PoE isn't available

8. Nyquist NQ-GA20P2 Plenum-Rated 20-Watt Integrated Amplifier

a. Single 20-watt, 8-ohm speaker output
b. Single Balanced Line Output
c. Power over Ethernet Plus (PoE+) 802.3at compliant
d. Nyquist network-based audio output (paging, intercom, audio distribution)
e. Web-based configuration
f. Front panel Power and Status LEDs
g. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package
h. Integrated slotted mounting flanges
i. Available PS4830W 48VDC External Power Supply when PoE+ isn't available
j. NQ-T1100 VoIP Admin Phone Color Touch Display (aka Admin Station)
k. 7” 800 x 480-pixel color display with backlight
l. Touch screen display for one touch operation
m. Full-duplex hands-free speakerphone with AEC
n. Call hold
o. Mute
p. Redial, call return, auto answer
q. PoE (802.3af) Class-3 support
r. Headset with EHS support
s. Dual Gigabit Ethernet ports
t. Desk Mountable
u. Optional Wall mount available

9. NQ-T1000 VoIP Staff Phone LCD Display (aka Staff Station)

a. 132 x 64-pixel graphical LCD with backlight
b. Two-port 10/100M Ethernet Switch
c. Full-duplex hands-free speakerphone with AEC
d. Call hold
e. Mute
f. Redial, call return, auto answer
g. PoE (802.3af) Class-3 support
h. Dual-color (red or green) illuminated LEDs for line status information
i. Two 10/100M Ethernet ports
j. Wall or desk mountable

10. Optional third-party equipment support

a. Telephony interface device(s) for FXO/FXS analog port connectivity
b. Third-party hardware FXS gateway support includes:

1) Two port FXS gateway Cisco SPA-112 typically used for analog interface to existing PBX CO port support
2) 24 port FXS gateway Yeastar TA-2400 typically used for analog staff phone support

2.3 COMPONENTS AND DESCRIPTIONS

A. The Nyquist E7000 Series Educational System is a software-based VoIP paging and intercom system.
B. The System must be capable of supporting existing Bogen Multicom 2000 and Bogen Quantum Multicom IP wiring, 25-Volt speakers and analog call-switches, and equivalent competitive systems utilizing the existing architectural numbering scheme. The VoIP capabilities of the Nyquist system will enable the support of the features across the Nyquist appliances within the facility. The following sections define how the system handles each of the features in the system. Systems that do not allow the reuse of existing wiring or numbering scheme shall not be deemed acceptable. Systems that do not allow appliances to be seamlessly integrated via the existing customers LAN are not considered equal.
C. Nyquist E7000 Software

1. The Nyquist E7000 software is pre-installed on a Nyquist NQ-SYSCTRL System Controller or can be optionally installed on a dedicated dealer or customer supplied server. An unlimited number of facilities can be networked into a Nyquist-based District.
2. Audio shall be transmitted between the System Controller and the Nyquist appliances using the customer supplied LAN/WAN using both G.722 and Opus 48k audio encoding and streaming technology to deliver High Definition DVD quality audio. Systems that do not use G.722 and Opus for audio encoding and streaming shall not be deemed equivalent.
3. Installers have the ability to verify that the Nyquist System Controller can access Internet-based URLs required for the system to run properly by clicking on the "Check Internet Site Access" on the license activation wizard. If the installer made mistakes in configuring the network the install has the ability to go back and make changes to the network by clicking on the “Network Wizard” button.
4. The Nyquist software and Nyquist appliances firmware shall be upgradeable via the Nyquist Web UI System Update page that contains a list of available Nyquist software updates. When automatic software check and download are enabled, new software updates will automatically be downloaded and appear in the System Update list, and a dashboard message will be displayed to announce newly available software. Release notes can be viewed for each available update. System updates can be started via the System Update list. The System Update page includes a "Check for System Updates" button that can be used to manually check for and download available Nyquist software updates.
5. Prior to preforming Nyquist updates the technician shall have the ability to verify if the default gateway, Network Time Protocol, and Domain Name Servers are configured and available, to obtain network interface and routing tables status, and to display the Nyquist E7000’s public IP address. See "Check Internet Site Access" under "System Parameters”. The E7000 system can be setup to automatic check for new Nyquist System software and automatic download of new Nyquist System Software
6. It shall be possible for a Nyquist facility to make “station-to-station” calls and “remote facility” All-Call pages to a single facility or to all Nyquist facilities in a district via the Nyquist Web UI or an Admin Station. Systems that require remote viewing software or other application software to be installed/loaded on to additional servers or PCs to make station-to-station calls and remote facility All-Call or district paging shall not be considered equivalent.
7. The Nyquist software is designed to handle all facility and district-wide communications, including but not limited to, inter-facility intercom calling and paging, district-wide Emergency All-Call and local facility point-to-point calls. Via the Nyquist Web UI, every facility shall be configured with the IP addresses of all the other remote facilities within the district. To ensure that these communications are operating correctly at all times the Nyquist appliances are supervised and remote facilities are monitored, if a device or facility has a fault the system can send and/or email and also display a message if a

device changes state. System that don't provide Station Supervision and remote Facility Monitoring shall not be considered.

8. Nyquist can support an unlimited number of facilities; however, the maximum number of simultaneous remote facility intercom calls supported is based on the actual performance of the WAN and the Nyquist System Controller CPU load.
9. The voice quality of the facility calls may vary based on the WAN conditions. The maximum network bandwidth that All-Call and Zone Paging uses is average of 0.086 Mbps (Multicast G.722), and intercom calls average of 0.171 Mbps (unicast, G.722).
10. The system shall facilitate the repetitive playing of Normal or Emergency audio tones or announcements directed to an All-Call or a Paging Zone until stopped by the Nyquist user via the Web UI, an Admin Station, or a dry contact closure connected to the Nyquist I/O Controller NQ-E7010.
11. Through the use of Routines, a trained individual can create a routine that can perform a sequence of events that can include the repetitive playing of normal or emergency audio files, make or break contact closure(s), display different messages in different areas, send email(s), and place a phone call (if equipped) offsite and play a pre-recorded message. Routines can be triggered/started by Application Programming Interface (API) or the playing of normal or emergency audio files, make or break contact closure(s) or almost any feature or function in the E7000 system. The system must also be capable of executing multi-site Routines (e.g., supports District-wide lockdown). Systems that don't provide Routines are not equal.
12. A built-in Master Clock shall be included to automatically control class change bells or other time-based events. The Master Clock shall have an unlimited number of Events that may be programmed into any of the unlimited number of Facilities, unlimited number of Schedules, and unlimited number of Holiday events. The schedules shall be nameable for easy selection when assigning schedules to days or overriding a schedule. Schedules can be overridden via the Admin Web UI or Admin phone.
13. Network Time Synchronization. The system shall be capable of periodically updating/synchronizing the processor's time with a Network Time Server running Network Time Protocol (NTP) via the school's LAN network. Systems that do not provide Network Time Synchronization will not be deemed equivalent. The Nyquist server can be the NTP server for other devices on the LAN such as IP clocks and other IP devices.

D. Nyquist E7000 System Software Application

1. The Nyquist software is pre-installed on the Nyquist System Controller, and upon boot-up, users can log in to the Nyquist application via a web browser that supports WebRTC. Systems that require Com Port redirect software, client PC application, software or serial-to-Ethernet adapters for user access are not deemed equal. Communications between the System Controller and the Web UI(s) shall be via secure Hyper Text Transfer Protocol (HTTPS) connections (i.e., https://).
2. The Nyquist Web UI shall be configured with four different default user access levels, based on four unique user roles. Systems that do not provide unlimited access levels and unlimited number of user roles are not considered equal.
3. The four default roles shall be: admin, optech, operator, and user. These roles provide a starting point/example for administrators to create additional roles
4. Only a user assigned the admin role shall be able to provide access to users, giving them the ability to create, delete, edit, and view system parameters.
5. Only an Administrator shall have the ability to adjust roles and Class of Service (CoS) of users. The roles determine if users can view the definable data objects that can include configuration, alarms, and performance data and if users can perform certain operations based on the user's role and station's CoS. All changes to roles and CoS are effective immediately, without the need to restart the browser or reboot the System controller or server.
6. The Nyquist Web UI Dashboard shall provide full administrative capabilities to manage/operate the following system features:

a. Calling/Paging – Used to access directory, dial pad, Page Exclusion, Call Forwarding, Zone Page, Record Page, Prepending Page, All-Call, Emergency All-Call, Manage Check-in and operate Routines.
b. Multi-Site Calling/Paging – Used for Facility Page, Multi-Site All Call, and Multi-Site Emergency All Call.
c. Tones/Announcements – Used for Tones, Announcements, Alarms, Stop Announcement, Display Message, and Remove Message.
d. View Weekly Schedule – Used to show the current active Bell Schedules.
e. Audio Distribution – Used to distribute audio sources to Stations, Audio Zones or entire facility. Operators can create an unlimited number Audio Distributions as needed by the facility
f. Enable or Disable Audio – Used to place the Nyquist system into Page Exclusion mode (i.e., “mute” the system) when a contact closure is supplied from the fire alarm panel. Systems that do not provide this capability are deemed not equal.

7. Systems that require application software to be installed on a PC to manage the above features shall not be considered.
8. To facilitate installation and configuration of the system, additional Web UI menus are required. The menus shall only be visible to users with the correct roles and CoS. The navigation menus found on the Web UI shall be as follows:

a. System Parameters – Allow installers to adjust core system parameters including Product License, Restart Server, Station Supervision, Email Configuration, System Update, Shut Down Server, Check Internet Site Access, Check Server Status, Edit system tools and adjust all the System Parameters.
b. Zones and Queues – Allow installers to create and modify Paging, Time, and Audio Zones. Installers can also setup Queues that can be used to eliminate feedback.
c. Schedules – Allow installers and administrators to create bell schedules for multiple Schools, predefine alternative schedules to run, prevent the bells from ringing on a holiday, and schedule an announcement to play. The system shall allow an unlimited number of schedules to operate simultaneously within a facility.
d. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that control station access to the following features: Call-in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call Any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, Inter-Facility Features, Manage Output Contacts, and Execute Routines.
e. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones, staff phones, and Admin Web UIs that can ring when a station calls in with a call switch.
f. Stations – Allow the installer to set up, modify, and delete stations; set up Page Exclusion; view Station Status; and add New Stations.
g. Bridge Devices – Allow the installer to configure the Nyquist ASBs.
h. Amplifier Devices – Allow the installer to configure Nyquist Two and Four and PA Amplifiers
i. Audio – Allow the installer to upload and manage Announcements, Playlists, Recordings, Songs, Tones, and Internet Radio Services. The system must support the uploading of both MP3 and WAV files and make Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
j. Users – Allow the installer to manage users by giving them the proper roles and assign extensions if needed.

k. Roles – Allow the installer to grant users rights to Create, Delete, Edit, Restart System, Sort Menu, Systems Update, Manage, Import/Export, Restore, Settings, or View.
l. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
m. Outside Lines – Allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
n. SIP Trunks – Allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
o. Call Details – Allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
p. System Backup/Restore – Allow the installer to preform system backups or restores and allow the backups to be scheduled to run automatically.
q. System Logs – Allow the installer to view and export log files, Nyquist-Intercom, and Web Server logs that can be used for troubleshooting and technical assistance.
r. Paging Exclusions – Allow the installer to view and edit stations that are excluded from paging.
s. Firmware – Update firmware for Nyquist speakers and appliances.
t. Routines – Allow installers to create routines that are a sequence of actions, that the Nyquist system executes as a result of an input trigger. Routines can support crisis plans for situations such as school lockdowns, weather events, or emergency evacuations.
u. Alert Filters – Allow installers to select the National Weather Alerts that the facility needs to monitor for such as weather events, earthquakes, tsunami, volcanoes, public health, power outages, and many other emergencies.
v. Systems that do not provide these options as a minimum shall not be considered equal.

E. Nyquist NQ-E7030 Analog Station Bridge

1. The Nyquist NQ-E7030 ASB allows facilities with existing Multicom or Quantum or compatible intercom systems to upgrade to Nyquist. Each ASB supports up to 24 speakers and call switches with 120-Watts of embedded 25 Volt power. The ASB is designed to drive almost any combination of 25 Volt speakers and horns.
2. The Nyquist ASB contains two 120-Watt amplifiers that are used dynamically by the system and allows two simultaneous amplified audio paths through the ASB. Either amplifier can be used for an intercom call and/or program (Paging, Time Tones and Audio) distribution.
3. Each of the 24 station interface ports - Support connections to as many as 24 individual 25 Volt speakers with one 25 Volt speaker connection per interface used for direct communication between the admin area and the classroom via Half-duplex talkback using the speaker as pickup and the 24 dry contact closure-type analog Call Switch connections allow for support of legacy Call-Switches like the CA15C.
4. On the back of the ASB is a CAN Bus 2.0 Interface designed to support the connection of 24 or more Nyquist NQ-E7020 Digital Call Switches DCS that can be associated with the programmed stations. Systems that don’t support Digital Call Switches shall not be considered equal.
5. On the front of the ASB are two (2) x RGB full spectrum LED’s. The POWER LED appears as solid red during initial power up, flashes green during a boot sequence, and appears solid green when fully booted. The STATUS LED uses the following indicators to provide information about the appliance:

    1) Flashing red – No network connection found
    2) Solid blue – The ASB is in an uninitialized state and is not associated to a server. (The server may be in a discovery mode.)

3) Solid green – The ASB is registered to a Nyquist server and is in normal operation
4) Flashing green – The ASB has an IP address but is not registered with the Nyquist server
5) Solid red – The ASB needs to be rebooted or reset so that the Nyquist application can resume
6) Flashing Blue – The ASB is updating.

6. USB 2.0 host port, type A connector designed for future applications.
7. On the front of the ASB you will also find the 10/100 Ethernet network connection. The ASB can be configured with a static IP address or use DHCP for connection to the customers network as required by the Network Administrator
8. The ASB gets its power from a universal mains power supply (100VAC – 240VAC)
9. The Nyquist NQ-E7030 ASB shall be rack, wall, or shelf mountable and shall include the required mounting bracket hardware.

F. Nyquist NQ-P0100 Matrix Mixer Pre-Amplifier (MMPA)

1. The Nyquist NQ-P0100 MMPA is designed to bring external audio into the Nyquist system. The MMPA interfaces with a local sound system by accepting one or more analog audio sources, mixing them, and outputting them to either, a) the network for Audio Distribution, or b) the MMPA's line level output that can then be inserted into an external amplifier to drive local sound system in gyms, cafeterias, auditoriums, etc. The MMPA supports the following:

   a. Four software selectable Line/MIC Input channels via three XLR connectors and four sets of screw-terminals. Input channel four (4) shall be capable of being configured to support a Push-to-Talk microphone Bogen model DDU-250. Channel-1 can be configured as a digital AES/EBU (AES3) input. Line/Monitor output – The MMPA becomes a station on the Nyquist system, allowing users to call it directly or to include it in any of the Page, Time, or Audio Zones and can be direct one-way page by calling it extension.
   b. The MMPA shall support the following features: Line-Level output to drive input on a local amplifier or self-amplified speaker; One USB 2.0 host port (Type-A connector) for future use; two (2) x RGB full spectrum LED status indicators.
   c. Configurable built-in Digital Signal Processing for Noise Gate, Compressor/Limiter functions, etc., Tone Controls: Low Shelving, Mid Bandpass and Hi Shelving, Multi-band Parametric EQ, and Variable Low-Cut/High-Pass filters.
   d. The MMPA is powered by Universal mains supply (100VAC – 240VAC).
   e. The MMPA shall be wall or shelf mountable and shall include the required mounting bracket hardware.

2. The system shall be equipped a minimum of one (1) Nyquist MMPA that allows for up to four user-configurable audio inputs. The MMPA shall support Line, MIC, and digital AES/EBU (AES3) input sources. The system supports an unlimited number of MMPAs.

G. Nyquist NQ-E7010 Input/Output Controller

1. The Nyquist NQ-E7010 I/O Controller is designed to accept contact closure inputs and activate open-collector outputs to drive relay coils. These inputs and outputs are used to trigger events or to be triggered by an event or Routine within the Nyquist system.

   a. PoE Class-1; IEEE 802.3af compliant with Optional 48VDC 15W power supply
   b. Eight Dry Contact Closure Inputs that can be used with Fire Alarm Override Relays, external event triggers (for example, Lockdown Buttons, etc.)

c. Eight Relay Driver Outputs (Open-Collector) for use with Clock Correction (Sync Pulse), response to contact closure inputs, etc.
d. USB 2.0 host port, Type-A connector (future use)
e. Two (2) x RGB full spectrum LED Power and Status indicators

2. The Nyquist NQ-E7010 I/O Controller shall support wall or shelf-mounting options and shall include the required mounting bracket hardware.
3. The Nyquist NQ-E7010 I/O Controller shall be designed for wall or shelf mounting.

H. Bogen Analog Call Switch CA-15C for use with the Nyquist ASB or NQ-GA10P(V)

1. The momentary Call Switch shall be capable of placing a combination of Normal/Urgent/Emergency Calls based on the software configuration of the Call Switch.
2. Normal/Emergency call configuration: Making a Normal call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the call switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Normal or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.
3. Urgent/Emergency call configuration: Making an Urgent call in this mode involves pressing the button on the Call Switch once. A call is then placed to the designated Admin Station. An Emergency call involves pressing the button on the Call Switch at least four times. The Emergency call is then routed to the designated Admin Station. In both scenarios, the calling station number and call-in level (Urgent or Emergency) are displayed on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to an alternative Admin Station or Emergency Link.
4. Emergency Only call configuration: Making an Emergency call in this mode involves pressing the Emergency call switch with Call Level Emergency one time. The call is then switched to the Admin Station. This requires the display of the station number and call-in level on the Admin Station or on a group of Admin Stations. Additionally, Emergency calls can be routed to any Admin Station, including Emergency Link.
5. Emergency Link Transfer - If an Emergency call goes unanswered by the Admin Station and the Emergency link transfer is active, the Emergency call will be forwarded to the loudspeaker associated with the Emergency Link Station. Any station equipped with a loudspeaker can be programmed as the Emergency Link Transfer. Systems that do not provide Emergency Link Transfer shall not be considered equal.
6. In addition to the mechanical click of a Call Switch button press, a call confirmation audio file shall be played on the associated loudspeaker when a call is placed. The three call-in levels shall have distinct audio confirmation messages:

a. Call Placed
b. Urgent Call Placed
c. Emergency Call Placed

I. The Nyquist plenum-rated amplifier shall be a model NQ-GA20P2 20-watt integrated amplifier and shall utilize UL 2043 plenum-rated packaging.

1. One 20 watt 8-ohm speaker output (with PoE+)
2. One Balanced Line Output
3. RJ-45 for Nyquist network connection
4. Power-over-Ethernet Plus (PoE+) 802.3at compliant
5. Nyquist network-based audio output Web-based configuration
6. Power and Status LEDs
7. In-wall, in-ceiling, shelf, or device mountable UL 2043 plenum-rated package

8. Optional 48VDC External Power Supply (PS4830W; sold separately)

J. The Nyquist plenum-rated amplifier shall be a model NQ-GA20P2 20-watt integrated amplifier and shall utilize UL 2043 plenum-rated packaging. The amplifier shall be capable of being powered with an 802.3at compliant Power-over-Ethernet Plus (PoE+) switch, PoE+ power injector, or 48VDC external power supply PS4830W. The amplifier shall provide a frequency response from 20-20 kHz +/- 0.25 dB at rated power. Distortion shall be less than 0.05% THD+N. The amplifier shall include GUI based configuration. Output shall be provided for both line level or 8-ohm speaker connections. Audio line level output shall be 2.2V RMS @10kΩ (+27 dB) electronically balanced.

K. The Nyquist based two channel amplifier shall be a model [_____], rated at [_____] watts RMS per channel (NQ-A2060/2x60 watts, NQ-A2120/2x120 watts, and NQ-A2300/2x300 watts) with switch selectable 2-Channel or 1-Channel bridged operation. The amplifier shall have one dedicated Balanced Line Input. The amplifier shall provide a frequency response from 20-20 kHz +/- 0.25 dB at rated power. Distortion shall be less than 0.03%. The amplifier shall include GUI based DSP controls; 16-band Graphic Equalize; Signal Present and Clip Monitor; Adjustable High Pass, Low Pass, and Bandpass Filters; Noise Gate; Compressor/Limiter; and 7-band Parametric Equalizer. Outputs shall be provided for 4-, 8-ohm, 25V, and 70V distributed systems. The amplifier shall be rack mountable 1/2 Rack Width - Wall, Rack, or Shelf mountable 1RU and 2RU packages or by using a 19” Rack Mount Kit (NQ-RMK03; sold separately). It shall carry the necessary safety agency listings for both the US and Canada. The amplifier shall employ convection air cooling. Amplifiers that require fans for cooling shall not be considered equal.

L. The Nyquist based four channel amplifier shall be a model [_____], rated at [_____] watts RMS per channel (NQ-A4060/4x60 watts, NQ-A4120/4x120 watts, and NQ-A4300/4x300 watts) with switch selectable 4-Channel or 2-Channel bridged operation. The amplifier shall have two dedicated Balanced Line Inputs with both Phoenix plug and XLR connections for each input. The amplifier shall provide a frequency response from 20-20 kHz +/- 0.25 dB at rated power. Distortion shall be less than 0.03%. The amplifier shall include GUI based DSP controls; 16-band Graphic Equalizer; Signal Present and Clip Monitor; Adjustable High Pass, Low Pass, and Bandpass Filters; Noise Gate; Compressor/Limiter; and 7-band

M. Nyquist NQ-T1100 VoIP Admin Phone – Color Touch Display (Admin Station)

1. The Nyquist Admin Station shall have the following features:

   a. 7” 800 x 480-pixel color display with backlight
   b. Touch screen display for one touch operation
   c. Full-duplex hands-free speakerphone with AEC
   d. Call hold
   e. Mute
   f. Redial, call return, auto answer
   g. PoE (802.3af) Class-3 support
   h. Headset with EHS support
   i. Dual Gigabit Ethernet ports
   j. Desk Mountable
   k. Optional Wall mount capable

2. The Nyquist Admin Station display panel shall show the time of day and day of week, the current bell schedule(s), and the station numbers and call-in priority of staff stations that are calling in. Depending upon the system programming, an Admin Station shall display menus to activate Zone Paging, All-Call Paging, Emergency All-Call Paging, District All-Call paging, alarm signals, and external functions.
3. The Admin Station shall be capable of calling either the loudspeaker or Staff Station at each classroom location.

4. The Admin Station shall display the classroom number of any station that calls 911. This allows front-office administrators to direct emergency personnel to the correct physical location in the building when they arrive. If a system is not connected to outside phone lines, then 911 calls can be routed to a designated station within the facility. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and continue unit the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities. Systems that do not provide this feature will not be deemed equal.

N. Nyquist NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station)

1. Nyquist Staff Station shall have the following features:

   a. 132 x 64-pixel graphical LCD with backlight
   b. Two-port 10/100M Ethernet Switch
   c. Full-duplex hands-free speakerphone with AEC
   d. Call hold
   e. Mute
   f. Redial, call return, auto answer
   g. PoE (802.3af) Class-3 support
   h. Dual-color (red or green) illuminated LEDs for line status information
   i. Two 10/100M Ethernet ports
   j. Wall or desk mountable

2. The classroom Staff Station shall be capable of the following features depending on how the station CoS is configured:

   a. Emergency intercom call – Staff Stations shall be capable of making an Emergency intercom call, which is then routed to the assigned Admin Station. This requires the display of the architectural number and call in level on the Admin Station. Systems that do not provide this feature are not equivalent.
   b. Speed dial
   c. Toggle audio distribution on and off
   d. Call Forward activation and deactivation for All-Calls/Busy/No Answer/Busy or No Answer
   e. Conference Calling
   f. Transfer Call
   g. Dial Administrative station– Staff Stations can allow the user to dial the station number to call to the Admin phone or its associated speaker. The call shall be routed to the Admin Station showing the architectural number that is calling.
   h. Emergency All-Call – An emergency page shall be broadcasted to all the stations in the facility.
   i. Place Outside Call
   j. Remote Answer
   k. Single-Zone/All-Station Page
   l. Call Waiting Tone for Outside Calls – It shall be possible to feed the call waiting tone to the Administrative Phone during a conversation.
   m. Transfer call from VoIP speaker in classroom down to an associated Staff Station
   n. Transfer call from analog speaker in classroom down to an associated Staff Station
   o. Transfer call from VoIP Staff Station in classroom up to an associated VoIP speaker
   p. Transfer call from Staff Station in classroom up to an associated analog speaker

O. Additional Loudspeakers for use with the Nyquist ASB

1. 25-Volt Classroom Speakers shall be Bogen:

    a. Ceiling Mounted Speakers: CSD2X2U Drop-In Ceiling Speaker
    b. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker

2. 25-Volt Hallway Speakers shall be Bogen:

    a. Ceiling Mounted Speakers: S810T725PG8U Ceiling Speaker
    b. Wall Baffle Speakers: MB8TSQ/SL Metal Box Speaker

3. 25-Volt Outdoor/Gym/Locker Room Speakers shall be Bogen:

    a. FMH15T mounted in BBSM6 surface-mounted vandal-resistant enclosure/BBFM6 flush-mounted vandal-resistant enclosure with FMHAR8 adapter ring and SGHD8 heavy duty grille
    b. KFLDS30T Wide Dispersion Re-entrant Horn Loudspeakers

4. 25-Volt Pendant Speakers shall be Bogen:

    a. OCS1 Orbit Ceiling Speakers
    b. OPS1 Orbit Pendant Speakers

P. Wire guards shall be provided and installed for each speaker where indicated on the drawings.
Q. Public Address Strobe:

1. Each public address strobe location shall include the following:
2. QTY (1) RDL ACR-1 Audio Relay
3. QTY (1) Altronix RB5 Relay
4. QTY (1) Edwards 53X-G1 Rotating Beacon, 24V, CONFIRM COLOR PRIOR TO PROCUREMENT
5. QTY (1) Edwards WBR Wall Mounting Bracket
6. QTY (1) Altronix SMP-5 Power Supply
7. QTY (1) TA238175 Transformer
8. QTY (1) STI EM121204 Utility Box
9. All required cabling
10. The power supply for the public address strobes shall be located in the data closet / telecommunication room.
11. The strobe shall activate during an all call or direct room call to the room the strobe is located in.

R. Cabling:

1. All cabling shall be plenum rated.
2. The contractor shall provide wiring in raceway for the proper operation of the sound systems as called for in this specification, or as shown on the drawings. The types of cable required are as follows:

    a. Loudspeaker Cable: It shall contain three (3) 22 AWG stranded tinned copper conductors (two (2) aluminum-polyester shielded and one (1) unshielded), plus a #22 AWG copper drain wire in a chrome PVC jacket. Conductors shall be polyethylene insulated with 0.014 inch thickness. Jacket thickness shall be 0.028 inch and overall outer diameter 0.21 inch. Loudspeaker cable shall be Belden or approved equal.
    b. Microphone Cable: Cable shall consist of one (1) pair of 20 AWG stranded, tinned copper conductors, plus a #20 stranded drain wire in a chrome PVC

jacket. Conductors shall be polyethylene insulated and aluminum-polyester shielded. Microphone cable shall be Belden or approved equal.

3. Raceways:
4. Conduit and Boxes: Comply with Section 260533 "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.
5. Outlet boxes shall be not less than 2 inches wide, 3 inches high, and 2½ inches deep.

2.4 SYSTEM CAPABILITIES

A. The communication system shall be a Bogen Nyquist E7000 Series Educational System and shall provide a comprehensive communications network between administrative areas and staff locations throughout the facility.
B. The system shall provide no less than the following features and functions:

1. Software-based, state-of-the-art, Voice over IP (VoIP) paging and intercom solution.
2. The system shall provide a Web User Interface (Web UI) shall allow users to configure and control the system, in accordance with their assigned User Role, from any Web browser enabled PC, Mac, Android or iOS tablet or mobile device.
3. Amplified-voice communication with analog loudspeakers shall use a shielded audio pair when connected to an ASB.
4. The system shall support any combination of the following VoIP phone station types: NQ-T1100 Administrative VoIP Phone – Color Touch Display (Admin Station) or NQ-T1000 Staff VoIP Phone – LCD Display (Staff Station).

    a. All VoIP phone station types shall utilize the same type of field wiring.
    b. There shall be no limit to the number of Admin Stations that can be connected to a facility. Systems that require different head-end equipment to make Admin Stations function, or systems that limit the number of Admin or Staff Stations shall not be deemed acceptable.

5. Future station alterations shall only require the Station Type to be changed in system programming. Alterations shall not require field wiring or system head-end alterations, unless an analog station device is being replaced by a VoIP station device or vice-versa.
6. The system shall be a global non-blocking system. The system shall be capable of unlimited amplified intercom paths per facility. Two amplified intercom paths shall be provided with each ASB for its complement of 24 stations. All hardware, etc., required to achieve the necessary number of amplified-voice intercom channels for this system shall be included in this submittal. ASB amplified-voice intercom channels shall provide voice-activated switching. Systems requiring the use of a push-to-talk switch on administrative telephones shall not be acceptable. There shall be an automatic level control for return speech during amplified-voice communications. The intercom amplifier shall also provide control over the voice switching sensitivity and delay times of the VOX circuitry on the ASB.
7. The system shall provide 911 Dial-Through via outside FXO/FXS lines or SIP trunks to ensure that one or more lines are always available for 911 calls. The 911 Dial-Through is available to any properly configured station (via CoS). When a station dials 911, the 911 call is processed as follows:

    a. Call routes to an Emergency Group where the call can be answered.
    b. The 911 CO lines can be pre-configured and reserved. If the 911 reserved lines are busy, the normal CO lines will be connected to route the 911 calls. If all the normal CO lines are busy, then one of the ongoing calls shall be disconnected and the 911 call shall be placed.

c. When 911 is dialed from any station, its designated Admin Station or Admin Group will receive a message that the station has dialed 911.
d. The system shall automatically record all 911 calls made from any station. The 911 call recording shall begin as soon as 911 is dialed and shall continue until the call is terminated. Recorded calls shall be maintained on the system for later playback review and/or retrieval by authorized personnel and/or authorities.

8. It is of highest importance that Emergency calls from stations receive prompt attention. Therefore, it is important that there be an alternative destination in case the Emergency call does not get answered at the primary location. Details are as follows:

a. Staff-generated Emergency calls shall be treated as the second highest system priority. Therefore, all Emergency calls shall annunciate at the top of the call queue of their respective Admin Station or Admin Group. Should that Emergency call go unanswered for 15 seconds, the call shall be re-routed to an alternative speaker station. Then, a tone will prompt the caller to make a verbal call for help and annunciates to the Emergency link station “Emergency.” During the transfer, the original administrative telephone shall continue to ring the distinctive Emergency Ring. Should the Emergency Transfer-to-Station have an associated Admin Station, it will also ring for the Emergency call.
b. The Emergency Transfer-to-Station shall be software configurable.
c. Systems failing to transfer unanswered Emergency calls or failing to immediately connect to the designated Admin Station shall not be deemed as equal.

9. There shall be a Facility Wide Emergency All-Call feature. The Emergency All-Call shall be accessed from designated Admin Stations or the Nyquist Dashboard or by the activation of an external contact closure that shall give a microphone input Emergency status. The Emergency All-Call function shall have the highest system priority and shall override all other loudspeaker-related functions including Time Tones, Normal All-Call or Zone Pages, or Audio Distribution.

a. Considering that Emergency calls are to be treated with the highest level of concern, systems that do not regard Emergency All-Call with the highest priority shall not be deemed as equal.
b. Upon touching the Directory icon, a menu shall appear on the Admin Station display prompting the user to select the desired menu.
c. The Emergency All-Call shall capture the highest-level system priority and shall be transmitted over all speakers in the facility. It shall also be capable of activating an external control output, which can be used to activate external relays to automatically override volume controls, local sound systems, or strobe circuits.
d. This Emergency All-Call feature can have a four-digit pin number associated with it that would be required to use the feature or override someone that is already using this feature.
e. Systems without Emergency All-Call or systems with All-Call that cannot be activated by external means or that do not capture complete system priority or activate an external relay, shall not be acceptable.

10. There shall be unlimited Alarm Tones (four by default). Each may be accessed by dialing *91 and the two-digit tone number from any Admin Station, SIP Trunk, or FXO/FXS system interface. These Alarm Tones are separate from the Time Tones. Users shall be able to add an unlimited number of Alarm Tones to the system by uploading MP3 or WAV files. Systems that do not allow the user to upload MP3 and WAV files to customize the Alarm Tones or need to use external alarm/tone generators or special software or have less than four Emergency Alarm Tones shall not be acceptable.

11. Upon touching the Directory icon on an Admin Station, a menu shall appear on the display prompting the user to select from the sub-menus. The Alarms sub-menu is the first available. This precludes the user from having to memorize complicated key sequences to access Alarm Tones.
12. There shall be unlimited I/O Controller relay driver outputs accessible and controllable by properly authorized users via an Administrative Web UI. These outputs remain set until accessed and reset. Users shall have the ability to review the status of each relay driver output. Users shall be prompted through fields via a plain English menu, precluding users from having to remember any dialing sequences to control this feature. The system shall support an unlimited number of I/O Controllers, and each I/O Controller shall be able to interact with any and all other I/O Controllers on the system (i.e., an input on one I/O Controller can trigger an output on one or more different I/O Controllers). Systems that require the user to remember complicated dialing schemes or prompt the user via cryptic commands shall not be acceptable.
13. The I/O Controller can create a contact closure when the following operations are performed in the system:

    a. 911 call placed
    b. Audio Distributed
    c. Alarm is played
    d. Announcement is played
    e. All-Call preformed
    f. Multi-Site All-Call performed
    g. Multi-Site Emergency-All-Call
    h. Emergency-Call
    i. Emergency-All-Call
    j. Audio-Disabled
    k. Page

14. The system shall provide software controlled and programmable control outputs for external relay activation for use with strobe lights, magnetic locks, card access systems, motion detectors, cameras, or any low-voltage, dry contact creating device. Systems using dedicated security stations for control of external functions shall not be acceptable.
15. The system shall be capable of interfacing to PSTN/PBX/iPBX via both FXO/FXS line and SIP trunk connectivity.
16. The system shall be capable of providing each facility (i.e., (i.e., Nyquist location) an unlimited number of incoming FXO/FXS or SIP trunk lines that can be designated by the user to ring the designated Day Admin or Night Admin. Where an Admin Station is designated to receive outside line calls, the incoming call’s Caller ID information shall appear on the display. The system shall also provide the ability to make outside line calls from Admin Stations. This ability shall be programmable for each Admin Station and there shall be an unlimited number of CoS available to assign to any station.
17. The system shall be capable of supporting DID, DISA, and Security DISA functions.

    a. The system shall provide a password-protected Security DISA feature that shall only be accessible from authorized Police, Fire, Emergency personnel, or an off-premise security office that monitors the facility’s security system. The Security DISA feature shall function as follows: Upon dialing the Security DISA phone number, the caller will receive a dial tone from the system, after which he or she must enter the assigned Security DISA passcode on the dial pad. Upon confirmation, the system will present the dial tone again and will allow the authorized personnel to dial any station/classroom on the system and monitor the activity without any pre-announce tone or privacy beep. This will allow the authorized personnel to audibly assess the situation and determine what actions need to be taken.

b. All DISA and Security DISA calls shall be automatically recorded by the system for later playback review and/or retrieval by authorized personnel and/or authorities.

18. The system shall provide for field-programmable three-, four-, five-, or six-digit architectural station numbers.
19. There shall be an automatic level control for return speech during amplified-voice communications.
20. Each station loudspeaker shall be assignable to all or any combination of Paging, Time, and/or Audio Zones. Systems that do not provide unlimited Paging, Time, and/or Audio Zones shall not be acceptable.
21. There shall be unlimited schedules with unlimited programmable events per facility. Each event shall sound one user-selected tone or external audio source. It shall be possible to assign each schedule to a day of the week or to manually change schedules from an authorized user via a web-based UI. Systems that do not provide unlimited schedules, events, and tones, or that require software to be installed on a PC to perform these functions shall not be acceptable.

    a. The system shall provide multiple concurrent schedules per facility/location to accommodate split facilities (for example., combined Elementary and Middle School, combined Middle and High School, etc.).
    b. The system must be capable of providing Class Change Music to be played from an external audio source or audio files that are stored in playlists on the system during class change periods or whenever a facility wants music to be played in an area (i.e., (i.e., one or more Time Zones) on an automated schedule.
    c. Each event shall be able to be directed to any one or more of the unlimited Time Zones.
    d. Each of the unlimited Time Zones shall have a programmable, customizable Preannounce Tone and volume control that is unique unto itself.
    e. Each event shall play any of the Normal tones or external audio. Each event may utilize a different tone. For example, the system shall be capable of sending the gymnasium, shop classes, and pool a separate, unique time tone to indicate “clean up.” Minutes later, the entire facility can be sent a different time tone to indicate class change.
    f. Each of the unlimited Time Tones may be manually activated by selected VoIP Admin Phones or via an authorized user with access to the Web UI. These tones shall remain active as long as the telephone remains off-hook or until canceled from the keypad or the Nyquist Web UI.
    g. Systems that do not provide an unlimited number of schedules or do not provide automatic activation of schedules shall not be acceptable.

22. Internal Master Clock shall be included, allowing an unlimited number of events per facility. Systems that do not provide an internal master clock or that must supply an external master clock to meet these specifications shall not be acceptable.
23. The Nyquist E7000 is capable of synchronizing with an NTP server and automatically adjusting the Daylight Savings Time for any time zone in the world. The server that the Nyquist E7000 application is running on can also be used as an NTP server for other systems on the LAN (for example, IP Clocks and control systems).
24. There shall be a Zone Page/All-Call Page feature that is accessible by selected Admin Phones and FXO/FXS or SIP connection to the PSTN or PBX/iPBX.
25. There shall be an option to play a pre-announce tone at any loudspeaker selected for voice paging.
26. There shall be a voice-intercom feature that is accessible by CoS authorized staff phones, all Admin VoIP phones, and Admin Web UIs.

a. There shall be a privacy beep played every 15 seconds at any selected loudspeaker to indicate that an intercom call is in progress.
b. There shall be a pre-announce tone played at any selected loudspeaker for intercom call communication.
c. For special applications, the privacy and pre-announce tone signals shall be capable of being disabled during system initialization.
d. There shall be a switch over to private telephone communications should the person at the classroom loudspeaker pick up his or her Staff Station and dial *3 to transfer the call down to the associated classroom Staff Station.

27. There shall be various levels of telephonic communication accessible by all Admin Stations and Staff Stations.

    a. Staff Stations must be capable of being programmed to ring one Admin Station during day hours and a different Admin Station during night hours. Day and Night start hours shall be configurable. Staff Stations shall be capable of being assigned to any Admin station. Systems that limit the number and assignment of staff call-ins to an Admin Station shall not be acceptable.

28. Each VoIP speaker or ASB speaker equipped with a call switch (analog or digital) shall be configurable as one of three call-in types, as follows:

    a. Normal/Emergency
    b. Urgent/Emergency
    c. Emergency

29. Call buttons programmed for access Normal / Emergency or Urgent / Emergency shall be able to initiate an Emergency call by repeated flashing of the phone's hook switch, or repeated pressing of the DCS or the Call Switch. Systems that require additional switches and/or conductors to initiate an Emergency call, shall not be acceptable.
30. Normal and Urgent calls shall be placed into the queue for the designated Admin Station or Admin Web UI.
31. Each Admin Station call queue shall first be sorted per call priority (for example, Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls per priority and order received shall not be acceptable.

    a. The display shall simultaneously display a minimum of three intercom calls pending.
    b. Additional calls beyond three shall be indicated by a scrolling option on the right-hand side of the screen thus prompting the user that additional calls are waiting.

32. It shall be possible to answer any incoming call by picking up the handset while it is ringing. It shall not be necessary to press any buttons to answer a call unless the call has dropped into the queue.
33. Staff Stations shall receive a dial tone upon going off-hook. Outgoing calls are made by dialing the desired station. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be a switchover from loudspeaker to private telephone communication when a person picks up the handset, dials *3, and presses Enter/OK.
34. Staff Stations shall be programmable for any type of system access, provided by or restricted by the following CoS options:

    a. CoS Name
    b. Call-in Level

c. Zone Paging
d. All-Call Paging
e. Emergency All-Call
f. Inter-Facility Call/Page
g. Audio Distribution
h. Remote Pickup
i. Join Conversation
j. Call Forwarding
k. Walking Class of Service
l. External Call Routing
m. Call Transfer/3-way Calling
n. Manually Activate Tone Signals
o. Call Any Station
p. Manage Recordings
q. Monitor Calls
r. Monitor Locations
s. Conference Admin
t. Conference User
u. Voicemail
v. Record Calls
w. Activate Alarm Signals
x. Disable Audio
y. Enable Audio
z. Allow Callee Auto-answer
aa. District Paging
bb. Inter-Facility Features
cc. Manage Output Contacts
dd. Execute Routines

35. Each Station in a facility can have a unique CoS programmed with an unlimited number of CoS combinations.
36. Staff Stations shall be able to make a Normal call to any Admin Station by dialing the Admin Station's extension number. Staff Stations shall also be able to initiate an Emergency Intercom Call by dialing ****. Emergency Calls shall ring the Designated Day/Night Admin Station. The system shall provide for each station to have a Personal Identification Number (PIN). By dialing the PIN at any system telephone, the administrator shall have access to Emergency paging regardless of the restrictions on the phone being used.
37. Admin Stations shall receive a dial tone upon going off-hook. Outgoing calls are made by dialing the desired stations. Incoming calls can be directed to the telephone or to the associated loudspeaker for a hands-free reply. There shall be an automatic switchover from loudspeaker to private telephone communication should the person pick up his or her handset.
38. The display shall normally show the time of day and day of week, bell schedule name, and the numbers of a minimum of three stations calling-in, along with the call-in status of each station (Normal, Urgent, Emergency). The Admin Station's display shall indicate the station number being dialed from the Admin Station.
39. The display shall also provide user-friendly menu selections to assist the operator when using the Nyquist system. Displays shall be in English for maximum ease-of-use. Systems that require the operator to memorize long lists of operating symbols or control codes shall not be acceptable.
40. Admin Stations shall be programmable for any type of system access, providing or restricting the following CoS options:

    a. Call-in Level
    b. Zone Paging

c. All-Call Paging
d. Emergency All-Call
e. Inter-Facility Call/Page
f. Audio Distribution
g. Remote Pickup
h. Join Conversation
i. Call Forwarding
j. Walking Class of Service
k. External Call Routing
l. Call Transfer/3-way Calling
m. Manually Activate Tone Signals
n. Call Any Station
o. Manage Recordings
p. Monitor Calls
q. Monitor Locations
r. Conference Admin
s. Conference User
t. Voicemail
u. Record Calls
v. Activate Alarm Signals
w. Disable Audio
x. Enable Audio
y. Allow Callee Auto-answer
z. District Paging
aa. Inter-Facility Features
bb. Manage Output Contacts
cc. Execute Routines

41. Program selection and its distribution or cancellation shall be accomplished from a designated Admin Station with the assistance of the menu display system. Distribution and cancellation shall be to any one or combination of speakers, any Audio Zone or Audio Zones, or All Zones. It shall be possible to provide an unlimited number of program channels for the user to pick from.

    a. It shall be possible via an Admin Station to manually initiate any of the unlimited Normal Tones or Emergency Tones. The Tones shall be separate and distinctly different from the Alarm Tones. The Tone selected shall be capable of being played one time, continuously until it is canceled, or until the administrative display phone is placed back on-hook.
    b. Each Admin Station shall maintain a unique queue of all stations calling that Admin VoIP phone.

42. VoIP Wall Baffle and VoIP Ceiling Speakers shall be configurable as either a VoIP Speaker Only or as44 a VoIP Speaker with DCS.

    a. The Bogen Nyquist VoIP speakers are powered via PoE. Use an 802.3af compliant PoE network switch port or PoE Injector to power these speakers. One PoE network switch port or PoE Injector is required per VoIP speaker.
    b. VoIP speakers can be equipped with a DCS that can be programmed as a Normal/Emergency, Urgent/Emergency, or Emergency Only and shall be able to initiate an Emergency call by touching the DCS one, two, or three times depending on the CoS and current call state of the DCS. If the station is authorized for Privacy Mode, the users can touch and hold for 4 seconds to enable Privacy Mode or hold for four seconds to disable Privacy Mode. Systems that require mechanical, membrane,

or an additional number of switches to initiate an Emergency call, shall not be acceptable.

c. Emergency Calls from VoIP Speaker with DCS shall have priority over the Normal and Urgent calls in the queue on the Admin Stations and will show up at the top of the list. Systems that do not provide priority for Emergency Call shall not be acceptable.
d. Normal and Urgent calls shall be logged into queue for the designated Admin Stations.

    1) Admin Stations shall ring for when they receive a call, and then the call will be removed from the queue when the call is answered or when the Admin Queue times out (default is 30 minutes).

e. Each queue call shall first be sorted by call priority (Emergency, then Urgent, and then Normal). Calls are sorted within each priority level on a first-in, first-out basis. When a call is answered, it shall automatically be removed from the queue. Systems that do not sort calls by priority and order received, shall not be acceptable. The display shall simultaneously show a minimum of three staff calls pending. Additional staff calls beyond three shall be indicated by an arrow pointing down thus prompting the Admin user that additional calls are waiting.
f. It shall be possible to answer any incoming call simply by picking up the handset while it is ringing. It shall not be necessary to hit any buttons to answer a call unless the call has dropped into the queue.

43. System programming shall be from an authorized Nyquist Admin User via any web browser. A valid username and password shall be required to gain access to the following programmable functions:

a. System Parameters – Allow installers to adjust core system parameters.
b. Zones – Allow installers to create and modify Paging, Time, and Audio Zones.
c. Schedules – Allow installers and administrators to create Bell Schedules for the facility, predefine alternative schedules to run. Holiday Events prevent the bells from ringing on a school holiday. The system shall allow an unlimited number of schedules to operate simultaneous within a facility.
d. Admin Groups – Allow the installer to create, modify, and delete software groupings of admin phones that can ring when a station calls in with a call switch.
e. CoS Configuration – Allow the installer to create, modify, and delete CoS groups that can have the following features defined: Call in Level, Zone Paging, All-Call Paging, Emergency All-Call, Inter-Facility Call/Page, Audio Distribution, Remote Pickup, Join Conversation, Call Forwarding, Walking Class of Service, External Call Routing, Call Transfer/3-way Calling, Manually Activate Tone Signals, Call any Station, Manage Recording, Monitor Calls, Monitor Locations, Conference Admin, Conference User, Voicemail, Record Calls, Activate Alarm Signals, Disable Audio, Enable Audio, Allow Callee Auto-answer, District Paging, Inter-Facility Features, and Execute Routines.
f. Stations – Allow the installer to set up, modify, delete stations, set up Page Exclusion, view stations' status, and add a station.
g. Bridge Devices – Allow the installer to install the Nyquist ASBs.
h. Audio – Allow the installer to upload and manage Announcements, Playlists, Announcements, Songs, and Tones. The must support the uploading of both MP3 and WAV files making Audio file management simple for users. Systems that limit the size of Audio files shall not be considered equal.
i. Users – Allow the installer to manage users by giving them the proper Role and assign an Extension if needed.
j. Roles – Allow the installer to limit user to the following: create, delete, edit, restart server, sort menu, systems update, manage, import/export, restore, settings, or view.

k. Facilities – Allow the installer to set up the district wide facilities for remote paging and calling.
l. Outside Line – allow the installer to set up FXS and FXO ports for inbound and outbound system calling.
m. SIP Trunks – allow the installer to set up SIP trunks into the facility for inbound or outbound calling.
n. Call Details – allow the installer to review the historical system activities that can be used for incident investigation or system troubleshooting.
o. System Backup/Restore – allow the installer to preform system backup or restores and allow the backups to be scheduled to run automatically.
p. System Logs – allow the installer to view and export Server, Nyquist-Intercom, and Web Server logs that can be used for trouble shooting and technical assistance.
q. Paging Exclusions – allow the installer to view and edit station that are excluded from paging.
r. Firmware – is used to update Nyquist appliances.
s. Routines – Allow installers to create routines that are a sequence of actions, that the Nyquist system executes as a result of an input trigger. Routines can support crisis plans for situations such as school lockdowns, weather events, or emergency evacuations
t. Alert Filters – Allow installers to select the National Weather Alerts that the facility needs to monitor for such as weather events, earthquakes, tsunami, volcanoes, public health, power outages, and many other emergencies.
u. Help –Provides information about the system, online help topics, and System Administrator Manual.
v. Systems not capable of supporting web-based configuration and control, or require plugins or dedicated application software, shall not be deemed as equal.
w. Systems that require a Serial-to-Ethernet converter, or require additional application software on a PC for configuration and/or control shall not be deemed as equal.

44. Admin Groups
45. Admin Stations can be placed into Admin Groups, which are used if incoming calls are not answered by the assigned Admin Station or the Day or Night Admin associated with the Admin Station. Admin Groups act as an always answer feature by providing an alternate list of Admin Stations. If an incoming call is not answered by the assigned Admin Station within 30 seconds for normal calls or 15 seconds for emergency calls, all Admin Stations in the Admin Group will ring.
46. If Call Forwarding is enabled at the Admin Station, Nyquist tries the forwarded extension. If that station does not answer or is busy, the call timeout is reduced to 15 seconds. After 15 seconds, the call rolls over to the Admin Group.
47. If an Emergency level call receives no answer, the Admin Group will ring if the Day Admin or Night Admin does not answer.
48. Admin Stations can be assigned to multiple Admin Groups. A Day or Night Admin can also be assigned to one or more Admin Groups.
49. Call Detail Reporting

    a. The Call Details feature allows the viewing and/or printing of detail records of every call in a facility in a call log format. Calls include scheduled announcements, paging, and internally and externally made or received telephone calls.

50. System Backup/Restore

    a. The system backup feature allows users with access to back up the system database, voicemail, and recordings.
    b. The system restore allows users with access to perform a system restore of previously backed up database, voicemail, and/or recordings.

c. The installer also can set up an automatic backup that can be performed daily, weekly, or monthly.

51. System Log Files

a. A log file records either events or messages that occur when software runs and is used when troubleshooting the system. The following parts of the Nyquist system generate log files:

1) Server (This provides access to the Debian Linux OS server log files.)
2) Intercom (This provides access to the Intercom application server log files
3) Web Server (This provides access to the web server log files.)

b. From the web-based UI, system logs can be viewed directly or exported via download to a PC, Mac, or Android device and then copied to removable media or attached to an email to technical support.

52. Paging Exclusions

a. For school testing and exams, the administrators shall be able to put stations into Page Exclusion mode. During this time, the stations will only receive Emergency All-Call pages – not music, tones, or All-Calls. Emergency pages will still be heard at the station even if that station is set to exclude paging.

53. Firmware

a. Installers can manage the available firmware. Because the Nyquist E7000 is constantly evolving and changing new versions of firmware will become available and the Firmware section allow installers or authorized users the ability to upload, check for updates, or configure the system to automatically download new firmware for later installation. Systems that can’t automatically check for new software are not considered equivalent.

54. Routines are designed to automatically launch a procedure, or sequence of actions, that the Nyquist system executes as a result of an input trigger.
55. Some of the events (triggered by dashboard, IP Phone, I/O Controller contact, or Routines API) that can be created are as follows:

a. Lockdown Routines
b. Emergency Evacuation Routines
c. Fire Alarm Routines
d. Weather Alert Routines

56. As you can see the power of Routines can support your facilities crisis plans for situations such as lockdown, lockout, weather events, or emergency evacuations.
57. Alert Filters Configuration - The Common Alerting Protocol (CAP) is an international standard format for emergency alerting and public warning. It is designed for all hazards related to weather events, earthquakes, tornado, tsunami, volcanoes, public health, power outages, and many other emergencies.
58. CAP elements and values are used when configuring alert filters for your Nyquist system. This part of the configuration allows installers to select or “Enable” or disable the filters needed for each facility. This filtered information can then be displayed on the NQ-GA10PV through the campus.
59. The growing list of information that can currently be displayed are as follows: 911 Telephone Outage, Administrative Message, Air Quality Alert, Air Stagnation Advisory,

Arroyo And Small Stream Flood Advisory, Ashfall Advisory, Ashfall Warning, Avalanche Advisory, Avalanche Warning, Avalanche Watch, Beach Hazards Statement, Blizzard Warning, Blizzard Watch, Blowing Dust Advisory, Blowing Dust Warning, Brisk Wind Advisory, Child Abduction Emergency, Civil Danger Warning, Civil Emergency Message, Coastal Flood Advisory, Coastal Flood Statement, Coastal Flood Warning, Coastal Flood Watch, Dense Fog Advisory, Dense Smoke Advisory, Dust Advisory, Dust Storm Warning, Earthquake Warning, Evacuation - Immediate, Excessive Heat Warning, Excessive Heat Watch, Extreme Cold Warning, Extreme Cold Watch, Extreme Fire Danger, Extreme Wind Warning, Fire Warning, Fire Weather Watch, Flash Flood Statement, Flash Flood Warning, Flash Flood Watch, Flood Advisory, Flood Statement, Flood Warning, Flood Watch, Freeze Warning, Freeze Watch, Freezing Fog Advisory, Freezing Rain Advisory, Freezing Spray Advisory, Frost Advisory, Gale Warning, Gale Watch, Hard Freeze Warning, Hard Freeze Watch, Hazardous Materials Warning, Hazardous Seas Warning, Hazardous Seas Watch, Hazardous Weather Outlook, Heat Advisory, Heavy Freezing Spray Warning, Heavy Freezing Spray Watch, High Surf Advisory, High Surf Warning, High Wind Warning, High Wind Watch, Hurricane Force Wind Warning, Hurricane Force Wind Watch, Hurricane Local Statement, Hurricane Warning, Hurricane Watch, Hydrologic Advisory, Hydrologic Outlook, Ice Storm Warning, Lake Effect Snow Advisory, Lake Effect Snow Warning, Lake Effect Snow Watch, Lake Wind Advisory, Lakeshore Flood Advisory, Lakeshore Flood Statement, Lakeshore Flood Warning, Lakeshore Flood Watch, Law Enforcement Warning, Local Area Emergency, Low Water Advisory, Marine Weather Statement, Nuclear Power Plant Warning, Radiological Hazard Warning, Red Flag Warning, Rip Current Statement, Severe Thunderstorm Warning, Severe Thunderstorm Watch, Severe Weather Statement, Shelter In Place Warning, Short Term Forecast, Small Craft Advisory, Small Craft Advisory For Hazardous Seas, Small Craft Advisory For Rough Bar, Small Craft Advisory For Winds, Small Stream Flood Advisory, Snow Squall Warning, Special Marine Warning, Special Weather Statement, Storm Surge Warning, Storm Surge Watch, Storm Warning, Storm Watch, Test, Tornado Warning, Tornado Watch, Tropical Depression Local Statement, Tropical Storm Local Statement, Tropical Storm Warning, Tropical Storm Watch, Tsunami Advisory, Tsunami Warning, Tsunami Watch, Typhoon Local Statement, Typhoon Warning, Typhoon Watch, Urban And Small Stream Flood Advisory, Volcano Warning, Wind Advisory, Wind Chill Advisory, Wind Chill Warning, Wind Chill Watch, Winter Storm Warning, Winter Storm Watch, and Winter Weather Advisory.

60. Systems that are not capable of displaying National Weather Service CAP information to give advanced warning to facilities shall not be considered equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the installer present, for compliance with requirements and other conditions affecting the performance of the Nyquist E7000 Series Educational System.
B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EQUIPMENT MANUFACTURER'S REPRESENTATIVE

A. All work described herein to be done by the manufacturer's authorized representative shall be provided by a documented factory authorized representative of the basic line of equipment to be utilized.
B. As further qualification for bidding and participating in the work under this specification, the manufacturer's representative shall hold a valid C-10 Contractor's License issued by the Contractor's State License Board of [your state]. The manufacturer's representative shall have

completed at least 10 projects of equal scope, giving satisfactory performance, and shall have been in the business of furnishing and installing sound systems of this type for at least five years. The manufacturer's representative shall be capable of being bonded to ensure the owner of performance and satisfactory service during the guarantee period.

C. The manufacturer's representative shall provide a letter with submittals from the manufacturer of all major equipment stating that the manufacturer's representative is an authorized distributor. This letter shall also state that the manufacturer guarantees service performance for the life of the equipment and that there will always be an authorized distributor assigned to service the area in which the system has been installed.

D. The contractor shall furnish a letter from the manufacturer of the equipment. This letter shall certify that the equipment has been installed according to factory intended practices, that all the components used in the system are compatible, and that all new portions of the systems are operating satisfactorily. Further, the contractor shall furnish a written unconditional guarantee, guaranteeing all parts and all labor for a period of five years after final acceptance of the project by the owner.

3.3 INSTALLATION

A. The installation, adjustment, testing, and final connection of all conduit, wiring, boxes, cabinets, etc., shall conform to local electrical requirements and shall be sized and installed in accordance with the manufacturer’s approved shop drawings.

B. Low-voltage wiring may be run exposed above ceiling areas where they are easily accessible.

C. The contractor shall install the new system at the location shown on the plans.

D. All Staff Stations and Call Switches shall be wall-mounted:

1. Mount at 54" AFF.
2. All wiring should be concealed.
3. Verify exact location with architect.
4. Avoid mounting near doors to prevent students from activating and running out of the rooms.

E. Admin Stations can be desk or wall mounted.

F. Speaker and telephone lines run above ceiling and not in conduit shall be tie-wrapped to a ceiling joist with a maximum spacing of 8' between supports. No wires shall be laid on top of ceiling tile.

G. Connect field cable to each Analog Speaker transformer using UL butt splices for #22 AWG wire.

H. Contractor shall provide a minimum of eight hours of configuration and operational instruction to school personnel.

I. On the first school day following installation of the Nyquist System, the contractor shall provide a technician to stand by and assist in system operation.

J. Mark and label all demarcs IDF and MDF points with destination point numbers. Rooms with more than one outlet shall be marked XXX-1, XXX-2, XXX-3, etc. where XXX is the room number.

K. No graphic room number shall exceed the sequence from 000001 through 899999.

1. All outside speakers shall be on a separate Page Zone and Time Zone.
2. All zones shall be laid out not to exceed 40 Watts (@25V) maximum per zone.
3. All hallway speakers shall be tapped at 1 Watt (@25V) maximum.
4. All outside horns shall be tapped at 3.75 Watts (@25V) maximum.
5. All classroom speakers shall be tapped at ½ Watt (@25V) maximum.
6. Large rooms, such as cafeterias, shall be tapped at 2 Watts (@25V) maximum.

L. Plug disconnect: All major equipment components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service.
M. Protection of cables: Cables within terminal cabinets, equipment racks, etc., shall be grouped and bundled (harnessed) as to type and laced with No. 12 cord waxed linen lacing twine or T and B wire-ties, or hook and loop cable management. Edge protection material shall be installed on edges of holes, lips of ducts, or any other point where cables or harnesses cross a metallic edge.
N. Cable identification: Cable conductors shall be color-coded and individual cables shall be individually identified. Each cable identification shall have a unique number located approximately 1-1/2" from cable connection at both ends of cable. Numbers shall be approximately 1/4" in height. These unique numbers shall appear on the As-Built Drawings.
O. Shielding: Cable shielding shall be capable of being connected to common ground at point of lowest audio level and shall be free from ground at any other point. Cable shields shall be terminated in the same manner as conductors.
P. Provide complete “in service" instructions of system operation to school personnel. Assist in programming of telephone system.

3.4 GROUNDING

A. The contractor shall provide equipment grounding connections for Integrated Telecommunications/Time/Audio/Media System as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to ensure permanent and effective grounds.
B. The contractor shall provide ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments.
C. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
D. The contractor shall note on their drawings the type and locations of these protection devices and all wiring information.
E. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.5 INSTALLATION OF SOUND SYSTEM WIRING

A. All installations shall comply with NECA 1.
B. Provide all conduits, conductors, boxes, receptacles, etc. indicated on the Drawings, herein specified, or required for the proper operation of the sound systems.
C. Installation of all sound system wiring and all equipment shall be performed under the direct supervision of a C-EST certified Field Engineer.
D. All Sound System conductors to and between the speakers and the Category 5E consolidation block shall be free from splices or other breaks.

    1. Interconnecting terminals as specified may be used only at terminals of loudspeakers, privacy switches, amplifiers, microphone receptacles, or where directed.

E. All loudspeaker cables shall be terminated in the following manner:

    1. The end connected to the loudspeaker transformer leads shall be neatly soldered and taped where such loudspeakers are not equipped with terminal strips. Where loudspeakers are equipped with terminal strips, the ends shall be equipped with U-type solderless lugs described above.

2. Where two (2) or more loudspeakers are on the same circuit, shall be soldered neatly to terminals of the loudspeaker transformers to form a "loop" circuit.
3. Unused leads or taps of loudspeaker matching transformers shall each be separately taped to insulate the conductors from each other and from grounded parts of the equipment.

F. All connections between/among components within the Central Control Rack shall be performed under the direct supervision of personnel authorized by the manufacturer of the Central Control Rack.
G. All connections of conductors entering the Central Control Rack and terminated at the terminal blocks shall be performed by the Contractor.
H. All connections shall be made under the direct supervision of the Manufacturer's Representative. Connections shall not be made until the Contractor and the Manufacturer's Representative have explained to the Owner's Representative the procedure to be followed.
I. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
J. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
K. All cabling shall be plenum rated and properly gauged per the distances of the devices from the central control station.
L. Install 18” excess cable at each termination at microphone, attenuator, volume control, speaker, and other system outlet.
M. Install 6’ excess cable at each termination at system cabinet.
N. Grounding

1. A dedicated #10 ground wire shall be installed in conduit from the main ground bus of the electrical service and/or adequate building ground and attached to the frame of all the sound racks/cabinets and all required devices. Conduit bonds shall be used only for rack to rack continuities.

3.6 PROTECTION

A. The Contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
B. The Contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information. Such devices are not to be installed above the ceiling.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Tests and Inspections:

1. Upon completion of the installation, contractor shall engage a factory-authorized service representative to perform overall performance test in the presence of the Owner’s representative. Provide testing reports and certificate of completion of testing. The test shall include, but not be limited to the following:

a. Loudspeaker Circuits Test

1) Transmit audio signals at normal levels over each loudspeaker circuit for determination of proper loudspeaker volume and clarity.
2) Adjust transformer taps for proper output, as necessary.

b. Input Circuits Test

1) Transmit audio signals at normal levels over each input circuit to determine proper operation of each input circuit. The test shall be performed using each of the two (2) input selector switches over each of the two (2) program channels. Each input source (tuner, CD/MP3 player, Mic., etc.) on the selector switch shall be tested.

c. Load Test

1) Check for proper system operation when the entire system load (all speakers) is applied to either channel.

d. Communications Tests

1) Initiate, by means of the central controls, two-way communications between classroom speaker and PA system.
2) ALL-CALL via Central Controls: Check all speakers in the entire new building
3) Zone paging via central controls.

e. Signal-to-Noise Ratio Test:

1) Measure signal-to-noise ratio of complete system at normal gain settings as follows:

Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio. Repeat test for each separately controlled zone of loudspeakers.
Minimum acceptance ratio is 50 dB.

f. Distortion Test:

1) Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is three percent (3%) total harmonics.

g. Acoustic Coverage Test:

1) Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five (5) locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.

h. Power Output Test:

1) Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.

i. Signal Ground Test:

1) Measure and report ground resistance at pubic address equipment signal ground. Comply with testing requirements specified in Section 260526 "Grounding and Bonding for Electrical Systems."

j. Inspection:

1) Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

k. Public address and mass notification systems will be considered defective if they do not pass tests and inspections.
l. Prepare test and inspection reports.
m. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

3.8 SERVICE/MAINTENANCE/WARRANTY

A. The Contractor shall provide a five (5) year equipment warranty of the installed system against defects in material and workmanship. All materials shall be provided at no expense to the Owner during normal working hours. The warranty period shall begin on the date of acceptance by the Owner/Engineer.
B. The Contractor shall, at the Owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.
C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.
D. The Contractor shall submit a written warranty from an authorized distributor of the sound system that the system installed is free from defects in materials and workmanship, for the period of one (1) year from the date of acceptance by the Owner. This warranty shall include all parts and labor.

3.9 DEMONSTRATION – TRAINING

A. Bidding contractor shall engage a factory-authorized service representative to train the Owner's maintenance personnel to adjust, operate, and maintain the public address system.
B. The vendor shall provide various levels of training including Manufacturer provided training as mandated by the Owner.
C. Sixteen (16) hours of training shall be included as part of this specification. These training hours shall be partitioned as the Owner mandates and as required.
D. Train Owner’s personnel on operation and maintenance of each component of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Instructor shall be manufacturer’s training personnel

3.10 GENERAL FIELD POLICY

A. When inspecting or supervising the installation of equipment, manufacturers’ representative shall be accompanied at all times by the technology consultant. In order to make the necessary arrangements, the Owner shall be notified at least forty-eight (48) hours in advance of the manufacturer's representative visit to the School.

B. Any changes of equipment shall be made only with the written permission of the technology consultant.
C. Changes in location of equipment may be made only with the written permission of the technology consultant.
D. All changes of location of equipment (including pull boxes, conduit runs, wire sizes, etc.) shall be incorporated in the As-built Sound/System Intercom Riser Diagram installed in the School.

3.11 DOCUMENTATION

A. Provide the following directly to the Supervisor of Technology Services.

1. One printed copy of all field programming for all components in system
2. One copy of all diagnostic software with a copy of field programming data for each unit

B. One copy of all field wiring runs, location, and end designation of system

END OF SECTION 275116

SECTION 275129.17 - TWO-WAY RADIO COMMUNICATION ENHANCEMENT SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Emergency responder communication enhancement system (ERCES) and associated components, including active equipment, battery secondary power source, passive components, and remote annunciator.

1.2 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260553 - Identification for Electrical Systems.

C. Section 271000 - Structured Cabling.

D. Section 284600 - Fire Detection and Alarm.

1.3 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authorities having jurisdiction.

B. BDA: Bi-directional amplifier.

C. DAS: Distributed antenna system.

D. ECS: Emergency communications systems.

E. ERCES: Emergency responder communication enhancement system.

F. RF: Radio frequency.

G. UHF: Ultra high frequency.

H. VHF: Very high frequency.

1.4 DEFINITIONS

A. Bi-Directional Amplifier (BDA): Active RF-emitting device, wired with coaxial cables, for amplification of band-selective or multi-band RF signals via uplink to base station and via downlink from base station to portable two-way radios for enhanced signals and improved coverage; also referred to as analog or digital signal boosters.

B. Downlink: Transmission of signals from external source into building.

C. Fiber Distributed Antenna System (DAS) Master/Remote: Active RF-emitting device, wired with fiber-optic backbone, for distributing band-selective or multi-band RF signals via uplink to master/remote station and via downlink from master/remote station to portable two-way radio for enhanced signals and improved coverage.

D. Emergency Responder Communication Enhancement System (ERCES): In-building two-way communication system installed to enhance effective operation of radio communications systems for fire, emergency medical services, or law enforcement agencies within building or structure. System used by firefighters, police, and other emergency services personnel.

E. Public Safety/First Responder: Public safety or first responder agencies charged with responsibility of responding to emergency situations, including law enforcement departments, fire departments, and emergency medical services.

F. Uplink: Transmission of signals from inside building to external source.

1.5 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition.

B. ICC (IBC) - International Building Code.

C. ICC (IFC) - International Fire Code.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction.

E. NECA 90 - Standard for Commissioning Building Electrical Systems.

F. NECA/BICSI 607 - Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings.

G. NECA/FOA 301 - Standard for Installing and Testing Fiber Optic Cables.

H. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems.

J. NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing.

K. NFPA 70 - National Electrical Code.

L. NFPA 72 - National Fire Alarm and Signaling Code.

M. NFPA 101 - Life Safety Code.

N. NFPA 780 - Standard for the Installation of Lightning Protection Systems.

O. NFPA 1225 - Standard for Emergency Services Communications.

P. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems.

Q. UL 2524 - Emergency Responder Communication Enhancement Systems.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Project Site:

a. Coordinate with Owner to allow testing agency to enter property at reasonable time for field testing to confirm required level of radio coverage.

b. Coordinate technical and operational criteria for design with AHJ and license holders, including required frequencies, radio site locations, effectiveness to radiate power from radio sites, maximum propagation delay in microseconds, and application types being used.

c. Store technical and operational criteria with date marked, included with design documents at location approved by AHJ.

2. Installation Locations:

a. Coordinate arrangement of communications equipment with dimensions and clearance requirements of equipment.

b. Coordinate sizes and arrangement of supports and bases with equipment and components.

c. Coordinate work to provide additional framing and materials required for installation.

d. Coordinate work with placement of supports and anchors required for mounting.

e. Verify exact conduit termination locations required for boxes, enclosures, and equipment.

f. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

3. Coordinate minimum sizes of conduits with actual type and quantity of cables.

4. Coordinate for power branch circuit protection and identification.

5. Coordinate listing requirements for fire-rated cables or assemblies.

6. Coordinate work to provide power for equipment at required locations.

7. Coordinate work to avoid placement of ductwork, piping, equipment, or other potential obstructions within spaces dedicated for ERCES components.

8. Coordination work with other sections, including fire alarm systems and associated communications cabling.

9. Coordinate roof component locations and pathway work with Engineer. Provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.

10. Coordinate integrated fire protection and life safety system tests in accordance with NFPA 1225.

B. Preinstallation Meetings: Require attendance of affected installers.

1. Convene one week prior to commencing work of this section. Review proposed routing, sequence of installation, and protection requirements for system.

2. Conduct preinstallation meetings to review design and operation of ERCES.

   a. Highlight importance of proper authorizations, operation, and performance to avoid interfering with public safety radio networks.

      Overview criteria for when equipment's transmitted power output is sufficient to require certification of frequency-licensing authority and associated restriction of installing or energizing prior to obtaining simultaneous written authorizations.

C. Sequencing:

1. Conduct meeting with facility representative to review equipment locations.

2. Obtain permits necessary for installation prior to commencement of work. Include permit costs and inspection fees.

3. Do not install active RF-emitting devices until AHJ and license holders concurrently provide prior written authorization.

4. Do not energize active RF-emitting devices until AHJ and license holders concurrently provide prior written authorization.

5. Verify naming convention for equipment identification prior to creation of final drawings, reports, and warning labels, where applicable.

6. Sequence work with affected installers to protect cabling (e.g., overspray painting, physical stress, and insulation damage or covering markings).

7. Do not connect cables on terminals before insulation resistance testing.

D. Scheduling:

1. Arrange access to facility for data collection with facility representative.

2. Where work involves interruption of existing electrical circuit or fire alarm system, arrange interruption with Owner.

1.7 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. See Section 016000 - Product Requirements for additional provisions.

C. Include names of installers, Owner, and system classification information.

D. Product Data: Manufacturer's detailed product data sheet for each component, including wiring diagrams, and cabling or communications wiring length limitations. Catalog pages and product descriptions include ratings, dimensions, finishes, service conditions, and included features.

E. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ and frequency license holders, including floor plans showing locations of fire alarm system or other interconnects, enlarged drawn to identified scale plan view, and riser diagrams.

1. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.

2. Include elevations and details of proposed equipment arrangements.

3. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application-specific information required by NFPA 72.

4. Include typical wiring diagrams for devices, annunciators, and related ERCES equipment.

5. Include requirements and control diagrams for interfacing with other systems.

6. Detailed drawing of annunciators.

F. Certifications:

1. Certification by Contractor that system design complies with Contract Documents.

2. Certification by manufacturer that system design complies with Contract Documents.

G. Design Documents: Submit information required for plan review and permitting by AHJ and frequency license holders, including floor plans, riser diagrams, and description of operation.

1. Include complete listing of software required.

2. Include technical and operational design criteria requirements from AHJ and frequency license holders, including maximum propagation delay in microseconds.

H. Design Data:

1. Power supply calculations demonstrating adequate battery power.

I. RF Survey for ERCES:

1. Include RF measurement drawings for coverage areas and indicate relative RF field strength for each frequency band required.

2. Indicate passed or failed by area based on required technical parameters.

J. Signal booster registry for FCC requirements.

K. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

L. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.

M. Designer's qualification statement.

N. Manufacturer's qualification statment.

O. Maintenance contractor qualification statement, if different from installer.

P. Testing agency's qualification statement.

Q. Maintenance contract.

R. Operating and Maintenance Data:

1. Complete set of specified design documents, as approved by AHJ and frequency license holders.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 1225 and ICC (IFC); provide printed copy and computer format acceptable to Owner.
8. Detailed but easy-to-read explanation of procedures requires recording of system trouble events by qualified personnel (e.g., when routine testing is being conducted for fire drills and when entering into contracts for building renovations).

S. Executed warranty.

T. Project Record Documents:

1. Complete set of floor plans showing actual installed locations of components and pathways.
2. As-installed wiring and schematic diagrams, with final terminal identifications.
3. As-programmed operating parameters, including secondary power source pick-up and drop-out settings.

1.8 RF BUILDING SURVEY FOR ERCES

A. Provide building survey for public safety radio signal strength in accordance with NFPA 1225 and ICC (IFC).

B. Survey prior to Date of Substantial Completion and before electrical installations begin.

C. Follow requirements listed in FIELD QUALITY CONTROL under PART 3.

D. Include report summary and recommendation if ERCES design is required.

1.9 QUALITY ASSURANCE

A. Comply with the following:

1. ICC (IBC).
2. ICC (IFC).
3. NFPA 70.
4. NFPA 72.
5. NFPA 101.
6. Code of Federal Regulations.

B. Unless Otherwise Approved by AHJ, Qualifications:

1. Provide qualifications as required by AHJ and frequency license holders.
2. Designer Qualifications:
    a. Designer personnel maintains valid FCC-issued general radio operators license (GROL).
    b. ERCES design performed by RF system designer.
    c. Designer personnel certified and authorized by in-building active RF-emitting equipment manufacturer in requirements for installation and operation of their equipment.
    d. Perform design under direct supervision of Professional Engineer or Registered Communications Distribution Designer experienced in design and licensed in the State in which the Project is located.
    e. Employing BICSI Registered Communications Distribution Designer (RCDD).
    f. Designer personnel maintains NICET Level II, Level III, or Design certified in-building public safety communications (IB-PSC), employed by manufacturer, Contractor, or installer.
3. Manufacturer Qualifications: Company specializing in manufacturing products specified, with at least three years of documented experience.

4. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL), and acceptable to AHJ and frequency license holders.

    a. Register signal booster specified Class A or Class B for applicable FCC requirements and provide proof in submittals:

5. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and:

    a. Installer personnel maintains valid FCC-issued general radio operators license (GROL).

    b. Supervisors and Installers: Factory-certified by manufacturers of products.

    c. Installer personnel certified and authorized by in-building active RF-emitting equipment manufacturer in accordance with requirements for installation and operation of their equipment.

    d. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of work.

    e. Installer personnel maintains NICET Level II or Level III certified in-building public safety communications (IB-PSC), employed by manufacturer or Contractor.

6. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

    a. Testing personnel certified and authorized by active RF-emitting equipment manufacturer in requirements for installation and operation of their equipment.

    b. Designer personnel maintains valid FCC-issued general radio operators license.

7. Maintenance Contractor Qualifications:

    a. Same entity as installer.

    b. Contract maintenance office located within 200 miles of project site.

C. Approved ERCES and Related Cabling:

1. Provide system type as required by AHJ and frequency license holders.

2. Automatically Activated ERCES: Where negative impact to normal operations of facility occurs, automatic activation requires AHJ approval.

3. Permits: Provide construction and operational permits for active equipment.

4. Obtain written approval from frequency license holders that may be adversely impacted by ERCES, resulting in noise interference.

D. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions, shop drawings, and frequency license holders requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Before removing from shipping vehicle, inspect equipment and shipping containers for signs of damage or mishandling.

C. Receive, handle, and store products in accordance with manufacturer's instructions. Store products repacked in manufacturer's original packaging, keep dry, and protect from damage until ready for installation. Do not store products outdoors without cover. Review environment relative humidity conditions and care to avoid condensation within products while stored.

D. Keep products clean and handle them carefully to avoid damage to finish. Protect materials from damage during handling and installation.

E. Unpack and inspect external and internal. Check for loose connections and damaged parts.

F. Confirm nameplate data aligns with submittals, drawings, and specifications.

1. Verify Class A equipment seen labeled on BDA or other signal booster products.

G. Obtain copies of packing slips, maintain current written records of products as they are used, and unboxed group received items for easy verification of quantities throughout installation.

1.11 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.12 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 1-year manufacturer warranty. Complete forms in Owner's name and register with manufacturer.

C. Installer Warranty: Provide 1-year warranty commencing on mm-dd-yyyy. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.1 TWO-WAY RADIO COMMUNICATION ENHANCEMENT SYSTEMS

A. General Requirements:

1. Provide new ERCES consisting of equipment, conduit, cabinets, outlet boxes, wiring, connectors, hardware, supports, accessories, components, software, and system programming as required for complete operating system.

2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    a. Requirements of State Fire Marshal.
    b. Requirements of AHJ.
    c. Applicable local codes.
    d. RF system design documents.
    e. Contract Documents.
3. Provide products listed, classified, and labeled as suitable for intended purpose.
4. Monitor primary and secondary power sources for integrity in accordance with NFPA 72, NFPA 1225, and ICC (IFC). For each RF-emitting device and active system component:
    a. Include monitoring for communications links.
    b. Provide automatic supervisory signals for malfunctions.
5. Include integrated, remote, real-time monitoring and control capabilities.
6. Provide repeaters, transmitters, optical-to-RF and RF-to-optical converters, and external filters contained in NEMA EN 10250, Type 4 or Type 4X enclosures.

B. System Performance:

1. Minimum Signal Strength:
    a. Entire Building: 95 percent.
    b. Designated Critical Areas: 99 percent.
    c. Downlink and Uplink Capability:
        1) Provide design for usable voice communication throughout coverage areas.
        2) Provide design to meet technical requirements of applications utilized by public safety system.
        3) Provide minimum delivered audio quality (DAQ) of 3.0 using narrowband analog, digital, or wideband LTE signals, or equivalent bit error rate (BER) or signal-to-interference-plus-noise ratio (SINR) applicable to technology for analog or digital signals.
2. Communication Antenna Density: Design to minimize near-far effect and include ability to reduce gain conditions.

C. Capabilities:

1. Capable of operating on frequencies licensed to public safety agencies in accordance with ICC (IFC).

2. Design system capable of modification or expansion if frequency changes are required by FCC or other frequency-licensing authorities or AHJ.

D. Nonpublic Amplification Safety Systems:

1. Design system for passive components to maintain 20 dB above system gain under operating conditions; maintain minimum 20 dB isolation of donor antenna from other inside antennas.

2. Suspend and correct systems that reduce performance or cause interference with ERCES. Obtain approved resolution from AHJ and frequency license holders.

E. Provide ERCES circuits and interconnects in accordance with NFPA 70.

1. Comply with methods of interconnecting FACUs for automatic supervision in accordance with NFPA 1225, NFPA 72, and NFPA 70.

2. Power Sources:

a. Comply with requirements for power supplies of emergency systems in accordance with NFPA 70.

b. Primary: Dedicated branch circuits from facility power distribution system.

c. Secondary: Storage batteries with capacity to operate system for period specified by ICC (IFC).

1) Provide 12-hour standby for 100 percent system capacity or 2-hour standby when connected to site standby generator.

3. Wiring and Wiring Methods:

a. General Requirements:

1) Comply with requirements for wiring and wiring methods in accordance with NFPA 70.

2) Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum-rated, listed, and labeled as suitable for use in return air plenums.

3) Special Occupancies: Comply with NFPA 70.

4) Comply with NFPA 70 for wire and cable for plenum, riser, general-purpose, limited-use, and underground applications.

2.2 ACTIVE EQUIPMENT

A. Provide equipment listed and labeled as complying with agency listings and approval requirements as follows:

1. Federal Communications Commission (FCC).
2. Frequency license holders.
3. Other radio licensing authorities.
4. ICC (IFC).
5. NFPA 70.
6. NFPA 72.
7. NFPA 1225.
8. UL 2524.

B. Enclosure: NEMA EN 10250, Type 4.

C. Provide modular design capable of scaling for future expansions. Utilize coax and digital BDA or fiber optic and master-remote DAS design, or design utilizing combination with centralized control, for ERCES.

D. Support Multi-Band Operation:

1. Provide dedicated or dual-band (VHF/UHF) equipment for each frequency range indicated.
2. VHF: 150 MHz to 174 MHz.
3. UHF: 380 MHz to 512 MHz.

E. Active RF-Emitters and Repeaters: Provide devices that support associated FCC requirements for Class A or Class B operation, compatible for intended use in accordance with related ERCES equipment listings and manufacturer requirements.

F. Include built-in oscillation detection, interference protection, and gain control circuitry to reduce gain and maintain operation.

1. Transmit supervisory signal when oscillations are detected.
2. Automatic shutdown when uncorrectable oscillations occur.

G. Equipment with Integral Batteries: See BATTERY SECONDARY POWER SOURCE below for requirements.

2.3 BATTERY SECONDARY POWER SOURCE

A. Provide batteries, charger, circuit protection, and related components as complete system.

B. Provide equipment listed and labeled as complying with agency listings and approval requirements:

1. Federal Communications Commission (FCC).

2. Frequency license holders.
3. Other radio licensing authorities.
4. ICC (IFC).
5. NFPA 70.
6. NFPA 72.
7. NFPA 1225.
8. UL 2524.

C. Enclosure Type:

1. Batteries Requiring Venting: NEMA EN 10250, Type 3R.
2. Batteries Not Requiring Venting: NEMA EN 10250, Type 3R.

D. Provide battery secondary power source compatible for intended use and in accordance with related ERCES equipment listings and manufacturer requirements.

E. Provide power in accordance with NFPA 70, Chapter 7, (i.e., 10 seconds maximum) when primary power is outside of programmed settings.

2.4 PASSIVE COMPONENTS

A. Description: Provide passive component requirements in RF system design as required for complete system, including passive RF-emitters, design frequency range, gain values, radiation patterns or heat maps, voltage standing wave ratio, polarization, power handling, impedance, connector types, environmental ratings, device losses, isolation characteristics, signal rejection, component size, form factor, attenuation values, output accuracy, and thermal stability.

B. Provide passive components compatible for intended use in accordance with related ERCES equipment listings and manufacturer requirements for RF system design, including quantities necessary:

1. Donor antennas.
2. Service antennas.
3. Antenna discharge units as required by NFPA 780 and ICC (IFC).
4. Duplexers.
5. Notch filters.
6. Jumpers and connectors.
7. Tappers and splitters.

C. Enclosure Type:

1. External Filters: NEMA EN 10250, Type 4.

2.5 REMOTE ANNUNCIATOR

A. Provide equipment listed and labeled as complying with agency listings and approval requirements:

1. Federal Communications Commission (FCC).

2. Frequency license holders.

3. Other radio licensing authorities.

4. ICC (IFC).

5. NFPA 70.

6. NFPA 72.

7. NFPA 1225.

8. UL 2524.

B. Provide remote annunciators or operational consoles with status of active equipment.

C. Include visual and labeled indications for system components and devices in accordance with ICC (IFC) and NFPA 1225.

D. Fire Command Centers: Provide ECRES remote annunciator; identify component locations.

E. Include necessary modules for monitoring communications link between in-building ERCES and fire alarm control unit (FACU) for integrity.

2.6 ACCESSORIES

A. Provide components as indicated or as required for connection of fire alarm system to devices and other systems indicated.

B. Provide EoL resistors as required for wiring supervision.

C. Cables for Network Connections:

1. Comply with manufacturer's requirements.

2. See Section 271000.

D. Surge Protection:

1. Line-Voltage Surge Protection: Listed; provide for each line voltage circuit that supplies operating power for ERCES equipment.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify the following:

1. Areas and surfaces are ready to receive system components and equipment.

a. Notify Engineer of conditions that would adversely affect installation or subsequent use.

b. Do not begin installation until unacceptable conditions are corrected.

2. Field measurements are as instructed by manufacturer.

3. Branch circuit wiring installation is completed, tested, and ready for connection to ERCES. Overcurrent protection ratings are consistent with circuit voltage, manufacturer's recommendations, and nameplate data for equipment.

4. Interior of building has been protected from weather.

5. Ratings, configurations, and characteristics of system components are consistent with indicated requirements.

6. Required utilities are available, in proper location, and ready for use.

7. Rough-ins for field connections are in correct locations.

8. System capacities listed in manufacturer's instructions align with designed system.

9. Work likely to damage ERCES has been completed.

3.2 PREPARATION

A. Prior to installation, confirm environment of installation area is clean, with ambient temperature, humidity, and ventilation requirements in accordance with manufacturer’s written instructions.

B. Clean and vacuum in accordance with manufacturer's written instructions. Confirm equipment ventilation holes are absent of obstructions and free for airflow.

C. Clean pathways thoroughly to remove foreign materials before installing conductors and cables.

D. Clean dirt, debris, plaster, and other foreign materials from equipment enclosures, cabinets, and outlet boxes.

E. Clean surfaces to receive adhesive products according to manufacturer's instructions.

F. Follow tool requirements for installation, including torquing adjustments, as listed in manufacturer documentation.

G. Conduct preinstallation inspections and testing in accordance with manufacturer instructions.

3.3 INSTALLATION

A. Concurrent Approvals Required:

1. Provide prior written approval from AHJ and frequency license holders of systems being enhanced.

2. Meet to review their established criteria for installation prior to beginning work.

3. Only frequency license holders have authority to permit powering and operating ERCES. Do not energize system before obtaining additional written approvals.

4. Include expiration date on written approvals, coincident with annual maintenance requirements.

B. Install products in accordance with NFPA 1225, ICC (IFC), state and local codes, manufacturer's instructions, and as indicated on drawings and RF design documents.

C. Comply with the following:

1. BICSI N1.

2. NECA 1.

3. NECA/FOA 301.

4. NECA/BICSI 607.

5. NFPA 70; including requirements for mechanical execution of work.

6. NFPA 72.

D. ERCES Components:

1. UL 2524 Listed and Labeled Equipment: Do not drill holes or field fabricate openings. Mark equipment front with identifier DO NOT DRILL INTO THIS CABINET label.

2. Donor Antenna Mounting:

a. Fixed Permanently: Mount on building where approved by Engineer and AHJ.

E. Interconnects and Branch Circuits:

1. Provide grounding and bonding in accordance with NFPA 70 Article 250, Chapter 8 Communications Systems, and manufacturer's recommendations.

2. Provide dedicated branch circuit for each battery system.

3. Identify system wiring, components, and overcurrent protective devices for branch circuits serving ERCES and related equipment.

4. Provide systems integration and interfacing with other work as required for complete ERCES.

5. Install firestopping to preserve fire resistance rating of partitions and other elements.

F. Troubleshooting and Installer Checks:

1. Field test connectivity periodically during installation process to avoid unexpected troubleshooting.

2. Do not energize system until deficiencies have been corrected.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Approval Required Before Installation, Energizing, and Startup; Minimum Two Weeks Notice:

1. Frequency license holders.

2. Engineer.

3. Owner.

4. AHJ.

C. Manufacturer Services: Provide services of manufacturer's field representative to perform systems startup.

D. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

E. Inspection and Testing for Completion:

1. Notify Owner 7 days prior to beginning completion inspections and tests.

2. Notify AHJ and frequency license holders prior to beginning completion inspections and tests. Comply with their requirements for scheduling inspections and tests, and for observation by their personnel.

3. Provide services of installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

4. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required.

5. Provide tools, software, and supplies required to accomplish inspection, testing, and document results.

6. Perform inspection and testing in accordance with ICC (IFC), NFPA 1225, and requirements of AHJ or frequency license holders; document each inspection and test.

7. Inspect ERCES and related equipment and components for damage and defects.

8. Test cabling; see Section 271000.

9. Test for proper interfacing with other systems.

10. Nonconforming Work:

    a. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

    b. Replace damaged or defective system components.

F. Coordination of Other Tests and Inspections: Provide access to accommodate tests and inspections by independent testing agency employed by Owner.

G. Perform tests for cable insulation resistance and acceptance testing procedures in accordance with ICC (IFC) and NFPA 1225.

1. Use NICET-certified test equipment for system verifications.

2. Use calibrated portable radios of same make and latest model used by AHJ.

3. Use spectrum analyzer or similar for monitoring oscillations from RF-emitting or other system active equipment.

4. Measure gain values of every ERCES amplifier and review test results against baseline data kept on file for annual testing.

5. Test building coverage for emergency communication systems, inside and outside, to and from the building, for minimum radio coverage indicated in TWO-WAY RADIO COMMUNICATION ENHANCEMENT SYSTEMS under PART 2.

6. Divide Coverage For Testing, Options:

    a. Maximum 20 equal areas, per building floor. From center of area, use two-way communications to and from outside of building for interfacing with AHJ's public system.

        1) Comply with NFPA 1225 and ICC (IFC) maximum square footage per area.

        2) Failing to communicate in more than one test area is failed acceptance test.

    b. Use radios for simultaneous voice quality checks; subjective by testing personnel. Position one radio within 10 ft to indoor antenna and second radio distance farthest away from indoor antenna. Both radios select different frequencies within same band for testing.

        1) Signal strength less than delivered audio quality (DAQ) of 3.0 is failed acceptance test.

7. Nonconforming Work:

    a. Repositioning test location for better test results not allowed.

    b. Alter system to meet coverage requirements and reacceptance test for compliance.

H. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without system or equipment malfunctions.

1. Record system operations and malfunctions.
2. If malfunction occurs, start diagnostic period over after correction of malfunction.
3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
4. At end of successful diagnostic period, fill out and submit inspection and testing forms.

3.5 ADJUSTING

A. Make amplifier gain adjustments and other system controls to achieve RF design requirements for operation.

B. Adjust each antenna using field strength meter to orient for maximum signal reception.

C. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.

D. Adjust components to eliminate spurious interference.

E. Make adjustments under supervision of manufacturer's field service personnel.

F. Record settings in written report and include with submittals.

3.6 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove dirt and debris from interior of outlet boxes and equipment.

C. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish, including repair of scratched or marred surfaces.

D. Comply with federal (EPA), state, and local regulations for battery handling and disposal. Do not spill battery fluids down plumbing drains. Only use containers safe for transportation marked as nonspillable.

3.7 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for additional requirements.

B. Commissioning of Fire Protection and Life Safety Systems: Comply with NFPA 3.

C. Commissioning Building Electrical Systems: Comply with NECA 90.

D. Functional Tests:

1. Commissioning Provider is witness for acceptance testing and startup to confirm compliance.

E. Support Commissioning Provider in assembling test data and generating reports.

F. Comply with requirements for testing as required by Commissioning Provider for Integrated System Testing.

1. Integrated Fire Protection and Life Safety System Testing: Comply with NFPA 4.

3.8 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Closeout Demonstration: Demonstrate operation of functions to stakeholders identified in ICC (IFC).

1. Allow minimum of two hours for demonstration of system.

2. Prepare to conduct required tests upon request.

3. Have minimum one copy of operation and maintenance data, preliminary copy of project record drawings, and operator instruction charts available during demonstration.

4. Have authorized technical representative of ERCES manufacturer present during demonstration.

5. Demonstration may be combined with inspection and testing required by AHJ; notify AHJ with enough time to schedule demonstration.

6. Repeat demonstration until successful.

D. Training: Train Owner's personnel on operation and maintenance of system.

1. Accommodate up to 10 attendees.

2. Training Reference: Operation and maintenance manual and additional training materials as required.

3. Provide minimum of two hours of training.

4. Conduct walking tour and describe function, operation, and maintenance of each component.

E. Substantial Completion of project cannot be achieved until:

1. Inspection and testing is successful.

2. Approved operating and maintenance data is delivered.

3. Aspects of operation have been demonstrated to Owner.

4. Final acceptance of ERCES is given by AHJ and frequency license holders.

5. Occupancy permit is granted.

F. Perform post-occupancy instruction within three months after Date of Substantial Completion.

3.9 PROTECTION

A. Protect installed system components from subsequent construction operations.

B. Upon concurrent approval from AHJ and frequency license holders for ERCES operation, maintain continuously.

3.10 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. System requires annual testing for routine maintenance or due to structural changes, additions, remodels, space reconfigurations configurations, or other applications that affect initial coverage areas.

C. Conduct site visit upon Owner's request within one year from mm-dd-yyyy to confirm operation within manufacturer specifications and make additional adjustments to system programming in accordance with ERCES design.

1. If Owner misplaces or does not have baseline amplifier gain values from original acceptance testing, coordinate with Owner to rerun acceptance test to reestablish gain values.

D. Provide separate maintenance contract for service and maintenance of ERCES for manufacturer's warranty period from mm-dd-yyyy.

1. Provide complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with detailed schedule.

2. Include work described below.

E. Perform annual routine inspection, testing, and preventive maintenance in accordance with ICC (IFC), including:

1. Maintain continuous operation of ERCES.

2. In-building coverage test.

3. Test power supplies and batteries for:

a. Loss of input power failure.

b. Loss of communication failure.

c. One-hour load test; extended if power quality symptoms are observed for battery integrity.

4. Measure for loss of signal booster gain and compare to baseline acceptance or commissioning reports. Record measurements in equipment historical logs and include in maintenance service reports.

a. Make adjustments in accordance with manufacturer's instructions for product specifications, and with ERCES design.

5. Maintenance of ERCES active equipment and passive devices connected to system.

6. Repairs are required, unless due to improper use, accidents, or negligence beyond control of maintenance contractor.

7. Coordinate emergency and backup power sources testing for emergency communication systems with Owner.

8. Upon completion of annual test, provide report verifying compliance to Owner and AHJ.

9. Record keeping required by ICC (IFC), frequency license holders, and AHJ.

F. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within two hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on hourly basis, based on actual time spent at site and not including travel time; hourly rate and definition of normal working hours in maintenance contract.

G. Maintain on-site log listing date and time of each inspection and call-back visit, condition of system, nature of trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

H. Comply with Owner's requirements for access to facility and security.

END OF SECTION 275129.17

SECTION 275313 - CLOCK SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY OF WORK

A. This Section specifies materials and accessories for a wireless clock system.

1. Section Includes:

a. Master clock;
b. Repeaters;
c. Secondary analog clock;
d. Secondary digital clock;
e. Elapsed timer control panel.

1.3 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.
B. Section [27 05 00 - Common Work Results for Communications: conductors and cables].
C. Section [27 15 00 - Communications Horizontal Cabling].
D. Section [27 10 53 - Clock System Commissioning].
E. Section [27 51 16 – Public Address System].
F. Related Drawings: “T” Drawings – Technology Plans

1.4 REFERENCE STANDARDS

A. Federal Communications Division (FCC)

1. Part 15 - Code of Federal Regulations.

B. National Fire Protection Association (NFPA).

1. NFPA 70E-[2012], Standard for Electrical safety in the Workplace.

C. US Green Building Council (USGBC).

1. LEED® NC Version 2.2-[2009], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

D. Underwriter's Laboratories (UL)
E. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE 802.3af-[1998], Standard for Information Technology – Telecommunications and Information Exchange Between Systems.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Co-ordination: Co-ordinate work of this Section with communications and electronics work and with work of other trades for proper time and sequence to avoid construction delays.
B. High Performance Building Submittal Requirements: The contractor or subcontractor must submit the following High Performance Building certification items:

1. A Connecticut High Performance Building Compliance letter shall be provided verifying agreement with relevant High Performance requirements. Information to be supplied includes, but is not limited to:

a. The percentage by weight of recycled content in the product(s). Identify post-consumer and/or pre-consumer recycled content.
b. The manufacturing location for the product(s); and the location (source) of the raw materials used to manufacture the product(s).
c. Provide material costs for the materials included in the contractor's or subcontractor's work. Material cost does not include costs associated with labor and equipment.

2. Letters of Certification, provided from the product manufacturer on the manufacturer's letterhead, to verify the amount of recycled content.
3. Product Cut Sheets for all materials that meet the High Building Performance Requirements this Section.
4. Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings applied on the interior of the building. MSDS shall indicate the Volatile Organic Compound (VOC) limits of products submitted (If an MSDS does not include a product's VOC content, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC content).

C. Pre-installation Meeting: Convene pre-installation meeting after Award of Contract and [one week] before starting work of this Section to verify project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's written installation instructions.

1. Comply with Section 01 31 19 - Project Meetings and co-ordinate with other similar pre-installation meetings.
2. Notify attendees 2 weeks prior to meeting and ensure meeting attendees include as minimum:

a. Owner;
b. Consultant;
c. Communications and Electronics Subcontractor;
d. Architect;
e. Manufacturer's Technical Representative

3. Ensure meeting agenda includes review of methods and procedures related to insulation installation including co-ordination with related work.

4. Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

A. Make submittals in accordance with Contract Conditions and Section 01 33 00 - Submittal Procedures.
B. Product Data: Submit product data including manufacturer's literature for clock system materials and accessories, indicating compliance with specified requirements and material characteristics.

1. Submit list on clock system manufacturer's letterhead of materials and accessories to be incorporated into Work.
2. Include product name.
3. Include preparation instructions and recommendations, installation methods, and storage and handling requirements.
4. Include contact information for manufacturer and their representative for this Project.

C. Shop Drawings: Submit shop drawings with information as follows:

1. Diagram of proposed system showing system platform appliance, communication pathway, and schedule of individual device locations.
2. Indicate integration with the Owner's network and servers. Include line diagram of network relationships.
3. Show system power requirements.

D. Samples:

1. Submit one sample of each type of device used on project. Samples will be returned Contractor for incorporation into the Work after Consultant's review.

E. Test Reports:

1. Submit evaluation and test reports or other independent testing agency reports showing compliance with specified performance characteristics and physical properties.

F. Subcontractor Experience: Submit verification of communication and electronics subcontractor's experience.
G. Manufacturer's Authorization: Submit verification that of communication and electronics subcontractor's authorization from clock system manufacturer to perform Work of this section.
H. Sustainable Design (LEED).

1. LEED Submittals: In accordance with Section [01 35 21 – LEED Requirements]

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Supply maintenance data for clock system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
B. Sustainable Design Closeout Documentation (LEED).

1. Provide calculations on end-of-project recycling rates, salvage rates, and landfill rates for work of this Section demonstrating percentage of construction wastes which were recycled.

2. Submit verification from recycling facility showing receipt of materials.

C. Record Documentation: In accordance with Section 01 78 00 - Closeout Submittals.

1. List materials used in clock system work.
2. Warranty: Submit warranty documents specified.

1.8 QUALITY ASSURANCE

A. Communications and Electronics Subcontractor Quality Assurance:

1. Work experience of [3] years minimum with work similar to work of this Section.
2. Manufacturer’s authorization to perform work of this section.

B. Supplier’s Accreditation: Use only suppliers accredited by clock system manufacturer.
C. Supplier’s Maintenance Requirements:

1. Ensure local supplier has adequate facility for storage of spare parts for clock system.

D. Sustainability Standards Certification (LEED).

1. LEED submittals: In accordance with Section [01 35 21 - LEED Requirements].

1.9 DELIVERY STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver material in accordance with Section 01 61 00 - Common Product Requirements.
2. Deliver materials and accessories in clock system manufacture’s original packaging with identification labels intact and to suit project.
3. Ensure clock system materials are not exposed to moisture during delivery.
4. Replace damaged clock system materials.

B. Storage and Handling Requirements: Store materials off ground in dry location and protected from exposure to fumes and harmful weather conditions and at temperature conditions recommended by manufacturer.

1. Store in original packaging until installed.

C. Packaging Waste Management:

1. Separate and recycle waste packaging materials in accordance with Section [01 74 19 - Construction Waste Management and Disposal].
2. Remove waste packaging materials from site and dispose of packaging materials at appropriate recycling facilities.
3. Collect and separate for disposal, paper, and plastic material in appropriate on-site storage containers for recycling [in accordance with Waste Management Plan].

1.10 WARRANTY

A. Project Warranty: Refer to Contract Conditions for project warranty provisions.

B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and not intended to limit other rights Owner may have under Contract Conditions.
C. Warranty period: [2] years commencing on Date of Purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design Manufacturer: Sapling Inc., 670 Louis Drive, Warminster, Pennsylvania 18974, USA, Phone: 1-215-322-6063, URL: www.sapling-inc.com.

2.2 WIRELESS CLOCK SYSTEM REQUIREMENTS

A. Ensure clock system components are designed to operate as a wireless clock system and as part of complete system including "fail-proof" design to ensure power interruption does not cause system failure.
B. Ensure system can work in conjunction with existing wiring.
C. Ensure system synchronizes all clocks and devices to each other.
D. Ensure system does not require FCC licensing.
E. Ensure system works in [915-928 MHz][2.5 GHz] frequency range.
F. Ensure system uses frequency-hopping technology.
G. Ensure system is capable of correcting clocks immediately upon receipt of wireless signal.

1. Analog and digital clocks automatically correct themselves on receipt of wireless signal.
2. Include built-in closed-loop system in analog clocks capable of allowing clocks to detect position of hands and bring clocks to correct time even if clocks are manually altered.
3. Ensure analog clocks have diagnostic function capable of allowing user to view how long since clock received wireless signal.
4. Ensure analog clocks are capable of functional tests of electronics and gears.

H. Ensure each individual product is bench tested at manufacturer's facility.

1. Random testing is unacceptable.

I. Ensure each product is designed, assembled, and tested in the United States of America.
J. Basis of Design: Sapling Inc., Wireless Clock System

2.3 WIRELESS SYSTEM MASTER CLOCK

A. Master Clock Type 1: To UL and cUL 863.

1. Ensure master clock includes 10 pre-programmed (S)NTP backup addresses.
2. Ensure master clock is capable of receiving (S)NTP time signal via Ethernet.
3. Ensure master clock is capable of receiving digital signals through RS485 connection.
4. Ensure master clock is capable of correcting secondary clocks for Daylight Saving Time
5. Ensure master clock is capable of customizing Daylight Saving Time, in the event of international use or a change in government regulations.
6. Ensure master clock is capable of outputting RS485 signals.
7. Ensure master clock has two clock circuits capable of outputting signals including:

a. 59 minute correction;
b. 58 minute correction;
c. National Time or Rauland correction;
d. Once a day pulse;
e. Rauland digital correction.

8. Communications Interface: Ensure master clock system is capable of being programmed remotely through online interface accessible through LAN and compatible with Microsoft Internet Explorer and Mozilla Firefox web browsers.

   a. Ensure interface includes functions as follows:

      1) Allow users to schedule bells and other events;
      2) Display features;
      3) Show IP settings;
      4) Show other master clock settings;
      5) Set time and date;
      6) Download or upload master clock settings;
      7) Configure e-mail alerts for various instances.

9. Display: Two row, 20 character LED and backlit LED display and 2 x 8 inch rubber keypad for operator programming.
10. Optional relays: Include relays to ensure master clock is capable of utilizing [8] zones that can be used for scheduling facility systems as follows:

    a. Bells;
    b. Lights;
    c. Other

11. Allow for programming of master clock through 16 button rubber tactile keypad or built-in web interface.
12. Ensure master clock can contain up to 800 events.
13. Ensure master clock can contain up to 255 schedule changes.
14. Clock System: Wireless with transmitter to FCC, Part 15.

    a. Transmitter: Capable of transmitting data to SAL(G) wireless analog and SBL(G) wireless digital clocks, and receiving signal from (S)NTP time server
    b. Automatic bi-annual Daylight Savings Time changes.

15. Countdown for Digital Clocks: Ensure master clock is capable of having digital clocks counting down time between events.
16. Ensure master clock has internal battery to save settings and operate internal real-time clock for 10 years.
17. Input Voltage: 85 V AC – 264 V AC, 50/60 Hz.
18. Basis of design: Sapling Inc., SMA 3000 Series Master Clock.

2.4 WIRELESS SYSTEM SECONDARY CLOCKS

A. Analog Clocks: To UL and cUL 863, designed for wireless system with fully automatic plug and play capability.

   1. Ensure secondary clock is capable of receiving wireless signals from master clock.
   2. Ensure each secondary clock works as an RF signal repeater, establishing a Mesh Network.

3. Clock display: [12] hour white face with black numbers.
4. Ensure analog secondary clock is capable of receiving Sapling wireless signals every two (2) or four (4) hours for battery models and every minute for 24 V / 110V model.
5. Materials:

    a. Dial: Polystyrene
    b. Case: Shallow profile, smooth surface SlimLine ABS
    c. Crystal: Shatter-proof, side-molded, polycarbonate.

6. Hand tolerance:

    a. Hour and minute hands: ±1/4 minute.
    b. Second hand: ± 1/2 minute.

7. Power Requirements: [Battery operated] [24V AC] [24 V DC] [110 V AC, 60 Hz] [220 V AC, 50 Hz].

    a. Batteries: 2 “D” cell batteries.

        1) Basis for design: Duracell Procell “D” Cell batteries.

8. Basis of design: Sapling Inc., SAL(G) Series Wireless Round Clock.

2.5 WIRELESS SYSTEM REPEATERS

A. Network Repeater: Capable of receiving time signal through TCP/IP from master clock and compliant with FCC, Part 15.
B. Input Voltage: 85 V AC – 264 V AC, 50/60 Hz.;

1. Input: RJ45;
2. Input source: Master clock;
3. RF power output: 30 dBM (1 Watt);
4. Frequency hopping technology;
5. Mounting: Wall mount;
6. Housing: 11 x 8 x 17 inches black smooth surface metal enclosure with 7 inch antennae.
7. Basis for design: Sapling Inc., Network Repeater.

C. Wireless Repeater: Capable of wirelessly transmitting and receiving data and compliant with FCC, Part 15.

1. Input Voltage: 85 V AC – 264 V AC, 50/60 Hz.;
2. Input: RS485. Sapling Wireless Communications;
3. Input source: Master clock or Secondary Sapling Wireless Clock;
4. RF power output: 30 dBM (1 Watt);
5. Frequency hopping technology;
6. Mounting: Wall mount;
7. Housing: 11 x 8 x 17 inches black smooth surface metal enclosure.
8. Basis for design: Sapling Inc., Wireless Repeater.

2.6 WIRELESS SYSTEM ACCESSORIES

A. Elapsed Timer Control Panel: Interface capability with [SBL(G) 3200 Series] [SBL(G) 3300 Series] digital clock.:

1. Capable of working with 4-digit or 6-digit digital clocks.
2. Count up functionality from 00:00:00 to 99:59:59.
3. Programmable countdown functionality starting at 99:59:59.
4. Customizable backlit buttons.
5. Ensure timer is capable of controlling digital clock functions.
6. Ensure timer is capable of activating relay at completion of count down on the digital clock (SBL 3300 Series only)
7. Basis of design: Sapling Inc., Digital Elapsed Timer.

B. Signal and Control Circuits: Manufacturer's recommended stranded, single conductors or twisted pair cable.
C. Data Circuits: Category 5 minimum, twisted pair cable.

2.7 SOURCE QUALITY CONTROL

A. Ensure clock system components and accessories are supplied by single manufacturer.

2.8 PRODUCT SUBSTITUTIONS

A. Substitutions: [In accordance with Section 01 23 13 - Product Substitution Procedures] [No substitutions permitted].

PART 3 - EXECUTION

3.1 INSTALLERS

A. Use only installers with [3] years minimum experience with work similar to work of this Section.
B. Ensure all clock system components are installed by single communications and electronics subcontractor.

3.2 EXAMINATION

A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for clock system installation in accordance with manufacturer's written recommendations.

1. Visually inspect substrate in presence of Consultant.
2. Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
3. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

B. Start of clock system installation indicates installer's acceptance of substrate installation conditions.

3.3 SYSTEM INSTALLATION

A. Install clock system in accordance with manufacturer's written recommendations and in accordance with NFPA 70E.
B. Integrate clock system with Owner's electrical and communications network.

C. Install wiring in accordance with requirements of local Authority Having Jurisdiction.

1. Do cabling in accordance with Section [27 15 00 - Communications Horizontal Cabling].

D. Conceal wiring except in unfinished spaces and as approved in writing by Consultant.
E. Install clocks only after painting and other finish work is completed in each room.
F. Install clocks and other devices square and plumb.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection in accordance with Division 01.

3.5 SYSTEM STARTUP

A. At completion of installation and before final acceptance, turn on equipment and ensure equipment is operating properly, and clock system devices and components are functioning.
B. Evaluate and test each device in clock system on room-by-room basis using factory-trained technicians.

1. Fix or replace devices which fail test or are functioning incorrectly.
2. Submit evaluation and report showing results of room-by-room tests and overall system compliance within 3 days of testing being carried out.

3.6 CLEANING

A. Progress Cleaning: Perform cleanup as work progresses [in accordance with Section 01 74 00 - Cleaning and Waste Management].

1. Leave work area clean at end of each day.

B. Final Cleaning: Upon completion, remove surplus materials, rubbish, tools, and equipment [in accordance with Section 01 74 00 – Cleaning and Waste Management].
C. Waste Management:

1. Co-ordinate recycling of waste materials with [01 74 19 - Construction Waste Management and Disposal].
2. Collect recyclable waste and dispose of or recycle field generated construction waste created during construction or final cleaning related to work of this Section.
3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 DEMONSTRATION AND TRAINING

A. Arrange system demonstration and training session for Owner’s operation and maintenance personnel.

1. Allow Owner and Consultant [7] days minimum advance notice before training session.

B. Break down system demonstration and training session into logical segments for Owner’s operations and maintenance personnel.

C. Train Owner's maintenance personnel in procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of clock system.
D. Training shall consist of a minimum of two (2) 4-hour training sessions.
E. Deliver two (2) sets of operating instructions and programming manuals for the clock system to the Owner's Representative.
F. Deliver all programming codes and passwords for the system to the Owner's Representative.

3.8 SYSTEM COMMISSIONING

A. Do clock system commissioning in accordance with Division 01.

3.9 PROTECTION

A. Protect installed products and accessories from damage during construction.
B. Repair damage to adjacent materials caused by clock system installation.

END OF SECTION 275313

SECTION 280500 - SECURITY CONDUCTOR CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. System Requirements
B. Cabling

1.3 RELATED REQUIREMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.” OR Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1. Division 07 - Firestopping.
2. Division 26 - Door Hardware: Electrically operated door hardware, for interface with access control system. Includes door hardware with integral request to exit devices.
3. Division 26 - Grounding and Bonding for Electrical Systems.
4. Division 26 - Conduit for Electrical Systems.
5. Division 26 - Identification for Electrical Systems: Identification products and requirements.
6. Division 27 - Structured Cabling: Data cables for access control system IP network connections.
7. Division 28 - Video Surveillance: For interface with access control system.
8. Division 28 -Building Intrusion Detection: For interface with access control system.
9. Division 28 - Fire Detection and Alarm: For interface with access control system.

B. Refer to the following construction documents for Data Room locations and device locations only.

1. “TY” Drawings – Security Plans
2. “T” Drawings – Technology Plans

C. Any apparatus, appliance, material, or work not shown on the Drawings but mentioned in the Specifications, or vice versa, and any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense. Coordinate with each system manufacturer to ensure all hardware, firmware, relays, or other necessary components are provided prior to bid submission.

D. All work of this Section to comply with the requirements of the Conditions of Contract, with all Specification Sections of Division 01 – General Requirements, with the Security Drawings, and with all other Contract Documents.
E. Refer to Division 26 of the Contract Documents, Electrical, for all Specifications governing the installation of raceway (conduit, EMT, cable trays, wire trough, etc.), system junction and pull boxes, and device rough-in boxes, for all Security System work shown on the Security Drawings. Conduit, back box, and trough work to be provided by this Contractor.
F. Refer to Division 26 of the Contract Documents, Electrical, for all work related to the interconnection of Security System equipment to 120 VAC power sources.
G. Refer to Division 09 of the Contract Documents, Finishes, for details relating to acoustical ceilings and gypsum board systems, floor finishes, painting, etc., for information pertinent to device and back box selection and installation.
H. Refer to Division 08 of the Contract Documents, Openings, for details relating to doors, door frames, windows, and window frames, for information pertinent to the selection of magnetic contact devices and their associated placement and installation, including back box selection and installation.
I. Refer to Division 08 of the Contract Documents, Openings, for details relating to door and door frame hardware and preparation, electrified lock power supplies, required coordination to accommodate these components and/or systems, lock voltage and current draw coordination, coordination of fail-safe electrified locks, and any other related equipment or requirements
J. Refer to Division 06, Wood, Plastics, Composites, and coordinate all desk locations and installation details with the Millwork Contractor.
K. Review all other Specification Sections as required to achieve complete inter- trade coordination.

1.4 DEFINITIONS

A. “Project Manager” shall mean the Owner’s appointed representative.
B. “As Necessary” shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.
C. “As Required” shall mean work which is required for completed construction and is shown on the drawings or described in the project specification.
D. “Install” shall mean to set in place complete with all mounting facilities and connections as required ready for normal use of service
E. “Substantial Completion” shall mean that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written specification.
F. “Conduit” shall include all fittings, sleeves, connections, hangers and other accessories related to such conduit.
G. “Surface Metal Raceway” shall include all fittings, sleeves, connections, hangers and other accessories related to such raceway.
H. “Concealed” shall mean hidden from sight, as in chases, furred spaces, shafts, fixed ceiling or embedded in construction.
I. “Exposed”, shall mean not “concealed” as defined above.
J. “Governmental” shall mean all municipal, state and federal government agencies.
K. The words “Furnish”, “Supply” and “Provide” shall mean purchase, deliver to the job site, protect and provide interim storage and install in accordance with manufacturer’s specifications.
L. Words “Approved Equal” shall mean any product which in the opinion of the Technology Consultant is equal in quality, arrangement, appearance, and performance to the product specified.
M. “Cabling” shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
N. “Product” shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.

O. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.
P. “Contractor” refers to the biding/installation Contractor responsible for furnishing and installation of all work indicated within this specification.

1.5 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. UL 294 - Access Control System Units; Current Edition, Including All Revisions.
E. UL 1076 - Proprietary Burglar Alarm Units and Systems; Current Edition, Including All Revisions.
F. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing in stated in the Environmental Design of Electrical Equipment Act (EDEE).
G. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”
H. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”
I. Electronic data exchange between Video Surveillance System and the Access Control System shall comply with SIA TVAC
J. Installation shall comply with FCC CFR 47 Part 15 Class A “Telecommunications, Radio, Frequency, Digital Device Emission:
K. Installation shall comply with Federal, State, and Local Codes and Authority Having Jurisdiction (AHJ).
L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other installers to provide suitable security wiring for all security systems.

1.7 SUBMITTALS

A. See Division 01 – Administrative Requirements for submittal procedures.
B. Evidence of Qualifications for Installer:

1. The Contractor shall be a bona fide security systems contractor, licensed by the State of Connecticut for the installation of the low voltage security and signal communication systems, and engaged in security system maintenance, service and contracting for at least the last five years.
2. The Contractor shall employ technicians who have been trained by the Manufacturer specified within this section to install the systems of this Manufacturer.
3. The contractor shall be a factory authorized stocking distributor of the manufacturer of the equipment included in the system so that immediate replacement parts can be made from inventory and service provided as needed on an emergency basis.

4. The Contractor shall submit with the bid a manufacturer's certificate of acceptance of the qualifications of the Installing Contractor to install, test, maintain and repair the manufacturer's equipment.
5. In order for the Security Consultant to verify that they meet the competency requirements of this specification, Contractors must submit the following information if so requested:

    a. Proof that the Contractor has installed, services and maintained similar security systems for a minimum of ten (10) years.
    b. Proof that the Contractor is a firm which currently and regularly installs, services and maintains security systems as a full time business.
    c. The names and qualifications of security system technicians that shall perform and supervise the work and perform tests or adjustments on the systems and equipment. Qualifications shall include all schooling, training, and history of work experience.
    d. A list of four prior systems comparable to the one specified under this contract which were installed, serviced, and maintained satisfactorily by the Contractor for a minimum of one (1) year. Each system listed shall include the firm or owner, location, person to contact (with telephone number), date of installation and service period, and a brief description of the system and work performed on the system.

6. The Contractor shall submit any other information required by the Security Consultant to determine the competency of the Contractor. If this information is not submitted as requested, it shall be submitted within the time specified by the Architect after the bid opening. If the Contractor fails to submit the information in accordance with the Security Consultant's request, the Contractor shall be declared non-responsive, and may be rejected to perform the work specified within this section.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation, installation, and operation of product.
D. Manufacturer's detailed field-testing procedures.
E. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.

1. Equipment Submittals

    a. Provide a Title Page, with project name, Contractor's name and address, contact information, date of submission, and submission revision number.
    b. Provide a Parts List, for proposed equipment, materials, components and devices, listing the following information for each line item:

        1) The system type
        2) Model number
        3) Specification sheet page reference

    c. Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Number each page, to correspond with the Parts List.
    d. Clearly delineate (with highlighter, arrow, or underline) on each specification sheet, specific model numbers, options and configurations being proposed for this project.
    e. Indicate kinds of materials and finishes for equipment where more than one option is presented.

2. Acceptance Testing Plan

   a. Submit a written document detailing the test procedures to be followed in evaluating and proving the installed system(s).
   b. Provide a sample of the test forms to be used for each system and for each component of each system.
   c. Include all tests required by the equipment manufacturer and by this Specification

3. Incomplete or unchecked submittals which do not contain complete data on the work and full information on related matters will be returned for correction.

F. CE and FCC Compliance Certificates:
G. Field quality-control reports
H. Current Specified Manufacturer Integrator Certification Letter
I. Current Specified Manufacturer Training Certificates (listing expiration dates) for Two technicians from the supporting office
J. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner. Submit sample of manufacturer’s warranty and documentation of final executed warranty completed in Owner’s name and registered with manufacturer.
K. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

1.8 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. NFPA 101 (Life Safety Code).
3. The requirements of the local authorities having jurisdiction.
4. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1. Contract maintenance office located within 100 miles (160 km) of project site.

E. Maintenance Contractor Qualifications: Same entity as installer.
F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
G. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
H. All work shall comply with the latest editions of the codes as referenced herein.
I. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.

J. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the project.
K. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
L. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or another recognized testing laboratory, the product shall be so examined, tested and certified.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
N. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

O. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.
P. Seismic Performance: Provide equipment capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 and current building codes for the state of CT.

1. The term “withstand” means “the system(s) will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.”

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.11 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.12 WARRANTY

A. See Division 01 – Closeout Submittals for additional warranty requirements.
B. The Integrator guarantees the Systems to be installed under this specification to be free from any defects in workmanship and materials for a period of one (1) year from the date of final completion/acceptance of the project by the Owner as evidenced by the date of final payment for the work. The Contractor shall promptly and at their own expense remedy any defects in the work and pay for any damage to other work resulting thereof, which shall appear during the period of time covered by this guarantee. Neither the final certificate of payment nor any provisions in this Agreement shall constitute an acceptance of work not done in accordance with this specification or relieve the Contractor of liability with respect to any expressed warranties or guarantees or responsibility for faulty materials or workmanship.

C. Submit manufacturer's standard warranties.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Furnish and install Electronic Security System cabling consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
B. It is the responsibility of the contractor awarded this project to ensure the cable used is approved by the equipment manufacturer for its intended use and will meet environmental and distance requirements.
C. Shields and twisted wire are required unless PROHIBITED by the Access Control or Intrusion Detection Manufacturer.
D. 20 AWG is a minimum wire size unless PROHIBITED by the Access Control and Intrusion Detection Manufacturer.

2.2 CABLING:

A. All cabling shall be plenum rated.
B. Approved Manufacturer’s:

1. Belden
2. West Penn

C. System Cable: Provide cable as shown below or as recommended by the Manufacturer.

1. Low Voltage Security Alarm Signal Cable shall be twisted, single pair, shielded cable, with shield drain wire, with overall jacket, gauge calculated to compensate for length of run and current requirements. All conductors for security zone signal to be minimum #20 AWG, UL listed. All wires to be color coded. One pair #20 AWG per security device zone required.
2. Low Voltage Security Power, 12 VDC cable shall be minimum of #18 AWG for runs up to 150,’ and a minimum of #16 AWG for runs up to 300,’ twisted, shielded stranded, with shield drain wire, UL listed, jacketed, pair, separate color code from any other power circuits.
3. Electric Lock Power Cable shall be minimum of #14 AWG for runs up to 200’ serving a single lock. Twisted, shielded, stranded, jacketed pair, UL listed, separate color ode from any other power circuits.
4. Composite Cable (Reader, Lock, Monitor, REX): CAT6 jacketed Plenum cable with overall shield, including (6) Conductor Shielded 22AWG w/ripcord, 4-Conductor 22AWG w/ripcord, 4-Conductor 22AWG w/ripcord, and 4-Conductor 18 AWG w/ripcord; or equal with written approval by Security Consultant.
5. Lock Power, at Double Doors: Jacketed Plenum cable, unshielded, 4-conductor 18 AWG (7- strand), unshielded, or approved equal.
6. Request-to-Exit Cable, at Double Doors: Plenum rated jacket, 4-conductor 22 AWG (7-strand), unshielded, or approved equal.
7. Special Control Cable, at Double Emergency Exit Doors with Power Booster: Plenum rated cable, 4-conductor 12 AWG (19 strand), unshielded, or approved equal.
8. Card Reader Cable for second card reader at same portal: 3 Pair Shielded 22AWG or approved equal.
9. Alarm Monitoring: 1Pair Shielded 22AWG, or equal.

10. Area Motion Detector: 2 Pair Shielded 20AWG, or equal.
11. Push Buttons: 2 Conductor 18AWG.
12. Lockdown Buttons: 2 Pair Shielded 18AWG, or equal
13. Data: 2 Pair Shielded 20AWG, or equal.
14. Strobe: 2 Pair Shielded 18AWG, or equal.
15. Network Cable: CAT 6, or as required by Division 27, whichever is more stringent.

D. Cable installed below grade shall be rated for immersion in water.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that ratings and configurations of system components are consisted with the indicated requirements.
C. Verify that mounting surfaces are ready to receive the system components.
D. Verify that branch circuit wiring is installed, completed, tested, and ready for connection to system.
E. Verify that conditions are satisfactory prior to starting work.
F. Device Locations

1. All device locations are to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for outlet installation in areas not reviewed or approved by the Owner.

G. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer’s instructions.
C. Unless otherwise indicated, use wiring in conduit.

1. Use suitable listed cables in we locations, including underground raceways.
2. Use suitable listed cables for vertical wire applications.
3. All cabling shall be plenum rated.
4. Install wiring in conduit for the following:

    a. Where required for rough-in.
    b. Where required by the AHJ.
    c. Where exposed to damage.
    d. Where installed outside the building.
    e. For exposed connections from outlet boxes to devices.

5. Conduit: comply with Division 26.
6. Conceal cables unless specifically indicated to be exposed.
7. User power transfer hinges specified within Division 08 for concealed connections to door hardware.
8. Cables in the following areas may be exposed:

a. Equipment Closets

9. Route exposed cables in parallel or perpendicular to building structural members and surfaces.
10. Do not exceed manufacturer's recommended maximum cable length between components.

D. Provide grounding and bonding in accordance with Division 26.
E. Install firestopping to preserve the fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
F. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
G. Identify system components, wiring, cabling, and terminals according to ANSI/EIA/TIA standards.
H. Wiring may be run in concealed spaces without conduit, in electrical trays (approved by owner), and where otherwise shown on drawings, provided conductors are reasonably protected from mechanical and environmental damage.
I. Conductors run without conduit shall be approved, UL Listed, rated and labeled for Plenum use.
J. Secure wire and cable with approved supports in accordance with the referenced standards and the Authority Having Jurisdiction.
K. Provide cable supports at a minimum of 4-foot intervals.
L. Equipment and devices shall be installed on approved electrical back-boxes. Do not install equipment and devices directly on walls, ceilings or structural components without back- boxes.
M. Secure cables to cabinets, junction boxes, pull boxes and outlet boxes with approved cable clamps.
N. Independently support cables. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, mechanical piping, or mechanical ducts).
O. Support cable independently of junction boxes, pull boxes, fixtures, suspended ceiling T- bars, angle supports, and similar items.
P. Support cable using cable trays, D-brackets, support straps, support wires or other approved cable supports.
Q. Fasten cable supports to building structure and surfaces.
R. In shared electrical trays, open ducts, and other cable runs without conduit, separate and strap Access Control cable so that it is clearly distinguishable from all other cables.
S. Clearly mark security system cables at minimum intervals of every 10-feet. Marking shall be with a permanent, printed label, color-coded tag, or other distinguishing marking. Felt tip pen marking on the cable is not acceptable.
T. After installation, and before termination, wiring shall be checked and tested to insure there are no grounds, opens, or shorts on any conductors or shields. In addition, wiring between buildings or underground and all coax cables shall have insulation tested with a megohmmeter and a reading of greater than 20 megohms shall be required to successfully complete the test.
U. Run wires continuously from termination to termination without splices. Splices at junction box locations are not allowed.
V. Water-resistant protection shall be continuous throughout the cable in outdoor surface conduit, poles, in-slab pull-boxes, in-slab conduit, and underground conduit and pull-boxes, and in any areas subject to moisture and/or water infiltration.

1. Splices/Junctions: Provide water-proof protection of splices and junctions, in surface conduit and boxes, in-slab conduit and pull-boxes, underground conduit, and underground pull-boxes, to prevent the entry of moisture or water into cables, splices or connections.
2. Cable Entries: Provide water-blocking sealants at all conduit entries into pull- boxes, junction boxes, back-boxes, cabinets, etc., to prevent the entry of moisture or water into the conduit and cable system.

W. Labeling: Identify wire and cable clearly with permanent labels wrapped around the full circumference within one inch of each connection. Correlate the number designated on the associated Shop or Field Drawings. Assign wire or able designations consistently throughout a given system. Each wire or cable shall carry the same labeled designation over its entire run. Regardless of intermediate terminations.

X. Boxes: Provide a box loop for wire and cable routed through pull boxes or controller panels. Cable loops and bends shall not be at a radius less than that recommended by the manufacturer. Coordinate pull box size with the Division 26 Contractor as necessary to accommodate this requirement.

Y. Wire Lacing and Dressing: Dress, lace, tie or harness wire and cable vertically, horizontally and at right angles to the enclosure surfaces to prevent mechanical stress on electrical connections as required herein and in accordance with accepted professional practice. No wire or cable shall be supported by a connection point.

Z. Non-Coaxial Connections: Make non-coaxial connections and approved splices within terminal cabinets (except microphone or line level) to screw-type barrier blocks with insulated crimp-type spade lugs. Size all lugs properly to assure high electrical integrity. Connect only one (1) wire per spade lug and not more than two (2) lugs per screw terminal.

AA. Non-Coaxial splicing at device locations to equipment with wire leads shall be made with pre-approved wire Dolphin Connectors.

BB. Shielded Cables: Shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, terminal cabinets or equipment enclosures. Tin terminated shield drain wires and insulate with heat shrinkable tubing.

CC. Coaxial Splices: Coaxial splices, if required and approved, shall be on plate mounted dual - barrel type insulated BNC connectors, secured in such a manner that no stress is placed upon the connector.

DD. Unacceptable Conditions: Correct any unacceptable wiring conditions immediately upon discovery, and upon receiving notice to correct.

EE. Wiring to provide all 120 VAC sources and points of connection to same shall be by the Electrical Contractor.

FF. All wiring, including low voltage power, voice, signal and data communication, shall be installed in approved metal raceway as required. All wiring, conduit and installation shall be in accordance with the latest edition of the National Electrical Code, especially article 725, with conduit fill requirements as though system wiring were 120VAC, (40% conduit fill) and the requirements of Division 26, Electrical Specifications. Up- size conduits from sizes shown on drawings, as necessary not to exceed 40% fill criteria. All conduit shall be ¾” minimum unless otherwise noted on the riser diagrams.

GG. Ensure cabling shield does not touch terminal connections. Provide “one-end” ground on all shields using drain wires at control panels, power supplies, or head end equipment, then to separate and dedicated RF ground via #8 AWG copper cable. Insulate shield at device end with shrink tubing to completely cover shield and drain wire.

HH. Where multiple devices are served by the same shielded cable, shield continuity shall be maintained and properly insulated to eliminate intermittent grounding. Do not bring shield grounds directly to a building electrical ground point of connection. Carefully follow manufacturer’s instructions and advise Engineer accordingly. Shield grounds shall be treated as specified herein unless prohibited by manufacturers.

II. Lay out conduit and cable runs with Electrical and General Contractor prior to installation, and maintain 1’-0” clearance from parallel runs with 120VAC or larger voltage conduit and wiring. Cross 120VAC or larger voltage conduit runs at 90° to reduce EMI and RF induction in security wiring.

JJ. All wires shall be color coded to provide separate identification of intrusion alarm signal, 12 VDC, 24 VAC, or ACS/IDS system data communication, lock power, video signal, VSS alarm input, zone expansion or relay board power and data bus or any other system function. Wires shall be similarly coded for each system serviced throughout the entire installation.

KK. All resistors shall be solder connected or double crimp connected to eliminate any additional circuit resistance. Wires connected to resistors shall be solder-tinned to insure positive solder connection or crimp connection. Resistors shall be insulated with shrink tubing extending a

minimum of 1” either side of resistor. (Unless factory installed and potted as part of magnetic contact construction.)

LL. No intermediate cable splices are allowed without the specific written approval of the Security Consultant. Request clarification and approval prior to installation of any splices.

MM. All alarm circuits shall be tagged at the device end and field control panel end with alarm panel or zone addressing module hardware circuit terminal address numbers.

NN. Transformers and power supplies shall be identified, along with their cable, at both transformer and load fed end of cable.

OO. Each alarm device system cable shall be tagged at both the device and control panel end with the device type (i.e. door contact, motion detector, etc.).

PP. All 12VDC power circuits shall be tagged at each device and 12VDC power supply fused terminal strip with 12VDC panel and fused circuit number.

QQ. All power cables shall be tagged at the device end and power panel end with matching numbers.

RR. All wiring in panels shall be neatly dressed, run parallel wherever possible, and provided with adequate slack for future maintenance and service terminations.

SS. All “unused” wire conductors shall be insulated to eliminate shorts and grounds, tagged with their terminal points and identified as “spare” at each end with a unique spare cable tag identification system.

TT. Minor deviations (relocations) in wire runs to installed mounting locations may be required prior to final acceptance when site conditions affect the equipment’s operation, performance, or purpose. Relocations which require only minimal work (plus or minus 15’) and/or materials shall be made without additional cost or credit.

UU. The Contractor shall note that connection of alarm zone circuits to the ACS/IDS panels will require the installation of end-of-line resistors in each zone circuit. Locate as close to the device as possible to provide as much circuit supervision as possible. EOL resistors shall not be located at the panel for active security circuits. All unused zones shall have the end-of-line resistor mounted in the panel if manufacturers’ requirements so dictate. Where end-of-line resistors are to be mounted at devices that are factory sealed and have factory configured wire leads, the resistor shall be spliced in-line with the leads as close to the device as possible (splices shall be soldered and covered with heat shrink tubing as specified elsewhere in these specifications).

VV. The Contractor shall install panel cover-operated tamper switches in each equipment enclosure, cabinet, housing, to actuate an alarm signal before access to equipment wiring within the enclosure is gained. Tamper switch mounting hardware shall be concealed so that the location of the switch cannot be visually detected from the exterior of the enclosure. These circuits shall be supervised.

WW. All wiring or cable shall be tested for, and be free of, opens and shorts. All wiring shall test free of grounds with the exception of circuits that are intended to be connected to the ground side of protective circuits.

XX. All wire and cables entering equipment cabinets and enclosures shall be grouped and tied inside the enclosures on 6-inch centers with self-locking nylon cable ties. All wiring shall be grouped in an orderly fashion. Under no circumstances is the use of adhesive tapes (electrical or other) permitted for either permanent or temporary ties or wire management.

YY. All stranded wiring that is connected to equipment that has terminal strips or screw lugs shall be terminated with either nylon insulated crimp-on spade lugs, equal to Thomas & Betts STA-KON fork tongue locking type or equivalent, sized for correct wire and screw sizes or shall be solid bare wire attached to screw terminals. Where compression screws are used to cap wiring, wiring shall be tinned to eliminate destranding and consequent poor connection. Each spade lug or wire shall be marked with a self- sticking numbered wire marker and documented on the as-built wiring diagrams.

ZZ. All wiring that is connected to equipment with solder lug connectors shall terminate wire to lug in a solder joint. The solder joint, lug and any bare wire shall be covered with heat shrink tubing. Multi-conductor bare wire ends shall be soldered to prevent de-stranding.

AAA. Each wire and cable shall be clearly marked within each enclosure, junction box, or where termination is made. Wires and cables shall be marked with a clear, heat-shrink system such as

"Shrink Mark" or equivalent, labeling system as manufactured by RayChem. Cable numbers shall be generated on a PC. Felt-tip "Sharpie" type pen markings are unacceptable. Marking documentation shall be included with the detailed wiring diagram to be provided to the Owner on completion of the installation as part of the As-Built documentation in the "Project Manuals".

BBB. Wiring and cables that are installed shall maintain color coding from origination point to termination point. Where paired cable is used, the pairs in the cable shall be maintained in the run. Pairs shall not be separated to form different pairs than those in the original cable. Color coding shall be maintained within the system. Maintaining color coding applies to all type circuits in the system.

CCC. Review wiring type, scheme and tagging for all systems prior to installation, with factory/technical representatives. Advise the engineer of any required modifications prior to wire procurement and installation and obtain approval accordingly. It is the contractor's responsibility to review the system's wiring with the factory representatives and supply the cables which meet their requirements. Where heavier gauge cables are specified by the engineer and such provide enhanced performance reliability, durability or future capacity, they shall be used unless prohibited by the manufacturer.

DDD. Paralleling of multi-conductor cables to "create" a cable of larger wire gauge is prohibited, except at door frame power transfer hinges.

EEE. Wiring diagrams shall be provided in all signal and power panels along with cable schedules, in a clear plastic envelope, for future use in system maintenance and service.

FFF. Run electric lock power circuits so that each electrified locking door opening is wired on its own wire pair to a dedicated fused circuit in the lock power supply.

GGG. Connect no more than five (5) 12VDC security devices to a single pair of 12VDC power wires without the engineer's approval. Terminate these 12VDC power circuits on a dedicated fused outlet in the 12VDC power supply

3.3 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified testing agency to perform tests and inspections with the Owner and appointed project manager.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least fourteen (14) days. Provide a minimum of ten (10) days notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Access Control System shall be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.
B. Clean installed items using methods and materials recommended in writing by manufacturer.
C. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. See Division 01 – Closeout Submittals for Closeout Submittals.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.7 MAINTENANCE

A. See Division 01 – Execution and Closeout Requirements for additional requirements relating to maintenance service.
B. Adjustments:

1. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

a. Check cable connections.
b. Check proper operation of access control devices.
c. Provide a written report of adjustments and recommendations.

C. Provide to Owner, at no extra cost, a separate maintenance contract for the service and maintenance of the Access Control System for One Year from date of Substantial Completion. Include a separate description of preventative maintenance, systematic examination, cleaning, inspection, and testing, with a detailed schedule.
D. Conduct site visit at least once every three months to perform inspection, testing, and preventative maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.
E. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at the site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 280500

SECTION 280528 - PATHWAYS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Related Drawings

1. “TY” Drawings – Technology Plans

C. Related Sections:

1. Section 271000 – Communication Horizontal
2. Section 280500 – Security Conductor Cables
3. Section 281300 – Access Controls
4. Section 281600 – Intrusion Detection
5. Section 282300 – Video Surveillance

1.3 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Metal wireways and auxiliary gutters.
5. Nonmetallic wireways and auxiliary gutters.
6. Surface pathways.
7. Boxes, enclosures, and cabinets.
8. Handholes and boxes for exterior underground cabling.

1.4 DEFINITIONS

A. ARC: Aluminum rigid conduit.
B. GRC: Galvanized rigid steel conduit.
C. IMC: Intermediate metal conduit.

1.5 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of pathway groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.
C. Seismic Qualification Certificates: For pathway racks, enclosures, cabinets, equipment racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Alpha Wire Company
4. Anamet Electrical, Inc.
5. Electri-Flex Company
6. O-Z/Gedney; a brand of EGS Electrical Group
7. Picoma Industries; Subsidiary of Mueller Water Products, Inc.
8. Republic Conduit
9. Robroy Industries
10. Southwire Company
11. Thomas & Betts Corporation
12. Western Tube and Conduit Corporation
13. Wheatland Tube Company; a division of John Maneely Company

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.
D. ARC: Comply with ANSI C80.5 and UL 6A.
E. IMC: Comply with ANSI C80.6 and UL 1242.
F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.
H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

a. Material: Steel.
b. Type: Setscrew.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Arnco Corporation
5. CANTEX Inc.
6. CertainTeed Corp.
7. Condux International, Inc.
8. Electri-Flex Company
9. Kraloy
10. Lamson & Sessions; Carlon Electrical Products
11. Niedax-Kleinhuis USA, Inc.
12. RACO; a Hubbell company
13. Thomas & Betts Corporation

B. General Requirements for Nonmetallic Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. RNC: Type EPC-40-PVC complying with NEMA TC 2 and UL 651 unless otherwise indicated.
D. Rigid HDPE: Comply with UL 651A.
E. Continuous HDPE: Comply with UL 651B.
F. RTRC: Comply with UL 1684A and NEMA TC 14.
G. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. Arnco Corporation.
3. Endot Industries Inc.
4. IPEX.
5. Lamson & Sessions; Carlon Electrical Products.

B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

2.4 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric

B. Description: Sheet metal, complying with UL 870 and NEMA 250 and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
D. Wireway Covers: Screw-cover type unless otherwise indicated.
E. Finish: Manufacturer's standard enamel finish.

2.5 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Moulded Products, Inc.
2. Hoffman; a Pentair company
3. Lamson & Sessions; Carlon Electrical Products
4. Niedax-Kleinhuis USA, Inc.

B. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:

a. Mono-Systems, Inc.
b. Niedax-Kleinhuis USA, Inc.
c. Panduit Corp
d. Wiremold/Legrand

C. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hubbell Incorporated; Wiring Device-Kellems Division
    b. Lamson & Sessions; Carlon Electrical Products
    c. Mono-Systems, Inc.
    d. Panduit Corp.
    e. Wiremold/Legrand

2.7 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    1. Adalet

B. Cooper Technologies Company; Cooper Crouse-Hinds

    1. EGS/Appleton Electric
    2. Erickson Electrical Equipment Company
    3. Hoffman; a Pentair company
    4. Hubbell Incorporated; Killark Division
    5. Lamson & Sessions; Carlon Electrical Products
    6. Milbank Manufacturing Co.
    7. Molex; Woodhead Brand
    8. Mono-Systems, Inc.
    9. O-Z/Gedney; a brand of EGS Electrical Group
    10. RACO; a Hubbell company
    11. Robroy Industries
    12. Spring City Electrical Manufacturing Company
    13. Stahlin Non-Metallic Enclosures; a division of Robroy Industries
    14. Thomas & Betts Corporation
    15. Wiremold/Legrand

C. General Requirements for Boxes, Enclosures, and Cabinets:

    1. Comply with TIA-569-B.
    2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

D. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
E. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
G. Metal Floor Boxes:

    1. Material: Cast metal.
    2. Type: Fully adjustable.
    3. Shape: Rectangular.
    4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
K. Device Box Dimensions: as specified within the Architectural drawings.
L. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
M. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures:

a. Material: Plastic.
b. Finished inside with radio-frequency-resistant paint.

3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:

a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.
d. Gymnasiums.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT. Allow plenum cable in j-hooks or cable tray.
5. Damp or Wet Locations: GRC.
6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway.
7. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: Plenum-type, optical-fiber-cable pathway.
8. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size: ¾-inch trade size. Minimum size for optical-fiber cables is 1 inch.
C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.

2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, cast-metal fittings. Comply with NEMA FB 2.10.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
E. Install surface pathways only where indicated on Drawings.
F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
C. Complete pathway installation before starting conductor installation.
D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
F. Install no more than the equivalent of two (2) 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.
G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
H. Support conduit within 12 inches of enclosures to which attached.
I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to RNC, Type EPC-40-PVC before rising above floor.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus ¼ turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.
R. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:

1. ¾-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.
3. Install with a maximum of two (2) 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

T. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.
U. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
AA. Support boxes of three (3) gangs or more from more than one (1) side by spanning two (2) framing members or mounting on brackets specifically designed for the purpose.
BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
CC. Set metal floor boxes level and flush with finished floor surface.
DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 271000 "Structured Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage or deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 280528

SECTION 281300 - ACCESS CONTROL SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.02 SECTION INCLUDES

A. System Requirements
B. Access Control Field Devices
C. Access Control System

1.03 RELATED REQUIREMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.” OR Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Division 07 - Firestopping.
C. Division 08 - Door Hardware: Electrically operated door hardware, for interface with access control system.

    1. Includes door hardware with integral request to exit devices.

D. Division 14 - Hydraulic Elevators: For interface with access control system.
E. Division 26 - Grounding and Bonding for Electrical Systems.
F. Division 26 - Conduit for Electrical Systems.
G. Division 26 - Identification for Electrical Systems: Identification products and requirements.
H. Division 27 - Structured Cabling: Data cables for access control system IP network connections.
I. Division 28 - Video Surveillance: For interface with access control system.
J. Division 28 - Building Intrusion Detection: For interface with access control system.
K. Division 28 - Fire Detection Alarm: For interface with access control system.
L. Refer to the following construction documents for Data Room locations and device locations only.

    1. “TY” Drawings – Security Plans

M. Any apparatus, appliance, material, or work not shown on the Drawings but mentioned in the Specifications, or vice versa, and any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense. Coordinate with each system manufacturer to insure all hardware, firmware, relays, or other necessary components are provided prior to bid submission.

N. All work of this Section to comply with the requirements of the Conditions of Contract, with all Specification Sections of Division 01 – General Requirements, with the Security Drawings, and with all other Contract Documents.
O. Refer to Division 26 of the Contract Documents, Electrical, for all Specifications governing the installation of raceway (conduit, EMT, cable trays, wire trough, etc.), system junction and pull boxes, and device rough-in boxes, for all Security System work shown on the Security Drawings. Conduit, back box, and trough work to be provided by this Contractor.
P. Refer to Division 26 of the Contract Documents, Electrical, for all work related to the interconnection of Security System equipment to 120 VAC power sources.
Q. Refer to Division 09 of the Contract Documents, Finishes, for details relating to acoustical ceilings and gypsum board systems, floor finishes, painting, etc., for information pertinent to device and back box selection and installation.
R. Refer to Division 08 of the Contract Documents, Openings, for details relating to doors, door frames, windows, and window frames, for information pertinent to the selection of magnetic contact devices and their associated placement and installation, including back box selection and installation.
S. Refer to Division 08 of the Contract Documents, Openings, for details relating to door and door frame hardware and preparation, electrified lock power supplies, required coordination to accommodate these components and/or systems, lock voltage and current draw coordination, coordination of fail-safe electrified locks, and any other related equipment or requirements
T. Refer to Division 06, Wood, Plastics, Composites, and coordinate all desk locations and installation details with the Millwork Contractor.
U. Review all other Specification Sections as required to achieve complete inter- trade coordination.

1.04 DEFINITIONS

A. API: Application Programming Interface
B. AVI: Audio Video Interleave
C. CA: Certificate Authority
D. CAC: Common Access Card
E. CE: European Union Conformity
F. CPU: Central Processing Unit
G. CSV: Comma Separated Values
H. DNS: Domain Name Server
I. DSM: Door Status Monitor
J. DVR: Digital Video Recorder
K. EACS: Electronic Access Control System
L. FCC: Federal Communications Commission
M. FIPS: Federal Information Processing Standard
N. FIFO: First In – First Out
O. FTP: File Transfer Protocol
P. FRAC: First Responder Authentication Credential
Q. GB: Gigabyte
R. GSOC: Global Security Operations Center
S. GUI: Graphical User Interface
T. HA: High Availability
U. HTML: Hypertext Markup Language
V. 4, H.265: Video Compression Standards
W. I2C: Inter-Integrated Circuit
X. IEEE: Institute of Electrical and Electronics Engineers
Y. I/O: Input / Output
Z. IP: Internet Protocol
AA. IS: Integrated System

BB. JPEG: Joint Photographic Experts Group
CC. LAN: Local Area Network
DD. LDAP: Lightweight Directory Access Protocol
EE. MB: Megabyte
FF. MJPEG: Motion JPEG
GG. MSATA: Mini-Serial Advanced Technology Attachment
HH. MSP: Mobile Security Professional
II. MTBF: Mean-Time Between Failure
JJ. NAS: Network Attached Storage
KK. NAT: Network Address Translation
LL. NBAPI: NetBox Application Programming Interface
MM. NECA: National Electric Code Association
NN. NFPA: National Fire Protection Association
OO. NVR: Network Video Recorder
PP. ODBC: Open Database Connectivity
QQ. OS: Operating System
RR. OVID: Open Video Integration Driver
SS. PDF: Portable Document Format
TT. PIN: Personal Identification Number
UU. PIV: Personal Identity Verification
VV. PoE: Power over Ethernet
WW. PTZ: Pan-Tilt-Zoom
XX. RAID: Redundant Array of Independent Disks
YY. RAM: Random Access Memory
ZZ. REX: Request to Exit
AAA. RFID: Radio Frequency Identification
BBB. RoHS: Restriction of Hazardous Substances
CCC. ROM: Read Only Memory
DDD. RU: Rack Unit
EEE. SFTP: Secure File Transfer Protocol
FFF. SHA: Secure Hash Algorithm
GGG. SIO: Serial Input / Output
HHH. SLA: Sealed Lead-Acid
III. SMS: Security Management System or Short Message Service (text messaging)
JJJ. SSL: Secure Sockets Layer
KKK. SUSP: Software Upgrade and Support Plan
LLL. TCP: Transmission control protocol - connects hosts on the Internet
MMM. TIA: Telecommunications Industry Association
NNN. TLS: Transport Layer Security
OOO. TWIC: Transportation Worker Identification Credential
PPP. UI: User Interface
QQQ. UPS: Uninterruptible Power Supply
RRR. UTP: Unshielded Twisted Pair
SSS. VMS: Video Management System
TTT. WAN: Wide Area Network
UUU. Wi-Fi: Wireless Network
VVV. AS NECESSARY: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.
WWW. AS REQUIRED: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.
XXX. Substantial Completion: Shall mean that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written specification.
YYY. Contractor/INTEGRATOR: Refers to the biding/installation Contractor responsible for furnishing and installation of all work indicated within this specification.

1.05 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. CSBC101.2 & CFSC 102.1 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. UL 294 - Access Control System Units; Current Edition, Including All Revisions.
E. UL 1076 - Proprietary Burglar Alarm Units and Systems; Current Edition, Including All Revisions.
F. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing in stated in the Environmental Design of Electrical Equipment Act (EDEE).
G. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”
H. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”
I. Electronic data exchange between Video Surveillance System and the Access Control System shall comply with SIA TVAC
J. Installation shall comply with FCC CFR 47 Part 15 Class A “Telecommunications, Radio, Frequency, Digital Device Emission:
K. Installation shall comply with Federal, State, and Local Codes and Authority Having Jurisdiction (AHJ).
L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other installers to provide suitable door hardware as required for both access control functionality and code compliance.
2. Coordinate the placement of readers with millwork, furniture, equipment, etc. installed under other sections or by others.
3. Coordinate the work with other installers to provide power for equipment at required locations.
4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review reader and equipment locations.
2. Conduct meeting with facility representative and other related equipment manufacturers to discuss access control system interface requirements.

C. Confidentiality of Documents

1. The project documents, consisting of all technical proposals, drawings, specifications, shop drawings, as-built drawings, manufacturer’s literature, etc., shall be considered proprietary information and are to be treated with complete confidentiality. Dissemination of any security system documentation to any party not considered “need-to-know” without a pre-defined and approved agreement will be considered a violation of the contract documents and all pursuant clauses regarding financial penalties, project termination, and/or legal prosecution will apply. The Contractor is to obtain a list of “need-to-know” parties from the Owner and/or Construction Manager.

2. Use of the Contract drawings and specifications is restricted to the original site for which they were prepared. Publication therefore is expressly limited to such use. Re-use, reproduction, storage by any medium or publication by any method in whole or in part is prohibited. Visual contact with the Contract drawings and specifications constitutes prima facie evidence of the acceptance of these restrictions. Unlawful publication, dissemination, and use of these documents carry significant liability and the Owner maintains the right to legally pursue restitution and/or penalty for violation of these confidentiality conditions.
3. All documents marked “DO NOT DUPLICATE” are to be returned to the Construction Manager for proper disposal and handling upon completion of their relevant use.

1.07 SUBMITTALS

A. See Division 01 – Administrative Requirements for submittal procedures.
B. Evidence of Qualifications for Installer:

1. The Contractor shall be a bona fide security systems contractor, licensed by the State of Connecticut for the installation of the low voltage security and signal communication systems, and engaged in security system maintenance, service and contracting for at least the last five years.
2. The Contractor shall employ technicians who have been trained by the Manufacturer specified within this section to install the systems of this Manufacturer.
3. The contractor shall be a factory authorized stocking distributor of the manufacturer of the equipment included in the system so that immediate replacement parts can be made from inventory and service provided as needed on an emergency basis.
4. The Contractor shall submit with the bid a manufacturer’s certificate of acceptance of the qualifications of the Installing Contractor to install, test, maintain and repair the manufacturer’s equipment.
5. In order for the Security Consultant to verify that they meet the competency requirements of this specification, Contractors must submit the following information if so requested:

    a. Proof that the Contractor has installed, services and maintained similar security systems for a minimum of ten (10) years.
    b. Proof that the Contractor is a firm which currently and regularly installs, services and maintains security systems as a full time business.
    c. The names and qualifications of security system technicians that shall perform and supervise the work, and perform tests or adjustments on the systems and equipment. Qualifications shall include all schooling, training, and history of work experience.
    d. A list of four prior systems comparable to the one specified under this contract which were installed, serviced, and maintained satisfactorily by the Contractor for a minimum of one (1) year. Each system listed shall include the firm or owner, location, person to contact (with telephone number), date of installation and service period, and a brief description of the system and work performed on the system.

6. The Contractor shall submit any other information required by the Security Consultant to determine the competency of the Contractor. If this information is not submitted as requested, it shall be submitted within the time specified by the Architect after the bid opening. If the Contractor fails to submit the information in accordance with the Security Consultant’s request, the Contractor shall be declared non-responsive, and may be rejected to perform the work specified within this section.

C. Design Data: Standby battery/UPS Calculations
D. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Manufacturer's detailed field-testing procedures.
F. Maintenance contracts.
G. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.
H. Shop Drawings:

1. General: General: Bid documents, including drawings, details and specifications are considered conceptual in nature, and provide direction on products and project requirements. Contractor is given a choice of methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.
2. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD DWG file format, which show details of all work to ensure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal drawing package shall consist of Drawings, Equipment Data Sheet Submittals, and an Acceptance Testing Plan.
3. Completeness: The Equipment Submittals, Acceptance Testing Plan, and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.
4. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect and Owner's Representative review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include as a minimum, but not limited to the requirements stated herein.
5. Requirements: Provide the following information complete, and in the manner described herein:

    a. Hardware, Application Software, and Network Requirements: A system description including analysis and calculations used in sizing equipment required by the security systems. The description shall show how the equipment will operate as a system to meet the performance requirements of the systems. The following information shall be supplied as a minimum:

        1) Server(s) processor(s), disk space and memory size
        2) Workstation(s) processor(s), disk space and memory size
        3) Description of facility (field) control equipment (Controllers/Field Panels, Models) and their configuration
        4) Operating System(s) Software, where software is provided or upgraded
        5) Application Software, with Optional and Custom Software Modules supplied in this project
        6) Integration Schemes: Proposed connectivity, software, development requirements, and SDK information, for inter-system communication.
        7) Network bandwidth and reliability requirements
        8) Number and location of LAN ports required
        9) Other specific network requirements, preferences, and constraints
        10) Backup/archive system size and configuration
        11) Start-up operations
        12) System power requirements and Uninterruptible Power Supply (UPS) sizing
        13) Device/Component environmental requirements (cooling and/or heating parameters)

    b. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:

        1) Title Sheet

2) Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations with device numbering scheme.
3) Riser Diagram: Showing all conduit relationships between devices shown on the Floor Plans. Show all power sources.
4) Single-Line/Block Diagrams: Show signal relationships of controls and devices within the system.
5) Custom Assembly Diagrams: For each custom assembly such as Access Control Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish)
6) Component Connection Diagrams

    (a) For each equipment component such as a computer, video switcher, camera or video recorder, show the rear elevation of the device and all connectors/terminations as a pictorial.
    (b) Show the wire designations on connectors. Typical wiring detail where multiple of same device is provided.
    (c) Show a schedule of the wire colors connected to the pins on each device connector.

c. Equipment Wiring Diagrams

1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet, including terminals, components and wiring devices.
2) Show the device nomenclature exactly as shown on the single line diagrams.
3) Terminations: Show every termination and terminating cable, with applicable cable and wire numbers matching the single line diagrams.

    (a) Every termination in the system must be documented.
    (b) Termination information may be rendered as a wiring list(s), if properly coordinated with, and referenced to, typical component and single-line diagrams. Otherwise, the Shop Drawings shall show a pictorial of every component in the system, with its terminations.

4) Show wire colors for each terminal.
5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
6) Provide working dimensions and erection dimensions.
7) Arrangements and sectional views
8) Necessary details, including complete information for making connections between work under this Contract, existing work, and work under other Contracts.
9) Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
10) Duplicate of design drawings may be used where each sheet is modified to reflect contractor coordination, specific requirements of the project and multi discipline conditions.
11) Each Drawing or page shall include:

    (a) Project name, Project Number and descriptions.
    (b) Submittal date and space for revision dates.
    (c) Identification of equipment, product or material.
    (d) Name of Contractor and Subcontractor.

(e) Name of Supplier and Manufacturer.
(f) Relation to adjacent structure of material.
(g) Physical dimensions clearly identified.
(h) ASTM and Specifications references.
(i) Identification of deviations from the Contract Documents.
(j) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
(k) Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

d. Equipment Submittals

1) Provide a Title Page, with project name, Contractor’s name and address, contact information, date of submission, and submission revision number.
2) Provide a Parts List, for proposed equipment, materials, components and devices, listing the following information for each line item:

(a) The system type
(b) Model number
(c) Specification sheet page reference

3) Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Number each page, to correspond with the Parts List.
4) Clearly delineate (with highlighter, arrow, or underline) on each specification sheet, specific model numbers, options and configurations being proposed for this project.
5) Indicate kinds of materials and finishes for equipment where more than one option is presented.

e. Acceptance Testing Plan

1) Submit a written document detailing the test procedures to be followed in evaluating and proving the installed system(s).
2) Provide a sample of the test forms to be used for each system and for each component of each system.
3) Include all tests required by the equipment manufacturer and by this Specification

f. Spare Parts List: Submit a list of recommended spare parts for Owner’s review & approval and/or amending. Spare parts shall comprise a minimum of 5% or minimum of 2 each of field devices, device termination boards and a minimum of 1 system controller boards.
g. Training Program

1) Submit a training program 10 working days prior to scheduled training to be followed in training key employees in the operation and maintenance of the installed system at the project site. The proposed training program shall be designed to provide a level of basic competence with the system for selected personnel. These selected personnel shall then be expected to train other personnel as required, utilizing the training that they have been given and the body of training documentation provided by Contractor. This plan shall comply with the requirements stated in the “Training” section, of these Specifications, all stated hours of which shall be considered to be classroom hours.

2) Submit a curriculum to account for, and relate, each subject to actual training time. All required hours shall be accounted for in this curriculum.
3) The training plan shall cover the overall system, each individual system, each subsystem, and each component. The plan shall also cover procedures for database management, normal operations, and failure modes with response procedures for each failure. Each procedural item must be applied to each equipment level.

h. Incomplete or unchecked submittals which do not contain complete data on the work and full information on related matters will be returned for correction.
i. Verification: The contractor shall check and acknowledge all shop drawings and shall place his signature on all shop drawings submitted for approval. Contractor's signature shall constitute a representation that all quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.
j. Timeliness: The Contractor shall schedule, prepare and submit a complete shop drawing assembly in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner so as to not delay the complete performance of the work.
k. Departure from Contract Requirements: If shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in his letter of transmittal, otherwise review of such submittals shall not constitute review of the departure. Review of the drawings shall constitute review of the specific subject matter for which the drawings were submitted and not of any other structure, materials, equipment, or apparatus shown on the drawings.
l. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such drawings have been reviewed and approved.
m. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1) The Contractor shall submit four (4) complete sets and/or electronic PDFs of shop drawings with equipment submittals and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, Architect’s Project Number, the name of the Contractor, the list of drawings submitted including numbers and titles, requests for any review of departures from the contract requirements and any other pertinent information. Drawings submitted for review shall be full-sized and included with the equipment submittals.
2) Drawings or descriptive data will be stamped "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected" or ‘Submit Specific Item’ and one copy with a Letter of Transmittal will be transmitted to the Contractor with the return of submitted documents.
3) If a shop drawing or data is stamped "Reviewed" or "Furnish as Corrected", no additional submittal is required for that shop drawing.
4) If a shop drawing or data is stamped "Revise and Resubmit" or “Rejected”, the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are re-submittals.
5) The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Furnish as Corrected."

I. Equipment and Software List: Include every piece of equipment and software by product/model name and/or number, manufacturer, serial number, revision number, location, and date of original installation. If factory and/or bench testing regimens are required by the project plan, add pretesting record of each piece of equipment and software, listing name of person testing, date of test, and adjustments made.
J. CE and FCC Compliance Certificates:
K. Field quality-control reports
L. Current Specified Manufacturer Integrator Certification Letter
M. Current Specified Manufacturer Training Certificates (listing expiration dates) for Two technicians from the supporting office
N. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner. Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.
O. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.
P. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
2. General: The Contractor is responsible for providing accurate drawings and equipment manuals describing and depicting the systems as they are actually installed and operated.
3. Phase One: Notwithstanding requirements specified elsewhere, submit the following labeled as the "Operating and Maintenance Manual" within thirty (30) days after Final Acceptance of the Installation:

a. Record Drawings: Submit two (2) copies of revised versions of drawings as submitted in the "Shop and Field" and "Equipment Wiring Diagrams" Submittals showing actual device locations, conduit routing, wiring and relationships as they were constructed. Include nomenclature showing as-built wire designations and colors. Drawings shall include room numbers coinciding with Owner space planning numbering. Drawings shall be submitted in electronic editable AutoCAD files, in ".dwg" format, on CD or DVD disks.
b. Manuals: Submit two (2) copies of each of the following materials in bound manuals, or electronic PDF copies on CD/DVD discs, with labeled dividers:

1) A final Bill of Material for each system.
2) Equipment Instruction Manuals: Complete, project specific comprehensive instructions for the operation of devices and equipment provided as part of this work.
3) Manufacturers Instruction Manuals: Specification sheets, brochures, Operation Manuals and service sheets published by the manufacturers of the components, devices and equipment provided.
4) Include information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.
5) Provide a replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.
6) Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.
7) Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturers' Warranty Registration papers as described herein.

1.08 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.
2. NFPA 101 (Life Safety Code).
3. The requirement of the local authorities having jurisdiction.
4. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Installer qualifications: company specializing in performing the work of this section with minimum three years documented experience with access control systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

1. Contract maintenance office located within 100 miles (160km) of project site.

E. Maintenance contractor qualifications: same entity as installer.
F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities jurisdiction.
G. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
H. All work shall comply with the latest editions of the codes as referenced herein.
I. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.
J. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the project.
K. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
L. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or another recognized testing laboratory, the product shall be so examined, tested and certified.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
N. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.

4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

O. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.
P. Seismic Performance: Provide equipment capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 and current building codes for the state of CT.
Q. The term “withstand” means “the system(s) will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.”

1.09 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.11 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.12 WARRANTY

A. See Division 01 – Closeout Submittals for additional warranty requirements.
B. The Integrator guarantees the Systems to be installed under this specification to be free from any defects in workmanship and materials for a period of one (1) year from the date of final completion/acceptance of the project by the Owner as evidenced by the date of final payment for the work. The Contractor shall promptly and at their own expense remedy any defects in the work and pay for any damage to other work resulting thereof, which shall appear during the period of time covered by this guarantee. Neither the final certificate of payment nor any provisions in this Agreement shall constitute an acceptance of work not done in accordance with this specification or relieve the Contractor of liability with respect to any expressed warranties or guarantees or responsibility for faulty materials or workmanship.
C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of equipment related to the Access Control System, and control-station equipment that fail in materials or workmanship within specified warranty period.

    1. Warranty Period: The standard manufacturer’s warranty shall apply or a minimum of a one (1) year warranty from the date of Substantial Completion.

D. The Integrator shall provide all services required to maintain the system in an operational state as specified by the manufacturer for a period of one (1) year after acceptance.
E. Service response shall be within twelve (12) hours of the initial request for service and shall be provided twenty-four (24) hours per day, seven (7) days per week and three hundred sixty-five (365) days per year.
F. Contractor shall include, as part of this warranty, a program for maintenance for each integrated system.

    1. Provide details of coverage, preventive maintenance schedules, exclusions and service rates for all billable time and travel charges.
    2. Maintenance shall include two (2) semi-annual inspections and tests to verify the intended operation of the security system(s). System testing shall include but not be limited to the testing of all devises, fault modes and batteries. A detailed test report indicating these results and any corrective measures shall be furnished to the owner.

G. The Contractor shall provide software and firmware upgrades as required and available to the Owner.
H. Submit manufacturer's standard warranties.

PART 2 - PRODUCTS

2.01 SYSTEM REQUIREMENTS

A. Furnish and install Access Control System consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
B. The awarded contractor of this section shall furnish and install a network access controlled system into this facility using electronic security devices. This integrated access control system shall incorporate all devices necessary to achieve the specified system, all associated monitoring and recording software, hardware, configuration, testing and training.
C. The contractor awarded this project must include the following licenses and configuration:

    1. Access Control Manufacturer licenses for each camera on the Specified VMS system
    2. Input / Output panels, and network nodes for all access-controlled doors, all door position switches, all duress & lockdown buttons, and all security strobes.
    3. Access Control Manufacturer Licenses for integration with the Specified Intrusion Detection System.
    4. Threat Level, Lockdown button configuration, and Day alarm configuration.
    5. Alarm and notification configuration through the Specified Access Control User Interface GUI.

D. This Access Control System described within this specification shall be fully integrated with the Video Surveillance, Intrusion Detection, Public Address, and Fire Alarm System.
E. All installation, peripheral devices, required licensing and configurations are required as part of this specification to establish a coherent, functional system as described within this bid package.
F. Security control and network cabling to/from the equipment rooms to the controlled doors, as described within the documents shall be furnished and installed by the contractor awarded this project.
G. Any and all additional interconnection cabling required for a functional system shall be furnished and installed by the contractor awarded this portion of work.
H. Final terminations to all devices are required by the Contractor awarded this Section.
I. The Contractor awarded this Section shall furnish and install a complete integrated security system and all associated, terminations, supporting devices, configuration of system, testing and training in accordance with this Bid package.
J. This specification is used to identify the requirements for an integrated access control system. The operator workstation(s) shall be used for database programming and storage of historical events and as a User interface with the Video Surveillance System.
K. This system shall be integrated with the building’s fire alarm system for proper activation of “fail-secure” locking mechanisms.
L. All interconnections required to the fire alarm system shall be terminated by the fire alarm installers and shall be coordinated with the contractor awarded this portion of work.
M. All system configuration(s) shall be included to attain a fully functional system and shall be within the Scope of work of the awarded contractor of this Bid package. This configuration shall include but not be limited to the following:

    1. Configuration of all controlled doors and devices.
    2. Configuration of all cameras shall be managed from the Access Control Platform
    3. Configuration of LAN switches – Active Electronics as required.
    4. Configuration of Access Control platform shall allow for Web access into the Access Control and Video Surveillance systems from all schools and via an internet connection which shall VPN into the owner’s network.

5. Configuration of the Lockdown / Duress / Emergency buttons, as directed by the Security Consultant, Police Department, and Owner.
6. Configuration of the Access Control, Intrusion Detection, and Video Surveillance integration.
7. Configuration of the Day Alarm system, which will notify users of a propped or opened door equipped with door position switches, as directed by the security consultant and Owner.

N. Environmental Conditions: System(s) shall withstand the environmental conditions without mechanical or electrical failure, damage or degradation of its operating capacity Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

2.02 ACCESS CONTROL FIELD DEVICES

A. Access Control Panels:

1. The Access Control Panels shall be Avigilon.
2. Include all required licenses, control panels, and door controllers as required for a fully functional system.

B. Wall Mounted Access Control Security Panel

1. AC-MER-CONT-LP1502

   a. QTY (A/R)

2. AC-MER-CON-MR52

   a. QTY (A/R)

C. Relayed Output Application Blade:

1. AC-MER-CON-MR16OUT

    a. QTY (A/R)

D. Supervised Input Application Blade:

1. AC-MER-CON-MR16IN

    a. QTY (A/R)

E. Power Supplies:

1. AC-LSP-4DR-MER-LCK

    a. QTY (A/R)

2. AC-LSP-8DR-MER-LCK

    a. QTY (A/R)

F. Credential Readers:

1. The selected manufacturer shall be SCHLAGE #MT15 Multi-Technology Wall Mount Reader.

    a. Utilize Mullion Readers where appropriate or required.

G. Licenses:

1. Furnish, install, and configure all licenses required to view all Avigilon cameras on the Avigilon Access Control Platform.
2. All Avigilon Access Controlled Doors shall integrate within the City's existing Access Control Server. Include licenses for each door requiring interface with the Access Control Platform specified within this project.
3. Include all required elevator license and software features to accommodate elevator credential readers as shown on the security drawings.

H. Request to Exit Sensor (REX / RTE):

1. Coordinate with the door hardware vendor and use the Provided Exit Request Touch Bar or Integral Lock Signal Switch, where specified in Division 08.
2. Where integral exit request touch bar is not specified, furnish an install the following:

    a. Manufacturer:

        1) BOSCH

            (a) #DS160
            (b) Approved Equivalent

I. Door Position Switches (Door Contacts):

1. All Door Position Switches shall be Double Pole-Double Throw (DPDT).
2. Door position switches shall be installed by the Contractor. The Contractor shall align, prepare, and fabricate doors and frames to accept specified door position switches. The

Contractor shall be responsible for coordinating the installation, so systems and hardware operate as specified. Door Position Switches will be installed at the top of the door in the first instance. If unable to install on top, then side installation on the handle side is acceptable.

3. Surface Mounted Door Switch: DPDT sensor. Interlogix or approved equal. Surface Mounted Magnetic Switch with armored cable. Route armored cable to junction box and permanently secure to box with clamp or set-screws. Use only where flush-mounted devices cannot be installed.
4. Non-fire rated Doors, Flush Mount:

    a. Interlogix Model 1076C-W or approved equivalent Concealed Magnetic Door Switch.

5. Fire Rated Doors:

    a. General: Contractor shall coordinate access control hardware equipment and installation so as to maintain the Fire Rating of each specific door to the satisfaction of the Local Authority Having Jurisdiction.

J. Lockdown Button:

1. The selected model shall be: Safety Technologies Inc, #SS-2000 or an Approved Equivalent

    a. The lock down button shall be green and labeled “LOCKDOWN”
    b. The lockdown button shall have a key-to-reset function
    c. Include plastic cover – STI #6518

2. Lock-down buttons must be configured to Owner requirements. Minimally, these buttons will have to interface with the Access Control System, Intrusion Detection System, Public Address System and Video Surveillance System.
3. Lock Down buttons shall automatically release fire-alarm hold-open doors.
4. Lock Down buttons shall cause the security strobes to activate. Coordinate configuration and functionality with Security Consultant and Owner.
5. Lockdown shall send emails and text messages to up to 50 users.
6. Lockdown shall notify the Magic Monitor Bricks of an event.
7. Lockdown shall signal a pre-recorded message over the public address system. Coordinate message with public address integrator.
8. Lockdown shall dial-out to the central monitoring company, through the Honeywell intrusion detection panel.

K. Panic / Duress Button

1. The selected model shall be: Sentrol UL Rated #3050 or equivalent. Include bi-color latching LED and single pole, double throw contacts.
2. Panic / Duress buttons must be configured to Owner requirements. Coordinate configuration and functionality with Security Consultant and Owner.

L. Security Strobe Lights:

1. The selected model shall be:

    a. Talkaphone #ETP-EL12/24 or approved equal.
    b. Contractor shall demonstrate that lamps are visible in direct sunlight prior to final installation and approval.
    c. Include low voltage power supplies.

d. Lights shall be controlled through outputs of the Access Control Panel. Coordinate configuration and functionality with Security Consultant and Owner.

M. Door Release Buttons:

1. The selected model shall be:

a. Dortronics #H276-HD29 or an approved equivalent.
b. The door release button shall be engraved with the label “ASSOCIATED DOOR # Push to Release”
c. The door release button shall be mounted to FSR #DSKB_385 Single Gang Table Box.

N. Access Control Source Power:

1. Derive primary Access Control 120VAC power from a designated power source within the telecommunication room, as shown on the T & Y drawings.
2. Power cable shall be protected by conduit.
3. Transformer shall be installed in locked cabinets, protected by tamper switches. Plug-in transformers which are not protected by locked cabinets are not acceptable.
4. Serve all Low Voltage powered devices within the Access Control Cabinet from the Electronics Power Supply.
5. Provide barriers as necessary to separate Class 1 from Class II power.

O. Access Control System Source Power Supplies and Batteries:

1. Furnish and Install Altronix UL Listed Class II power supplies or approved equivalent.
2. Serve all low voltage powered devices within the Access Control Enclosure from the Electronics Power Supply.
3. Capacity: The power supply shall be capable of powering a minimum of 125 percent of the load required at the time of acceptance (25% spare capacity).
4. Power Monitoring: The system shall monitor the loss and restoration of power at the Access Control Panel of both primary and secondary loss of power. Loss and restoration of power shall be displayed at the console, but shall not require resetting the system.
5. Battery Back-up: Provide battery back-up to retain functions of all electronics for a period of four (4) hours upon loss of 120VAC power.

P. Lock Power Supply (LPS)

1. Provide Altronix, UL Listed Class II power supplies within a ventilated, locked, cabinet within the telecommunication rooms as noted on the T & Y drawings, or as otherwise required, to affect proper system performance. Cabinet shall be equipped with a tamper switch, which shall be connected to the Access Control System to provide a supervisory alarm. Power supply shall include separate terminals for each door lock. Power supply voltage shall be required by the hardware supplied locks.
2. Capacity: The power supply shall be capable of powering 200 percent of the load required at the time of acceptance (100% spare capacity).
3. Power Monitoring: The system shall monitor the loss and restoration of power at the Access Control Cabinet. Restoration of power shall be displayed at the console but shall not require resetting the system.
4. Battery Back-Up: Power supplies shall be equipped with integral battery recharging circuits and batteries. If a separate cabinet is used for batteries, the cabinet shall be locked and provided with a tamper switch connected to the Access Control System.

a. Fail Safe Door Locks: Provide four (4) hours of battery backup for Low-Voltage electrified door hardware.
b. Fail-Secure Door Locks: Provide battery backup enough to operate fail-secure door locks 100 times per hour, for four (4) hours.

5. Power supply output may be connected to remove UL-approved distribution board of the same manufacturer mounted within the Access Control Cabinet.
6. Provide a Fire Alarm Interface Relay to interface the LPS to the Access Control system and Fire Alarm System as shown on the contract drawings.
7. Transformers shall be installed in locked cabinets, protected by tamper switches. Plug-in transformers which are not protected by locked cabinets are not acceptable.

Q. Auto Door Actuator Interface Relay: Furnish and install Dayton Model 5YR20N, or equal, with compatible relay base, at automated doors to ensure the Access Control System approved the Credential / Push Plate before actuator motor is engaged.
R. Provide IDEC RTE series interval timer, or equal, for interface with motorized door Push Plates and the Automated Door Operator. This will be used to provide a functional time extension for the interaction of between the Access Control system and the Automated Door Hardware, to avoid damage and prevent unwanted alarms.

1. Unit shall be UL listed and operate on 24VDC.
2. Unit shall mount to UL listed relay socket.
3. Unit shall mount within the door operator housing.

S. Access Control Cabinet:

1. System controllers and field control boards serving a given area shall be installed inside Access Control Cabinets. No controller or control module shall be mounted independently of the cabinet and its power supplies. Refer to the drawings and the following descriptions for details on the Access Control Cabinet construction.

T. Provide Access Control Cabinets as described below, located in the telecommunication rooms where the access control cabling terminates, per the T & Y Drawings, to house all equipment. Each access control cabinet shall contain the following equipment to support the current and future alarm initiating and controlled devices to be connected to the Access Control System:

a. Access Control Cabinet:

1) Indoor: NEMA 2, hinged, locking cabinet by Access Control Manufacturer, Hoffman, or approved equal, sized to fit contents. Lock shall be coordinated with the Owner allowing replacement by the Owner.
2) Outdoor: Stainless steel, NEMA 4X, hinged locking handle cabinet by Access Control Manufacturer, Hoffman, or approved equal, sized to fit contents.
3) Provide door tamper switch and wire into alarm input for each Access Control Cabinet.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that ratings and configurations of system components are consisted with the indicated requirements.
C. Verify that mounting surfaces are ready to receive the system components.

D. Verify that branch circuit wiring is installed, completed, tested, and ready for connection to system.
E. Verify that conditions are satisfactory prior to starting work.
F. Device Locations

1. All device locations are to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for outlet installation in areas not reviewed or approved by the Owner.

G. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install access control system in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Unless otherwise indicated, use wiring in conduit.

1. Use suitable listed cables in we locations, including underground raceways.
2. Use suitable listed cables for vertical wire applications.
3. All cabling shall be plenum rated.

D. Install wiring in conduit for the following:

a. Where required for rough-in.
b. Where required by the AHJ.
c. Where exposed to damage.
d. Where installed outside the building.
e. For exposed connections from outlet boxes to devices.

2. Conduit: comply with Division 26.
3. Conceal cables unless specifically indicated to be exposed.
4. User power transfer hinges specified within Division 08 for concealed connections to door hardware.
5. Cables in the following areas may be exposed:

a. Equipment Closets

6. Route exposed cables in parallel or perpendicular to building structural members and surfaces.
7. Do not exceed manufacturer's recommended maximum cable length between components.

E. Provide grounding and bonding in accordance with Division 26.
F. Install firestopping to preserve the fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
G. Install all devices and infrared illuminators level and plumb.
H. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
I. Identify system components, wiring, cabling, and terminals according to ANSI/EIA/TIA standards.
J. Door Hardware Coordination

1. Doors shall not be locked in path of legal egress unless integrated with the fire alarm for release upon the fire alarm system notification. All access controlled locked door within the path of legal egress must be brought to the attention of the Architect and Security Consultant prior to rough-in.
2. Refer to Section Division 08 for Door Hardware requirements and coordination. Contractor shall work directly with door hardware supplier to ensure the provision of specified mechanical and electronic functionality.
3. Request to Exit Activation: Contractor shall configure the system such that Request to Exit devices and System Controllers will react quickly enough to bypass alarms before a fast-moving individual can reach and open the door. This bypass shall be evaluated and verified by the Contractor on the fully configured and operation Access Control system prior to acceptance testing. When possible, use door hardware with REX devices built into the hardware.
4. Fire Alarm Interface: Electrified locks, strikes and turnstiles which are part of this work and which may be locked in the path of legal exiting, shall be connected to the building Fire Alarm System in accordance with the AHJ requirement such that they automatically unlock in the event of activation of the Fire Alarm System. This shall occur whether the activation is a result of a manual pull station, smoke detector, or sprinkler flow switch.

    a. A fire alarm “general / common alarm relay” shall be programmed at the fire alarm control panel to activate the Access Control System interface relays located in each Lock Power Supply cabinet. The Access Control Contractor shall research and provide all necessary fire alarm system conduit, wire, hardware, and programming to perform required interface.
    b. This interface shall not depend on the Access Control System host or Remove Controllers for its operation. Locate these interface relays electrically ahead of lock power distribution. The Contractor shall supply and install programmed alarm interface relay(s) with sufficient capacity to control the power supplied to all controlled locks.

5. Access Control Lock Configuration

    a. Secured Doors: Doors equipped with electric locks shall be individually programmed for locking and unlocking at specific times of the day. A valid credential presented at a reader will allow the portal to unlock for a programmed period of time.
    b. Stairwell Door Locks:

        1) Stairwell doors which are locked from the stairwell side shall have the capability to be simultaneously unlocked upon a signal from the Fire Command Center, Fire Alarm Panel, or the Access Control Command Center when applicable.
        2) Stairwell locking systems shall, in all respects, comply with the requirements of the Building Codes for “Means of Egress”.
        3) Contractor shall provide clearly labeled switches, in the required locations, to unlock all stairwell doors simultaneously for “non-fire” emergencies. Coordinate wall or desk mounted switch style, with the Owner and the AHJ.
        4) This interface shall not depend on the Access Control System Host or Remote Controllers for its operation. Locate interface relays for each stairwell door electrically ahead of the Access Control System lock control, to independently override the Access Control System Control.

    c. Upon authorization by card reader or manual means, “door force” and “door held open” alarms associated with the portals shall be automatically bypassed (prevented from reporting an alarm) for a duration of time that is programmable on an individual door and individual cardholder basis.

d. The door shall re-lock immediately upon closing, after an authorized access, and the bypass duration shall be immediately truncated. A door position switch will be required at every door for this purpose. The same door position switch shall be used to sense the position of the door for “door forced” and “door held open” alarms.
e. Free Egress Authorization

1) Unless otherwise shown on the plans or described herein, the system shall detect the normal egress of a user at any individual portal and shall bypass any alarm associated with the portal for a duration of time that is programmable on an individual door and individual cardholder basis.
2) Timing shall be independently programmed for each portal during the initial enrollment process. This function allows extended timing for disabled persons to pass through a portal.
3) The timing function shall automatically truncate after an adjustable period (0-4 seconds) after a portal is closed. This feature allows a subsequent alarm at the portal to be detected and prevents the portal from being re-opened without an authorized request.
4) “Request-to-Exit” devices shall be used to signal the system that an individual is ready to exit the secured door. Request-to-Exit devices may include but not be limited to:

(a) Integral Lock Handle Signal Switches
(b) Touch Bars (Electro-Mechanical or Electronic)
(c) Push Bars (Mechanical)
(d) Push Buttons

5) On doors with integral electro-mechanical locking mechanisms (strikes, electrical panic hardware, or electrical mortise locks) the mechanical action of the door hardware shall enable egress without requiring release of the electrical mechanism. The Request-to-Exit device shall not unlock the door.
6) On doors with integral electro-mechanical locking mechanisms (magnetic locks), a Request-to-Exit device may unlock the door, releasing the electrical mechanism for the programmed duration. Refer to the drawings for details and direction.
7) On doors with Intercom Systems or Door Release Buttons, the Contractor shall interconnect the intercom system or door release button to activate the Request to Exit function and unlock the door. The door release request contact shall be connected to an input on the Access Control System, such that an event shall be registered into the Access Control System indicating its operation.

f. Sequences: Verify each door type sequence at each door with the Owner.

1) Doors with Door Position Switches (DPS) and Request-to-Exit (REX) Devices:

(a) DPS and REX contacts shall be wired to Access Control System auxiliary input. Configure the Access Control System to mask the associated DPS alarm for a minimum of 45 seconds. Coordinate the required masking duration with the Owner.
(b) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
(c) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended.

2) Doors with Electronic Locking (EL), DPS and REX devices:

   (a) DPS and REX contacts shall be wired to Access Control System auxiliary input. Configure the Access Control System to mask the associated DPS alarm for a minimum of 45 seconds. Coordinate the required masking duration with the Owner.
   (b) Electronic lock shall be wired to Access Control System auxiliary output. Configure the Access Control System to mask the associated DPS alarm during timed or commanded unlock.
   (c) Electric lock shall be locked and unlocked based on preprogrammed schedules and conditions, and by manual control from the Access Control System client workstations.
   (d) Access Control System shall not cause an alarm event when door is unlocked.
   (e) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
   (f) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended during locked mode.
   (g) REX device shall not unlock the door.

3) Doors with Card Access Control (CR), EL, DPS and REX devices:

   (a) CR, EL, DPS and REX devices shall be wired to a door controller board.
   (b) Electronic lock shall be locked on command from the system at any time.
   (c) Electronic lock shall unlock during a preset time zone or from the system.
   (d) Electronic lock shall be unlocked and shall not require use of card reader during timed unlock mode.
   (e) Access Control System shall not report activity when door is scheduled unlocked.
   (f) During locked mode Card Reader shall unlock the door, mask DPS preventing alarm.
   (g) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended.
   (h) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
   (i) REX device shall not unlock door.

4) Doors with Auto-Operators, Proximity CR, EL, DPS and REX devices:

   (a) Auto-Operator controls, CR, EL, DPS and REX devices shall be wired to a door controller board.

5) Electronic lock shall be locked on command from the system at any time.

   (a) Electronic lock shall unlock during a preset time zone.
   (b) EACS shall not report alarm activity when door is unlocked.
   (c) Auto-Operator door dwell times will meet all ADA/DDA requirements.
   (d) Day mode: proximity card reader shall activate the auto operator to open the door.
   (e) Secure mode: Card reader, auto operator function, shall activate the auto door operator at all times.

(f) Card Reader shall unlock the door, mask the DPS device preventing alarm and allow use of door open pushbuttons. Electronic lock to be unlocked prior to door open mechanism is engaged. Where auto door equipment is not provided with door open pushbuttons, the door shall automatically open after unlocking. NOTE: The exterior door open pushbutton should not function without first presenting a valid access card.
(g) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended during locked mode.
(h) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
(i) Use of push plate shall activate the Access Control System REX, unlock the door and operate the auto door system only after a valid card read.
(j) Door shall report a door held open time when REX (push plate or signal from the door operator) is activated, door is opened from the secured side and the system bypass time has expired during locked mode.
(k) Verify interior push plate is operational in both lock and unlocked modes.
(l) Verify exterior push plate is operational during unlocked mode.
(m) Verify exterior push plate is non-operational until valid card read during locked mode.
(n) Verify exterior push plate is operational after valid card read during locked mode.
(o) Verify door can be manually opened during locked mode from secured side.

g. Doors with Auto-Operators, Dual CR (Mag Stripe and Proximity types), EL, DPS and REX devices:

1) Auto-Operator controls, CR, EL, DPS and REX devices shall be wired to a door controller board.
2) Electric lock shall be locked on command from the system at any time.
3) Electric lock shall unlock during a preset time zone.
4) Door shall not report alarm activity when door is unlocked.
5) Secure mode:

(a) Proximity card reader, auto operator function, shall open the door at all times.
(b) During secure mode the card reader shall operate as item e above.

6) Access Control System shall report a “door-held-open” alarm after the door has been opened and the masking duration has ended during locked mode
7) Access Control System shall report a “door forced” alarm when any time the door is opened without a valid REX request. The subsequent operation of an associated REX shall not abort a “door forced” alarm already sensed by the system.
8) Use of push plate shall activate the Access Control System REX, unlock the door and operate the auto door system from the inside; however, the push plate will not operate the door from the exterior (secure) side unless there is a valid access card presented.
9) Door shall report a door held open time when REX (push plate or signal from the door operator) is activated, door is opened from the secured side and the system bypass time has expired during locked mode.
10) Verify interior push plate is operational in both locked and unlocked modes.
11) Verify exterior push plate is operational only during unlocked mode.

12) Verify exterior push plate is non-operational until valid card read during locked mode.
13) Verify exterior push plate is operational after valid card read during locked mode.
14) Verify door can be manually opened during locked mode from secured side.

h. Auto Sliding Doors shall operate similar to Doors with Auto-Operators (as applicable).

1) Contractor to coordinate and confirm door hardware includes electronic remote door locking control capability.
2) Verify sliding door break away feature is not disabled when door is in legal path of egress.

i. Exterior Gates:

1) Insert as defined by hardware group. [Provide gate with electric strike] [Provide gate with electrified mortise handle] CR, EL, DPS, REX wired to input / output / door controller card as required by application.
2) Gate shall operate as described for door with similar access control devices including being tied to the Fire Alarm System via a relay so the gates will unlock on receipt of a fire alarm.

6. Electrical Connections to Door Hardware: Wire connections to door hardware pigtail leads shall be made using the manufacturer-provided quick-connect devices, or by Dolphin insulated dis- placement connectors. Wire nuts and splices are not acceptable.
7. Tamper Devices

a. Terminal cabinets, equipment cabinets, enclosures, power supply cabinets, exposed wireways, and pull and junction boxes with wire connections or splices shall be equipped with tamper switches programmed to report an alarm.
b. Junction boxes requiring tamper switches that are associated with an individual alarmed de- vice (such as a door position switch) may report to the respective device alarm point if end- of-line resistors and the system are configured to support 6-state alarm reporting. Other cabinet and box tamper switches shall report as independent alarm points.
c. Power Supply/Battery Chargers: Power supply/battery chargers shall be connected to alarm monitoring points to provide an "Event" indication of tamper, power failures and other system troubles.

K. Access Control System Connectivity

1. Access Control Network: Access Control Servers, Client Workstations and Controllers shall reside on the Owners' Local Area (LAN) and/or Wide Area Network (WAN) to allow global event activity and shared data interchange.
2. Provide and coordinate with Owner IT adequate network "firewalls" to maintain the security of Access Control System controls and information while connected to shared computer networks and transmission media. Contractor shall coordinate shared resource usage with the Owner, and develop network security schemes acceptable to the Owner to ensure the integrity of the Access Control System.
3. LAN Communications & Connectivity, (Integrated CPU's and Controller's)

a. Provide LAN communications interfaces for the applicable Access Control System Server, Clients and Controllers to support multiple workstation and integration schemes that are part of this work.

b. LAN Communications: Contractor shall utilize the facility's Local Area Network for Access Control System connections and interfaces, as shown on the drawings and described herein.
c. Coordinate with Access Control System equipment and software manufacturers to provide network inter- face devices compatible with the established LAN/WAN network.
d. Coordinate with the Owner's IT Department to provide servers, Access Control System clients, network interface devices, bandwidth utilization, and appurtenances acceptable to the Owner.

4. Controller Communications

a. Between controllers at an individual location, and between controllers located within the same building, the controller network may be implemented using standard, twisted, shielded copper conductors as approved by the system manufacturer. It is also acceptable for controllers to be LAN connected, regardless of location.

L. Duress / Lockdown Alarm System

1. Furnish and install duress / lockdown alarm devices as shown on the Drawings, and as coordinated with final architectural millwork details, millwork shop drawings and consoles.
2. Wire alarm signal circuit using two-conductor twisted, shielded cable per cable specifications. Specified device contains latching L.E.D. Run additional two- conductor cable, dedicated to intrusion detection system, 12VDC power, per cable specifications, to power supply via reset switch at power supply.
3. Each hardwired duress alarm system device shall be wired to an Access Control input panel and intrusion detection remote field input module panels as separate 24 hour security zones.
4. Duress devices associated alarm signal circuitry to be fully supervised for open, short, normal and alarm. Provide required end-of-line resistors to achieve this supervision per manufacturer's specifications. Locate as close to device as possible, preferably in device homerun junction box. Protect wires from button to junction box using miniature Greenfield/stainless steel sheathing.
5. Provide separate 12 VDC, power kill, LED reset switch in security device low voltage power supply cabinet enclosure, and wire duress device LED power through switch. Label switch accordingly.

M. Emergency Standby Power

1. Low-Voltage Equipment: Access Control System Remote Controllers, peripheral devices and Lock Power Sup- plies shall have their own 4-hour battery back-up systems.

a. Power back-up may be in the form of direct DC battery power back-up or by 120VAC Uninterruptable Power Supplies (UPS), depending upon equipment requirements.
b. Lock Power Supplies shall allow fail-secure locks to be operated by the system a minimum of 100 times-per-hour, during this time period. Fail-safe locks shall be maintained for the full 4-hours.
c. Battery back-up systems may be distributed throughout the facility to provide the required emergency power to individual components.
d. Battery back-up systems shall include battery chargers to keep storage batteries at their peak charge.

N. Security System Integration

1. The Contractor shall be responsible for providing hardware and software interfaces to achieve the specified system performance described herein and, by reference, realize absolute and seamless compatibility with the related component systems.
2. The Contractor shall ensure system additions and modifications provided under this scope of work have no negative effect on the individual components and systems, and their core functionality, and no permanent effect beyond that specified or implied by the scope of work.
3. Purpose

    a. Integration is the process of designing, deploying, and configuring independently operating systems with the ability to request, receive, extract, process, and act upon information from other systems.
    b. Successful system integration must address three fundamental issues:

        1) Functionality: What information is needed, how it is to be requested and processed, and what functions or activities need to occur upon receipt of the information.
        2) Connectivity: How systems will be connected to support the communication of information and commands. (Special interfaces, wiring, networks, databases.)
        3) Communication: How information will be communicated between systems. (Instruction sets, language, protocols, formats, priority.)

4. Environment

    a. Integration components shall generally comprise special elements of independent subsystems, and shall be located within, or in close proximity to, the processing components of each independent subsystem. Where subsystems require special hardware or communications interfaces to support integration, the special hardware should be located near the independent subsystem processing components or network appliance, based on the manufacturers' recommendation. See the drawings for details on mounting locations.

5. Infrastructure and Connectivity:

    a. Devices/Appliances: Appliances and devices shall be connected to their respective systems via the applicable communications network.
    b. System LAN/WAN Connectivity: System Servers and microprocessor-based Control Panels, shall reside on the Local Area Network (LAN) or Wide Area Network (WAN) tier designated for integrated components.
    c. Enterprise: LAN networks will be connected to the Wide Area Network, to establish connectivity between remote sites and both the Primary and Alternate Security Operations Center (SOC – room SB05-1).

6. Attributes

    a. The attributes of the integrated environment are primarily defined by the subsystems that are to be integrated. Verify existing system components to be expanded by this project.
    b. Integrated systems comprise the processors, software, electrical control panels, data gathering panels, special data interfaces, and converters required to allow systems to communicate with each other, process information, and allow users to program and perform operations.

7. Functions

a. The system shall provide the following automated processing rules, at a minimum:
b. The object of “Access Control system integration” is to automatically configure the system to display, record, and report appropriate system activity to various elements of the system. Automatic configuration can free operators from difficult control tasks, give the operator more time to respond to events, reduce operator error, and ensure critical system tasks occur consistently.
c. Electronic Access Control system elements shall be electronically integrated in such a way as to enable detection, database records and/or event-initiated instructions to be communicated between system components, to initiate recording, display, communication, and control activities.
d. Event-Initiated Interface, General:

1) The system shall support the capability to send and receive alarm and control messages between the Access Control System and video systems via a LAN communications link, using API, XML, or other industry-standard communication languages and formats, and shall act upon those messages received.
2) The system shall support the capability to send and receive alarm and control messages and alarm signal between the Access Control system and Intrusion Detection System for lockdown / duress / and panic button initiation.
3) Where integration may require the implementation of data interfaces, Contractor shall propose such integration to the Owner for approval, before proceeding with the work.
4) Software routines required to accomplish the required data-interface with external equipment and controls will be fully developed, installed, tested and supported by the Contractor.
5) The manufacturer of each applicable system will also support the data interface and will be engaged by the Contractor to provide on-site technical assistance where required to prepare, repair, configure, and test the system to operational condition.
6) Communication of event information between systems shall take place automatically and immediately when the event is sensed by the System.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified testing agency to perform tests and inspections with the Owner and appointed project manager.
B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least fourteen (14) days. Provide a minimum of ten (10) days notice of test schedule.

4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

E. Access Control System shall be considered defective if it does not pass tests and inspections.
F. Prepare test and inspection reports.

3.04 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.
B. Clean installed items using methods and materials recommended in writing by manufacturer.
C. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Division 01 – Closeout Submittals for Closeout Submittals.
B. Demonstration: Demonstrate proper operations of system to Owner and correct deficiencies or make adjustments as directed.
C. Training:

1. By means of training classes augmented by individual instruction as necessary, the Bidding contractor shall fully instruct the BOE's designated staff and personnel in the operation, adjustment and maintenance of all products, equipment and systems.
2. General Training Requirements:

a. The security contractor shall submit proposal to conduct training courses for the security personnel in the operation and maintenance of the security systems within this security project.
b. The security contractor shall include training manuals and aids in the quantity as requested by the Owner. The training manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. All personnel providing the instructions shall be certified by the equipment manufacturer for all applicable hardware and software.
c. Approval of the planned training content and training schedule shall be obtained by the Owner at least 45 days before the training is scheduled.
d. Training shall be provided by qualified, factory trained and certified engineers familiar with each system and its operations and shall be provided at the site for a period of no less than the hours stipulated below.

3. Training Topics:

a. System Administration Training

1) This training shall focus on determining and implementing system operational parameters.
2) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. 8 Hours of Administration training; (2) 4-hour classes.
3) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing.

The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of training; (2) 3-hour classes.

4) This Administrations training shall include:

(a) Overall architecture and configuration of each system.
(b) Use of all system functions.
(c) ID badging design and production.
(d) Card-holder setup and configuration.
(e) Card-holder access level assignment.
(f) Access Door programming.
(g) Alarm setup and implementation.
(h) Data storage and retrieval through reports.
(i) Creation of reports.
(j) System database backup procedures.
(k) Hardware specifications.
(l) Fault diagnosis and corrections.

b. System User Monitoring Training

1) This training shall be for each designated personnel at this school.
2) This training shall focus on day-to-day system operations. Each user shall be capable to start the systems, operate them, recover the systems after a failure, and describe the specific hardware architecture and operation of the systems.
3) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. All System User Training shall be performed at each school within this specification. 8 Hours of User training; (2) 4-hour classes.
4) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of User training; (2) 3-hour classes.
5) Training shall include:

(a) Use of overall system monitoring functions as determined by the security administration staff.
(b) Monitoring alarm events.
(c) Monitoring personnel access into the facility.
(d) Assessing, responding to, and clearing alarms and messages.
(e) Monitoring access door status.
(f) Running routine reports.
(g) General hardware architecture.
(h) Functional operation of each system and interaction between these systems.
(i) All Operator commands.
(j) Database entry.
(k) Report generation.
(l) Alarm assessment.
(m) Simple diagnostics.

c. System Troubleshooting and Maintenance Training

1) Training shall be provided with the internal features and configuration of the security systems so the user can trouble shoot and repair most configuration and physical device problems.

2) The training class shall be conducted so that it is completed approximately 14 days prior to acceptance of the system and final reliability testing. The users shall be included as part of this reliability testing. 8 Hours of training; (2) 4-hour classes.
3) This training shall include:

(a) System networking communications and diagnostics.
(b) Device configuration and programming.
(c) Controller setup.
(d) Wiring and cabling overview.
(e) System Diagnostics.
(f) Software troubleshooting.
(g) Physical layout of each piece of hardware.
(h) Preventive maintenance procedures and schedules.
(i) Calibration procedures.

d. IT Training

1) Training shall be provided information of the security systems to the IT staff. This shall include information as to how each system functions within the LAN/WAN network infrastructures. 4 Hours of training.
2) Topics shall include:

(a) Network topologies.
(b) Maintenance of data security.

4. Training hours and sessions must be documented by the instructor and approved by the Owner before project closeout.
5. Should the training be deemed as inadequate by the Owner, the owner reserves the right to retain outside manufacturer training. If this outside manufacturer training has an associated cost, this cost shall be deducted from the final invoice of this project.
6. The Owner reserves the right to request the Contractor to videotape training sessions and turn over video records (DVD format) to Owner as part of the “Owner Project Manuals” and Deliverables.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

A. See Division 01 – Execution and Closeout Requirements for additional requirements relating to maintenance service.
B. Adjustments:

1. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

a. Check cable connections.
b. Check proper operation of access control devices.
c. Provide a written report of adjustments and recommendations.

C. Provide to Owner, at no extra cost, a separate maintenance contract for the service and maintenance of the Access Control System for One Year from date of Substantial Completion. Include a separate description of preventative maintenance, systematic examination, cleaning, inspection, and testing, with a detailed schedule.
D. Conduct site visit at least once every three months to perform inspection, testing, and preventative maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.
E. Provide trouble call-back service upon notification by Owner:

    1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
    2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at the site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION 281300

SECTION 281600 - INTRUSION DETECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”
B. Refer to the following construction documents for Data Room locations and device locations only.

1. “TY” Drawings – Technology Plans

1.2 SUMMARY

A. The scope of work required as part of this project shall include a new intrusion detection system installed into the school.
B. Section Includes:

1. Control Panel
2. Motion Sensors
3. Door Contacts
4. Intrusion detection devices

C. These specifications contain the functional and operational requirements for an integrated intrusion alarm system employing motion detection devices and door contacts as the primary means of intrusion detection for selected interior protection. This procurement shall include all the equipment required at various facilities as shown on the Drawings.
D. Responsibility for the integrated security systems and equipment is specified in the following sections and shall be coordinated with the finish door hardware and Fire Alarm sections.
E. The intrusion system is intended to provide protection of selected facilities against intrusion and for the detecting or discouraging of burglary or vandalism during the hours the facilities are unoccupied and report signal to the Central Station.
F. General: Provide and install an integrated security system and all devices, terminations, associated supporting devices, configuration of system, testing and training in accordance with this Bid package to provide a complete and functional system.
G. The cabling shall be provided and installed by the contractor awarded this project and as described within the construction bid document and referenced on the drawings associated with this bid package. All other cabling required to provide a complete and functional system shall be furnished and installed by the Contractor awarded this portion of work.
H. This specification is used to identify the requirements for integrated Burglar entry systems encompassing door contacts and motion detectors.
I. Responsibility for the integrated security systems and equipment is specified in the following sections and shall be coordinated with the Finish Hardware and Fire Alarm sections of the Phase I Construction.
J. It is the intent of these specifications to procure a fully acceptable, effective and reliable integrated security system. Refer to the Drawings for division of responsibility. These specifications recognize the importance of complete system operation and are not limited to specifying of equipment only. The following are also required from the selected bidder:

1. Proven experience in the security business.
2. Prompt delivery and professional installation including service of equipment as specified.
3. Bidder must provide, for objective evaluation, references, which clearly state and show the effectiveness of proposed equipment and services.
4. Used products will not be acceptable. Manufacturer must satisfactorily demonstrate that he has supplied and will continue to supply products to avoid the obsolescence of equipment installed in the building.
5. All equipment shall be fully guaranteed for twelve (12) months. This guarantee shall become effective from the day of installation completion. When in normal operation, if the equipment is found to be below the manufacturer's specification, repair and replacement of equipment shall be provided. Repairs shall be started within twenty-four (24) hours and completed without delay. Installation contractor shall either stock spares or be capable of obtaining all required replacement parts within twenty-four (24) hours.
6. Extended warranty terms shall be provided by the installing security system integrator at the time of bid.

1.3 SYSTEM DESCRIPTION

A. The system shall be a Intrusion Detection System that includes the following capabilities:

1. Supports up to 128 zones.
2. Supports up to eight (8) separate partitions.
3. Supports up to one hundred fifty (150) users.
4. Provides integrated security, access control, and CCTV switching capability.
5. Provides supervision of peripheral devices.
6. Supports up to ninety-six (96) optional relay outputs.
7. Supports long-range radio (LRR) communication.
8. Provides scheduling capability to allow for automated operations.
9. Supports up to eight (8) alphanumeric paging devices.
10. Supports panel linking.
11. Supports alarm reporting via Internet.
12. Interfaces with automation software.
13. Capable of being installed using existing wiring.

1.4 APPLICABLE STANDARDS

A. All of the work within the scope of this bid shall be performed in accordance with the applicable state, county and city laws and ordinances. The bidder shall be able to obtain all permits and licenses as required in addition to being a licensed contractor. All materials, supplies and equipment being furnished shall be installed in accordance with the latest version of the applicable standards of:

1. OSHA
2. Uniform Building Code
3. Americans with Disabilities Act (ADA)
4. Components of the system shall be of the type approved by Safety and Regulatory Agencies including:

    a. Underwriters' Laboratories (UL), Inc.
    b. Federal Communications Commission (FCC).
    c. Agency approvals and UL Listing declare the system's design, components, and installation shall meet the highest standards.
    d. System installation shall comply with UL 681 and UL 611.

5. Alarm detection systems intended for UL certified fire alarm reporting shall meet the requirements of UL Standard 985, NFPA Standard 72 Chapter 2.
6. The equipment shall comply with Part 68 of the FCC Telephone Requirements Rules.
7. All circuits and equipment shall be installed and protected according to the National Electric Code and any applicable local requirements.

1.5 DEFINITIONS

A. LCD: Liquid-crystal display.
B. LED: Light-emitting diode.
C. PIR: Passive infrared.
D. RFI: Radio-frequency interference.
E. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.

1.6 SUBMITTALS

A. Product Data: Components for sensing, detecting, systems integration, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.

1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify programmable logic controllers, networks, and control interface devices and media to be used. Describe characteristics of network and other data communication lines.
2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection and for systems integration. Include designation of devices connected by raceway, raceway type, and size, and type and size of wire and cable fill for each raceway run.
3. Device Address List: Coordinate with final system programming.
4. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
5. Sensor detection patterns and adjustment ranges.

C. Equipment and System Operation Description: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are not acceptable.
D. Field quality-control test reports.
E. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Data for each type of product, including features and operating sequences, both automatic and manual.
2. Central-station control-unit hardware and software data.

F. Warranty: Special warranty specified in this Section.

G. In the event that the installation contractor does not furnish or does not supply sufficient documentation, the owner has the right to engage a separate contractor to attain any or all required documentation. All costs related with this event shall result in a back charge to the installation vendor via a change order.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
3. A copy of the Contractors Certified Installers Certificate shall be furnished with bid response.

B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and/or Installer who has completed systems integration work for installations similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. FMG Compliance: FMG-approved and -labeled intrusion detection devices and equipment.

E. Comply with NFPA 70.

F. Electrical Power

1. Normal System Power Supply: 120V, 60Hz, through a locked disconnect device and an isolation transformer in a central-station control unit. Central-station control unit shall supply power to all components connected to it unless otherwise indicated.
2. Power Continuity for Central-Station Control Units: Batteries in power supplies of the central-station control unit and individual system components shall maintain continuous system operation during outages of both the normal and backup ac system supply.

   a. Batteries: Rechargeable, valve-regulated, recombinant, sealed, lead-acid type with nominal ten (10) year life expectancy. Capacity adequate to operate portion of system served, including audible trouble signal devices for up to four (4) hours and audible and visual alarm devices under alarm condition for an additional ten (10) minutes.
   b. Battery Charger: Solid-state fully automatic, variable-charging-rate type. Charger shall recharge fully discharged battery within twenty-four (24) hours.

G. Annunciation: Indicate a change in system condition and switching of system or component to backup power.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fails in materials or workmanship within specified warranty period.

1. Warranty Period: The standard manufacturer’s warranty shall apply or a minimum of a one (1) year warranty from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers:

1. Digital Monitoring Products Incorporated (DMP)
2. Bosch G Series Panels
3. The main panel shall be sized to accommodate all the devices within the plans for each school and include an additional headroom of forty percent (40%) expansion.

2.2 CONTROL PANEL

A. Bosch #B9512G or Equivalent

1. QTY (1)

2.3 KEYPAD

A. Bosch #B920 or Equivalent

1. QTY (A/R)

2.4 EXPANSION MODULE

A. Bosch #D299 or Equivalent

1. QTY (A/R)

B. Bosch D9127 or Equivalent

1. QTY (A/R)

2.5 COMMUNICATION DEVICE

A. BOSCH #B44-V
B. BOSCH #B430

2.6 MOTION SENSORS

A. Ceiling Mount: Bosch #DS9370

1. QTY (A/R)

B. Wall Mount: Bosch #ISC-CDL1-W15G

1. QTY (A/R)
2. Include Gimbal Mounting Bracket

2.7 DURESS BUTTON

A. Sentrol #3050

2.8 ENCLOSURE

A. The Control Panel shall be enclosed in a metal cabinet, suitable for wall mounting. The dimensions shall not exceed 14.5 inches in height, 12.5 inches in width or 3 inches in depth.

2.9 ELECTRICAL POWER REQUIREMENTS

A. System Power – The Fire and Burglary Alarm System shall operate using standard 120 volts AC, 50/60 Hz power.

1. Control Primary Power – Transformer power shall be 16.5 VAC, 40VA.
2. Backup Battery – A rechargeable 12 VDC, gel type, lead acid backup battery shall be provided. The battery shall be rated between 7 and 34- ampere hours (AH).
3. Alarm Power – Alarm power shall be 12 VDC, 1.7 amps for each bell output
4. Auxiliary Standby Power – Standby power shall be 12 VDC, 750 mA maximum.
5. Fusing – The battery input, auxiliary, and bell outputs shall be protected using PTC circuit breakers. All outputs shall be power limited.

2.10 SUBSTITUTIONS

A. Substitution of any item shall only be permitted when the Owner waives the specification(s) of a particular product(s) in writing, allowing a substitute item to be bid. It shall be the responsibility of the Contractor requesting the substitution that the proposed item is equivalent in each and every way to the originally specified product stated within this bid specification and drawing package and that it is in the best interest of the Owner to use the proposed substitute.

PART 3 - EXECUTION

3.1 COMMISSIONING OF SYSTEMS AND EQUIPMENT

A. Engage a factory-authorized service representative or technician who is familiar with this project to participate and assist, if necessary, in the functional performance testing of the equipment include in this Division with the Commissioning Agent.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of intrusion detection.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.

B. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.

1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Re-inspect after repairs or replacements are made.
2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.

C. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SYSTEM INSTALLATION

A. The System shall be installed and tested in accordance with the Manufacturer's Installation instructions. The following conditions are applicable:
B. In order to ensure a complete, functional System, for bidding purposes, where information is not available from the Owner upon request, the worst case condition shall be assumed.
C. Interfaces shall be coordinated with the Owner's representative, where appropriate.
D. All necessary backboxes, pullboxes, connectors, supports, conduit, cable, and wire shall be furnished and installed to provide a complete and reliable System installation.
E. All conduit, cable, and wire shall be installed parallel and square with building lines. Conduit fill shall not exceed forty percent (40%). All wires shall be gathered, labeled and tied to create an orderly installation.
F. Comply with UL 681.

3.4 WIRING INSTALLATION

A. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
B. Wires and Cables:

1. Conductors: Size as recommended in writing by system manufacturer, unless otherwise indicated.

C. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
D. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.
E. Identify components with engraved, laminated-plastic or metal nameplate for central-station control unit and each terminal cabinet, mounted with corrosion-resistant screws.

3.5 GROUNDING

A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding. Provide 5-ohm ground. Measure, record, and report ground resistance.
C. Install grounding electrodes of type, size, location, and quantity indicated.

3.6 FIELD QUALITY CONTROL

A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.

B. Perform the following field tests and inspections and prepare reports:

1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
2. Operational Tests: Schedule tests after pretesting has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.
3. Electrical Tests: Comply with NFPA 72, Section A-7. Minimum required tests are as follows:

a. Verify the absence of unwanted voltages between circuit conductors and ground.
b. Test all conductors for short circuits using an insulation-testing device.
c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit on Record Drawings.
d. Verify that each controller is in normal condition as detailed in manufacturer's operation and maintenance manual.
e. Verify that transient surge-protection devices are installed according to manufacturer's written instructions.
f. Test each initiating and indicating device for alarm operation and proper response at central-station control unit.

C. Report of Tests and Inspections: Prepare a written record of tests, inspections, and detailed test results in the form of a test log.
D. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within twelve (12) months of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three (3) visits to Project during other than normal occupancy hours for this purpose. Visits for this purpose shall be in addition to any required by warranty.

3.8 CLEANING

A. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.
B. Clean installed items using methods and materials recommended in writing by manufacturer.

3.9 DEMONSTRATION – TRAINING

A. By means of training classes augmented by individual instruction as necessary, the Bidding contractor shall fully instruct the BOE's designated staff and personnel in the operation, adjustment and maintenance of all products, equipment and systems.
B. The Contractor shall be required to provide all training aids, e.g., notebooks, manuals as required.
C. All training shall be completed a minimum of two (2) weeks prior to system cut over. Training schedule shall be subject to the Owner approval.
D. Training shall be conducted by experienced personnel and supported by training aids. An adequate number and amount of training material shall be provided by the Contractor. The following is considered a minimum.

    1. Functional flow-charts, overall block diagrams, and descriptive material for all software;
    2. Schematic drawings for each of the hardware components;
    3. All procedure manuals, specification manuals, and operating manuals;
    4. As-built drawings.

E. Bidding contractor shall engage a factory-authorized service representative to provide formal training the Owner's maintenance personnel to adjust, operate, and maintain this Intrusion Detection system.
F. Training shall include the following:

    1. User Training; Eight (8) hours of instruction to the users at EACH school within this project shall be included as part of this specification. Eight (8) hours of instruction per school is required.
    2. Administrator Training; Twenty four (24) hours of advanced system administration training to the administrator of this system shall be included as part of this specification.
    3. All training shall be divided up into four (4) hour sessions as mandated by the Owner.

G. Training hours and sessions must be documented by the instructor and approved by the Owner before project closeout.
H. Should the training be deemed as inadequate by the owner, the owner reserves the right to retain outside manufacturer training. If this outside manufacturer training has an associated cost, this cost shall be deducted from the final invoice of this project.

END OF SECTION 281600

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SECTION 282300 - VIDEO SURVEILLANCE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. System Requirements
B. Uninterruptible Power Supplies
C. Surge Protection
D. Client Workstations
E. Cameras
F. Video Surveillance Software

1.3 RELATED REQUIREMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.” OR Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Division 07 - Firestopping.
C. Division 08 - Door Hardware: Electrically operated door hardware, for interface with access control system. Includes door hardware with integral request to exit devices.
D. Division 26 - Grounding and Bonding for Electrical Systems.
E. Division 26 - Conduit for Electrical Systems.
F. Division 26 - Identification for Electrical Systems: Identification products and requirements.
G. Division 27 - Structured Cabling: Data cables for access control system IP network connections.
H. Division 28 – Access Control: For interface with access control system.
I. Division 28 - Intrusion Detection: For interface with access control system.
J. Division 26 - Fire Detection and Alarm: For interface with access control system.
K. Refer to the following construction documents for Data Room locations and device locations only.

    1. “TY” Drawings – Technology Plans

L. Any apparatus, appliance, material, or work not shown on the Drawings but mentioned in the Specifications, or vice versa, and any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be provided without additional expense. Coordinate with each system manufacturer to insure all hardware, firmware, relays, or other necessary components are provided prior to bid submission.

M. All work of this Section to comply with the requirements of the Conditions of Contract, with all Specification Sections of Division 01 – General Requirements, with the Security Drawings, and with all other Contract Documents.
N. Refer to Division 26 of the Contract Documents, Electrical, for all Specifications governing the installation of raceway (conduit, EMT, cable trays, wire trough, etc.), system junction and pull boxes, and device rough-in boxes, for all Security System work shown on the Security Drawings. Conduit, back box, and trough work to be provided by this Contractor.
O. Refer to Division 26 of the Contract Documents, Electrical, for all work related to the interconnection of Security System equipment to 120 VAC power sources.
P. Refer to Division 09 of the Contract Documents, Finishes, for details relating to acoustical ceilings and gypsum board systems, floor finishes, painting, etc., for information pertinent to device and back box selection and installation.
Q. Refer to Division 08 of the Contract Documents, Openings, for details relating to doors, door frames, windows, and window frames, for information pertinent to the selection of magnetic contact devices and their associated placement and installation, including back box selection and installation.
R. Refer to Division 08 of the Contract Documents, Openings, for details relating to door and door frame hardware and preparation, electrified lock power supplies, required coordination to accommodate these components and/or systems, lock voltage and current draw coordination, coordination of fail-safe electrified locks, and any other related equipment or requirements
S. Refer to Division 27, Telecommunications for all Ethernet Cabling for the Cameras.
T. Review all other Specification Sections as required to achieve complete inter- trade coordination.

1.4 DEFINITIONS

A. API: Application Programming Interface
B. AVI: Audio Video Interleave
C. CA: Certificate Authority
D. CAC: Common Access Card
E. CE: European Union Conformity
F. CPU: Central Processing Unit
G. CSV: Comma Separated Values
H. DNS: Domain Name Server
I. DSM: Door Status Monitor
J. DVR: Digital Video Recorder
K. EACS: Electronic Access Control System
L. FCC: Federal Communications Commission
M. FIPS: Federal Information Processing Standard
N. FIFO: First In – First Out
O. FTP: File Transfer Protocol
P. FRAC: First Responder Authentication Credential
Q. GB: Gigabyte
R. GSOC: Global Security Operations Center
S. GUI: Graphical User Interface
T. HA: High Availability
U. HTML: Hypertext Markup Language
V. H.264, H.265: Video Compression Standards
W. I^2C: Inter-Integrated Circuit
X. IEEE: Institute of Electrical and Electronics Engineers
Y. I/O: Input / Output
Z. IP: Internet Protocol
AA. IS: Integrated System
BB. JPEG: Joint Photographic Experts Group

CC. LAN: Local Area Network
DD. LDAP: Lightweight Directory Access Protocol
EE. MB: Megabyte
FF. MJPEG: Motion JPEG
GG. MSATA: Mini-Serial Advanced Technology Attachment
HH. MSP: Mobile Security Professional
II. MTBF: Mean-Time Between Failure
JJ. NAS: Network Attached Storage
KK. NAT: Network Address Translation
LL. NBAPI: NetBox Application Programming Interface
MM. NECA: National Electric Code Association
NN. NFPA: National Fire Protection Association
OO. NVR: Network Video Recorder
PP. ODBC: Open Database Connectivity
QQ. OS: Operating System
RR. OVID: Open Video Integration Driver
SS. PDF: Portable Document Format
TT. PIN: Personal Identification Number
UU. PIV: Personal Identity Verification
VV. PoE: Power over Ethernet
WW. PTZ: Pan-Tilt-Zoom
XX. RAID: Redundant Array of Independent Disks
YY. RAM: Random Access Memory
ZZ. REX: Request to Exit
AAA. RFID: Radio Frequency Identification
BBB. RoHS: Restriction of Hazardous Substances
CCC. ROM: Read Only Memory
DDD. RU: Rack Unit
EEE. SFTP: Secure File Transfer Protocol
FFF. SHA: Secure Hash Algorithm
GGG. SIO: Serial Input / Output
HHH. SLA: Sealed Lead-Acid
III. SMS: Security Management System or Short Message Service (text messaging)
JJJ. SSL: Secure Sockets Layer
KKK. SUSP: Software Upgrade and Support Plan
LLL. TCP: Transmission control protocol - connects hosts on the Internet
MMM. TIA: Telecommunications Industry Association
NNN. TLS: Transport Layer Security
OOO. TWIC: Transportation Worker Identification Credential
PPP. UI: User Interface
QQQ. UPS: Uninterruptible Power Supply
RRR. UTP: Unshielded Twisted Pair
SSS. VMS: Video Management System
TTT. WAN: Wide Area Network
UUU. Wi-Fi: Wireless Network
VVV. AS NECESSARY: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.
WWW. AS REQUIRED: Shall mean work which is required for completed construction, but is not necessarily shown or described in the Contract Documents.
XXX. Substantial Completion: Shall mean that the project is sufficiently complete to be utilized for its intended use as stated in the body of this written specification.
YYY. Contractor/INTEGRATOR: Refers to the biding/installation Contractor responsible for furnishing and installation of all work indicated within this specification.

1.5 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices; current edition.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
C. NECA 303 - Standard for Installing Closed- Circuit Television (CCTV) Systems; 2005.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
E. System shall be RoHS (Restriction of Hazardous Substances) compliant and meet proposed amendments to the reduction of toxic substances in manufacturing in stated in the Environmental Design of Electrical Equipment Act (EDEE).
F. Installation shall comply with NECA 1-2010 “Standard Practice of Good Workmanship in Electrical Construction”
G. Installation shall comply with NEC/NFPA 70E “Standard for Electrical Safety in the Workplace”
H. Electronic data exchange between Video Surveillance System and the Access Control System shall comply with SIA TVAC
I. Installation shall comply with FCC CFR 47 Part 15 Class A “Telecommunications, Radio, Frequency, Digital Device Emission:
J. Installation shall comply with Federal, State, and Local Codes and Authority Having Jurisdiction (AHJ).
K. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.
2. Conduct meeting with facility representative and other related equipment manufacturers to discuss video surveillance system interface requirements.

C. Confidentiality of Documents

1. The project documents, consisting of all technical proposals, drawings, specifications, shop drawings, as-built drawings, manufacturer’s literature, etc., shall be considered proprietary information and are to be treated with complete confidentiality. Dissemination of any security system documentation to any party not considered “need-to-know” without a pre-defined and approved agreement will be considered a violation of the contract documents and all pursuant clauses regarding financial penalties, project termination, and/or legal prosecution will apply. The Contractor is to obtain a list of “need-to-know” parties from the Owner and/or Construction Manager.
2. Use of the Contract drawings and specifications is restricted to the original site for which they were prepared. Publication therefore is expressly limited to such use. Re-use, reproduction, storage by any medium or publication by any method in whole or in part is

prohibited. Visual contact with the Contract drawings and specifications constitutes prima facie evidence of the acceptance of these restrictions. Unlawful publication, dissemination, and use of these documents carry significant liability and the Owner maintains the right to legally pursue restitution and/or penalty for violation of these confidentiality conditions.

3. All documents marked “DO NOT DUPLICATE” are to be returned to the Construction Manager for proper disposal and handling upon completion of their relevant use.

1.7 SUBMITTALS

A. See Division 01 – Administrative Requirements for submittal procedures.
B. Evidence of Qualifications for Installer:

1. The Contractor shall be a bona fide security systems contractor, licensed by the State of Connecticut for the installation of the low voltage security and signal communication systems, and engaged in security system maintenance, service and contracting for at least the last five years.
2. The Contractor shall employ technicians who have been trained by the Manufacturer specified within this section to install the systems of this Manufacturer.
3. The contractor shall be a factory authorized stocking distributor of the manufacturer of the equipment included in the system so that immediate replacement parts can be made from inventory and service provided as needed on an emergency basis.
4. The Contractor shall submit with the bid a manufacturer’s certificate of acceptance of the qualifications of the Installing Contractor to install, test, maintain and repair the manufacturer’s equipment.
5. In order for the Security Consultant to verify that they meet the competency requirements of this specification, Contractors must submit the following information if so requested:

    a. Proof that the Contractor has installed, services and maintained similar security systems for a minimum of ten (10) years.
    b. Proof that the Contractor is a firm which currently and regularly installs, services and maintains security systems as a full time business.
    c. The names and qualifications of security system technicians that shall perform and supervise the work, and perform tests or adjustments on the systems and equipment. Qualifications shall include all schooling, training, and history of work experience.
    d. A list of four prior systems comparable to the one specified under this contract which were installed, serviced, and maintained satisfactorily by the Contractor for a minimum of one (1) year. Each system listed shall include the firm or owner, location, person to contact (with telephone number), date of installation and service period, and a brief description of the system and work performed on the system.

6. The Contractor shall submit any other information required by the Security Consultant to determine the competency of the Contractor. If this information is not submitted as requested, it shall be submitted within the time specified by the Architect after the bid opening. If the Contractor fails to submit the information in accordance with the Security Consultant’s request, the Contractor shall be declared non-responsive, and may be rejected to perform the work specified within this section.

C. Design Data: Standby battery/UPS Calculations
D. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instruction for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Manufacturer's detailed field-testing procedures.
F. Maintenance contracts.
G. Product Data: Provide details and technical specifications for each product indicated. Include physical dimensions, features, performance, electrical characteristics, ratings, software versions, and operating system details.
H. Shop Drawings:

1. General: General: Bid documents, including drawings, details and specifications are considered conceptual in nature, and provide direction on products and project requirements. Contractor is given a choice of methods that may be incorporated into the system. These choices may affect the overall design, configuration and installation of the proposed system.
2. Contractor Responsibility: Prepare and submit shop drawings, rendered in the latest AutoCAD DWG file format, which show details of all work to ensure proper installation of the work using those materials and equipment specified or allowed under the approved plans and specifications. A complete Shop Drawing submittal drawing package shall consist of Drawings, Equipment Data Sheet Submittals, and an Acceptance Testing Plan.
3. Completeness: The Equipment Submittals, Acceptance Testing Plan, and the Shop Drawings should be submitted as a complete and contiguous package. Partial or unmarked submittals will not be accepted for review.
4. Scheduling: A schedule of shop drawing submissions shall be submitted for the Architect and Owner's Representative review on a form acceptable to the Architect within ten (10) days after award of the Contract. The schedule of shop drawing submissions shall include as a minimum, but not limited to the requirements stated herein.
5. Requirements: Provide the following information complete, and in the manner described herein:

a. Hardware, Application Software, and Network Requirements: A system description including analysis and calculations used in sizing equipment required by the security systems. The description shall show how the equipment will operate as a system to meet the performance requirements of the systems. The following information shall be supplied as a minimum:

1) Server(s) processor(s), disk space and memory size
2) Workstation(s) processor(s), disk space and memory size
3) Description of facility (field) control equipment (Controllers/Field Panels, Models) and their configuration
4) Operating System(s) Software, where software is provided or upgraded
5) Application Software, with Optional and Custom Software Modules supplied in this project
6) Integration Schemes: Proposed connectivity, software, development requirements, and SDK information, for inter-system communication.
7) Network bandwidth and reliability requirements
8) Number and location of LAN ports required
9) Other specific network requirements, preferences, and constraints
10) Backup/archive system size and configuration
11) Start-up operations
12) System power requirements and Uninterruptible Power Supply (UPS) sizing
13) Device/component environmental requirements (cooling and/or heating parameters)

b. Shop Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly present the following information:

1) Title Sheet

2) Floor Plans: Showing devices, pull boxes, cabinets, conduits and conductors in their proposed locations with device numbering scheme.
3) Riser Diagram: Showing all conduit relationships between devices shown on the Floor Plans. Show all power sources.
4) Single-Line/Block Diagrams: Show signal relationships of controls and devices within the system.
5) Custom Assembly Diagrams: For each custom assembly such as Access Control Terminal Cabinets, receptacle assemblies, or door control panels, provide an assembly drawing illustrating the appearance of the assembled device. Include dimensions, assembly components, and functional attributes (momentary or alternate action switch, lens color, panel finish)
6) Component Connection Diagrams

For each equipment component such as a computer, video switcher, camera or video recorder, show the rear elevation of the device and all connectors/terminations as a pictorial.
Show the wire designations on connectors. Typical wiring detail where multiple of same device is provided.
Show a schedule of the wire colors connected to the pins on each device connector.

c. Equipment Wiring Diagrams

1) Show a pictorial illustration of each equipment enclosure and/or terminal cabinet, including terminals, components and wiring devices.
2) Show the device nomenclature exactly as shown on the single line diagrams.
3) Terminations: Show every termination and terminating cable, with applicable cable and wire numbers matching the single line diagrams.

Every termination in the system must be documented.
Termination information may be rendered as a wiring list(s), if properly coordinated with, and referenced to, typical component and single-line diagrams. Otherwise, the Shop Drawings shall show a pictorial of every component in the system, with its terminations.

4) Show wire colors for each terminal.
5) For each wire exiting the enclosure, show the destination of the wire by floor, room number and the drawing number of the panel where the wire terminates.
6) Provide working dimensions and erection dimensions.
7) Arrangements and sectional views
8) Necessary details, including complete information for making connections between work under this Contract, existing work, and work under other Contracts.
9) Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
10) Duplicate of design drawings may be used where each sheet is modified to reflect contractor coordination, specific requirements of the project and multidiscipline conditions.
11) Each Drawing or page shall include:

Project name, Project Number and descriptions.
Submittal date and space for revision dates.
Identification of equipment, product or material.
Name of Contractor and Subcontractor.
Name of Supplier and Manufacturer.
Relation to adjacent structure of material.
Physical dimensions clearly identified.

ASTM and Specifications references.
Identification of deviations from the Contract Documents.
Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
Location at which the equipment or materials are to be installed. Location shall mean both physical location and location relative to other connected or attached material.

d. Equipment Submittals

1) Provide a Title Page, with project name, Contractor’s name and address, contact information, date of submission, and submission revision number.
2) Provide a Parts List, for proposed equipment, materials, components and devices, listing the following information for each line item:

The system type
Model number
Specification sheet page reference

3) Provide Manufacturers Specification Sheet with descriptive information for equipment, materials, components and devices. Number each page, to correspond with the Parts List.
4) Clearly delineate (with highlighter, arrow, or underline) on each specification sheet, specific model numbers, options and configurations being proposed for this project.
5) Indicate kinds of materials and finishes for equipment where more than one option is presented.

e. Acceptance Testing Plan

1) Submit a written document detailing the test procedures to be followed in evaluating and proving the installed system(s).
2) Provide a sample of the test forms to be used for each system and for each component of each system.
3) Include all tests required by the equipment manufacturer and by this Specification

f. Spare Parts List: Submit a list of recommended spare parts for Owner’s review & approval and/or amending. Spare parts shall comprise a minimum of 5% or minimum of 2 each of field devices, device termination boards and a minimum of 1 system controller boards.
g. Incomplete or unchecked submittals which do not contain complete data on the work and full information on related matters will be returned for correction.
h. Verification: The contractor shall check and acknowledge all shop drawings and shall place his signature on all shop drawings submitted for approval. Contractor's signature shall constitute a representation that all quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents.
i. Timeliness: The Contractor shall schedule, prepare and submit a complete shop drawing assembly in accordance with a time-table that will allow his suppliers and manufacturers sufficient time to fabricate, manufacture, inspect test and deliver their respective products to the project site in a timely manner so as to not delay the complete performance of the work.
j. Departure from Contract Requirements: If shop drawings show departures from the Contract requirements, the Contractor shall make specific mention thereof in

his letter of transmittal, otherwise review of such submittals shall not constitute review of the departure. Review of the drawings shall constitute review of the specific subject matter for which the drawings were submitted and not of any other structure, materials, equipment, or apparatus shown on the drawings.

k. Contractor Responsibility: The review of shop drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such drawings, nor for the proper fitting and construction of the work, nor for the furnishing of materials or work required by the Contract. No construction called for by shop drawings shall be initiated until such drawings have been reviewed and approved.

l. Shop Drawing Submittal Review: The procedure in seeking review of the shop drawings shall be as follows:

1) The Contractor shall submit four (4) complete sets and/or electronic PDFs of shop drawings with equipment submittals and other descriptive data with one copy of a letter of transmittal to the Architect for review thirty (30) working days after award of the contract. The letter of transmittal shall contain the project name, Architect's Project Number, the name of the Contractor, the list of drawings submitted including numbers and titles, requests for any review of departures from the contract requirements and any other pertinent information. Drawings submitted for review shall be full-sized and included with the equipment submittals.
2) Drawings or descriptive data will be stamped "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected" or 'Submit Specific Item' and one copy with a Letter of Transmittal will be transmitted to the Contractor with the return of submitted documents.
3) If a shop drawing or data is stamped "Reviewed" or "Furnish as Corrected", no additional submittal is required for that shop drawing.
4) If a shop drawing or data is stamped "Revise and Resubmit" or "Rejected", the Contractor shall make the necessary corrections and resubmit the documents as required above. The letter transmitting corrected documents shall indicate that the documents are re-submittals.
5) The Contractor shall revise and resubmit the shop drawing as required, until they are stamped either "Reviewed" or "Furnish as Corrected."

I. Equipment and Software List: Include every piece of equipment and software by product/model name and/or number, manufacturer, serial number, revision number, location, and date of original installation. If factory and/or bench testing regimens are required by the project plan, add pretesting record of each piece of equipment and software, listing name of person testing, date of test, and adjustments made.

J. CE and FCC Compliance Certificates:

K. Field quality-control reports

L. Current Specified Manufacturer Integrator Certification Letter

M. Current Specified Manufacturer Training Certificates (listing expiration dates) for Two technicians from the supporting office

N. Warranty: Software support and warranty information for all components, including Service Level Agreement (SLA) details, and duration of agreement from date of system acceptance by Owner. Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

O. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

P. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
2. General: The Contractor is responsible for providing accurate drawings and equipment manuals describing and depicting the systems as they are actually installed and operated.
3. Phase One: Notwithstanding requirements specified elsewhere, submit the following labeled as the "Operating and Maintenance Manual" within thirty (30) days after Final Acceptance of the Installation:

    a. Record Drawings: Submit two (2) copies of revised versions of drawings as submitted in the "Shop and Field" and "Equipment Wiring Diagrams" Submittals showing actual device locations, conduit routing, wiring and relationships as they were constructed. Include nomenclature showing as-built wire designations and colors. Drawings shall include room numbers coinciding with Owner space planning numbering. Drawings shall be submitted in electronic editable AutoCAD files, in ".dwg" format, on CD or DVD disks.
    b. Manuals: Submit two (2) copies of each of the following materials in bound manuals, or electronic PDF copies on CD/DVD discs, with labeled dividers:

        1) A final Bill of Material for each system.
        2) Equipment Instruction Manuals: Complete, project specific comprehensive instructions for the operation of devices and equipment provided as part of this work.
        3) Manufacturers Instruction Manuals: Specification sheets, brochures, Operation Manuals and service sheets published by the manufacturers of the components, devices and equipment provided.
        4) Include information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.
        5) Provide a replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purpose.
        6) Performance, Test and Adjustment Data: Comprehensive documentation of performance verification according to parameters specified herein.
        7) Warranties: Provide an executed copy of the Warranty Agreement and copies of all manufacturers' Warranty Registration papers as described herein.

1.8 QUALITY ASSURANCE

A. Comply with the following:

    1. NFPA 70.
    2. Applicable TIA/EIA standards.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.

    1. Contract maintenance office located within 100 miles (160 km) of project site.

E. Maintenance Contractor Qualifications: Same entity as installer.
F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
G. The requirements of the State Building Code and local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
H. All work shall comply with the latest editions of the codes as referenced herein.
I. Follow manufacturer's directions for articles furnished, in addition to directions shown on drawings or specified herein.
J. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.
K. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
L. Equipment and materials shall:

1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed or labeled.
2. Be without blemish or defect.
3. Not be used for temporary purposes.
4. Be in accordance with the latest applicable NEMA standards.
5. Be products which will meet with the acceptance of all authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or another recognized testing laboratory, the product shall be so examined, tested and certified.

M. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
N. For items which are to be installed but not purchased as part of the electrical work, the electrical work shall include:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into any point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with Contractor who originally purchased the item.
5. Their field make up and internal wiring as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these specifications.

O. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work includes all procedures, regardless of

how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

P. Seismic Performance: Provide equipment capable of withstanding the effects of earthquake motions determined according to ASCE/SEI 7 and current building codes for the state of CT.

1. The term “withstand” means “the system(s) will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.”

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.11 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.12 WARRANTY

A. See Division 01 – Closeout Submittals for additional warranty requirements.
B. The Integrator guarantees the Systems to be installed under this specification to be free from any defects in workmanship and materials for a period of one (1) year from the date of final completion/acceptance of the project by the Owner as evidenced by the date of final payment for the work. The Contractor shall promptly and at their own expense remedy any defects in the work and pay for any damage to other work resulting thereof, which shall appear during the period of time covered by this guarantee. Neither the final certificate of payment nor any provisions in this Agreement shall constitute an acceptance of work not done in accordance with this specification or relieve the Contractor of liability with respect to any expressed warranties or guarantees or responsibility for faulty materials or workmanship.
C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of equipment related to the Access Control System, and control-station equipment that fail in materials or workmanship within specified warranty period.

    1. Warranty Period: The standard manufacturer’s warranty shall apply or a minimum of a one (1) year warranty from the date of Substantial Completion.

D. The Integrator shall provide all services required to maintain the system in an operational state as specified by the manufacturer for a period of one (1) year after acceptance.
E. Service response shall be within twelve (12) hours of the initial request for service and shall be provided twenty-four (24) hours per day, seven (7) days per week and three hundred sixty-five (365) days per year.
F. Contractor shall include, as part of this warranty, a program for maintenance for each integrated system.

    1. Provide details of coverage, preventive maintenance schedules, exclusions and service rates for all billable time and travel charges.
    2. Maintenance shall include two (2) semi-annual inspections and tests to verify the intended operation of the security system(s). System testing shall include but not be limited to the testing of all devises, fault modes and batteries. A detailed test report indicating these results and any corrective measures shall be furnished to the owner.

G. The Contractor shall provide software and firmware upgrades as required and available to the Owner.
H. Submit manufacturer's standard warranties.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Furnish and install Video Surveillance System consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
B. The awarded contractor of this section shall furnish and install a network Video Surveillance (VSS) system into this facility using electronic security devices. This integrated VSS shall incorporate all devices necessary to achieve the specified system, all associated monitoring and recording software, hardware, configuration, testing and training.
C. The contractor awarded this project must include the following licenses and configuration:

    1. VSS licenses for each camera on the Specified Access Control System

D. The contractor shall provide a rack mounted UPS for each equipment rack provided for powering all equipment located within the equipment rack. The UPS shall be supplied with an auto-shutdown feature to allow an automatic orderly shutdown of the connected server. The auto-shutdown feature shall be connected to and programmed to shut down any servers contained within the equipment rack being powered from the UPS.
E. Surge Protection: Protect components from voltage surges originating external to equipment housing and entering through power, communication, signal, control, or sensing leads. Include surge protection for external wiring of each conductor's entry connection to components.
F. This VSS described within this specification shall be fully integrated with the Access Control and Intrusion Detection System.
G. All installation, peripheral devices, required licensing and configurations are required as part of this specification to establish a coherent, functional system as described within this bid package.
H. Security Ethernet cabling from the indicated Telecommunication Rooms to the Specified Cameras as described within the documents shall be furnished and installed by the contractor awarded Division 27.
I. Any and all additional interconnection cabling required for a functional system shall be furnished and installed by the contractor awarded this portion of work.
J. Final terminations to all devices are required by the Contractor awarded this Section.
K. The Contractor awarded this Section shall furnish and install a complete integrated security system and all associated, terminations, supporting devices, configuration of system, testing and training in accordance with this Bid package.
L. This specification is used to identify the requirements for an integrated VSS. The operator workstation(s) shall be used for database programming and storage of historical events and as a User interface with the Access Control System.
M. Within the VMS, the Contractor shall create floor plan maps that include camera icons appropriately placed according to actual location. Upon clicking a camera icon, the video feed associated with that camera shall automatically be called up and displayed.
N. System Design Intent:

1. It is the intention of this system design to provide a fully functional Video Surveillance System for, minimally, the following features:

    a. The end user shall be able to access live or recorded video from within the VSS software and shall have the following capabilities:

        1) The end user shall have the ability to pause, stop, resume, fast forward, frame advance, rewind, and move to a different time window.
        2) The user shall be able to quickly switch between live and recorded video.
        3) The user shall be able to view multiple video feeds simultaneously.
        4) Upon alarm input to the IDS or ACS, a predetermined video feed or feeds that are associated with that alarm shall automatically display in the Access Control System Software window. This video window shall have the capability to display recorded (IE 10 seconds prior to alarm) video.
        5) Within the VSS software window, the end user shall have the ability to call up and display live video from any camera. This shall include the ability to display multiple live camera views simultaneously through a matrix view.
        6) Within the VMS, the end user shall have the ability to export recorded video to a local hard drive or to a removable media (such as CD or USB drive). The system shall automatically watermark this video file for future proof of authenticity.

O. System Functionality Overview:

1. System shall provide high-quality delivery and processing of IP-based video and control data using standard Ethernet-based networks.
2. System shall have seamless integration of all video surveillance and control functions.
3. Graphical user interface software shall manage all IP-based video matrix switching and camera control functions and recording and archive/retrieval management. IP system shall also be capable of integrating into larger system environments.
4. System design shall include all necessary compression software for high-performance, dual-stream, Motion JPEG and H.264 video.
5. All camera signals shall be compressed to H.264, encoded, and delivered onto the network for processing and control by the IP video-management software.
6. Camera system units shall be ruggedly built and designed for extreme adverse environments, complying with NEMA Type environmental standards.
7. The Camera's recorded images shall include masking of the unwanted areas within each camera view to minimize storage space. These recorded images shall be defined with the Owner and technology consultant.
8. Configuration of the Video Server to utilize two (2) Ethernet connections and Network Interface cards; one (1) for incoming video and recording and one (1) to send recorded video to the storage device.
9. Video management software shall be configured for the following.

    a. Recorded Video Compression Rate: H.264
    b. Frame Recorded Per Second: Fifteen (15).
    c. Resolution should be set at the highest obtainable from each camera specified.
    d. Stored data shall be saved for thirty (30) calendar days.
    e. Interior cameras shall record eighteen (18) hours per day.
    f. Exterior cameras shall record twenty-four (24) hours per day.
    g. Include 10% headroom storage.
    h. Include subtotal for processing and management software.
    i. Each camera "Field of View" shall be coordinated with the assistance of the Owner and/or the Security Consultant.

P. System Configuration Overview:

1. All system configuration(s) shall be included to attain a fully functional system and shall be within the Scope of work of the awarded Contractor of this section. This configuration shall include but not be limited to the following:

    a. Configuration of all cameras to be managed via the Video Management software.
    b. Configuration of Video Surveillance Server to view/record/access all cameras.
    c. Configuration of the Video Surveillance Servers to monitor all connected cameras for video loss. Video loss detection shall create an alarm on the VMS, alert any connected workstation, and simultaneously send an email to the system administrator conveying the video loss condition.
    d. Configuration of video storage devices with the server.
    e. Configuration of Browser Based Client for up to (4) users groups.
    f. Configuration of the Video Storage Server per the manufacturer's established best practices.
    g. Configuration of the Video Management Server per the manufacturer's established best practices.
    h. Configuration of the Video Mobile Server per the manufacturer's established best practices.
    i. Integration with the Owner's Active Directory.
    j. Configuration of LAN switches – Active Electronics, as related to the systems specified within this document. Including VLANS and IP addressing shall be as indicated by the Owner.

k. The Contractor shall coordinate any/all network connections with the Owner IT Department prior to making any physical connections to the Owner's network components. Failure to follow this directive may result in expenditures for repair and troubleshooting by the Owner's IT department or 3rd party IT contractor/vendor. Such expenditures to remedy any issues caused by incorrect coordination by the Contractor shall be borne by the Contractor.

l. The contractor will be responsible for establishing the security of all IP devices, servers, and VMS storage from adversary compromise (internal or external) in conjunction with the owner's IT Department.

m. The cost of investigation, repairs, and reprogramming resulting from any security breaches during the construction or operation of the systems (while under warranty or service agreement) attributable to the failure of the Contractor to implement approved IT security measures shall be borne by the contractor.

n. Configuration of the VMS and Access Control managed software to:

1) Allow complete interface between both platforms
2) Allow the Access Control System to access and view all video surveillance cameras.
3) Allow access and controlled network management system with Web and Internet access of the Video Surveillance system.

o. Programming camera names and recording parameters to optimize the camera for the environment for which it is operating in. Camera names shall be coordinated with the Owner prior to configuration. Naming all cameras within the system is the responsibility of the Contractor.

Q. Environmental Conditions: System(s) shall withstand the environmental conditions without mechanical or electrical failure, damage or degradation of its operating capacity Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Interior, Controlled Environment: System components installed in temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 36 to 122 deg F (2 to 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
2. Interior, Uncontrolled Environment: System components installed in non- temperature-controlled interior environments shall be rated for continuous operation in ambient temperatures of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, noncondensing. Use NEMA 250, Type 3R enclosures.
3. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and twenty to ninety percent (20-90%) relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph and snow cover up to 24 inches thick. Use sufficiently rated NEMA 250 enclosures.
4. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
5. Corrosive Environment: System components subject to corrosive fumes, vapors, and wind-driven salt spray in coastal zones. Use sufficiently rated NEMA 250 enclosures.
6. Security Environment: Camera housing for use in high-risk areas where surveillance equipment may be subject to physical violence.

2.2 VIDEO MANAGEMENT SYSTEM

A. The Video Management System shall be Avigilon Enterprise.
B. Include all licenses for a fully functional system.

2.3 VIDEO SURVEILLANCE CAMERAS

A. Cameras shall be Avigilon.
B. Refer to camera schedule for make, model, and mount information.
C. Include all required mounting, housing, brackets, and power supplies for a fully functional system.

2.4 VIDEO MANAGMENENT SERVER

A. The Video Management Server shall be Avigilon Enterprise: #NVR5 series or better.

2.5 UNINTERRUPTIBLE POWER SUPPLY (UPS):

A. The Contractor shall supply individual UPS' each Telecommunication Room or Equipment Room where Active Electronics supplying data and signal to the Video Surveillance System is located. The UPS will be used to support Ethernet switch, servers, video recorders, and any other rack mount security equipment.
B. The Contractor shall supply individual UPS at security guard post. UPS will be used to support security workstation, monitors, printer, intercom master station, and any other security equipment in that location.
C. The UPS shall be as manufactured by APC or approved equal
D. The supplied UPS shall support the equipment at each location plus an additional 500 Watts at 120VAC for a minimum of fifteen (15) minutes under full load
E. The Contractor shall supply the appropriately sized UPS as dictated by the accepted submitted equipment as approved by the Engineer.
F. The UPS located in ER / TR locations shall be rack mountable and shall include all mounting hardware.
G. The UPS shall have the capability of sending SMTP email messages
H. The UPS shall be supplied with software to connect to the security system Ethernet network to allow for monitoring and alarm condition of the UPS including but not limited to the following;

    1. UPS on battery
    2. UPS load capacity exceeded
    3. UPS off line
    4. UPS overheat
    5. UPS experienced surge

2.6 SURGE PROTECTION:

A. Install Lightning / Surge protection for all exterior rated cameras. Ground all protectors to manufacturer recommendations and Code requirements.
B. The intent of the Lightning / Surge protector is to protect the connected electronics (switches, routers, servers) in the event a camera is struck by lightning.
C. Surge protectors shall be installed between camera and patch panel.
D. Acceptable manufacturers:

1. Ditek
2. Approved Equivalent

2.7 CLIENT WORKSTATIONS:

A. Client Viewing PC:

1. Seneca
2. Avigilon
3. Dell

B. Wireless Mouse and Keyboard:

1. IOGEAR #GKM552R
2. Approved Equivalent

C. 55” Display and Mount:

1. SAMSUNG #QM55 or approved equal
2. The digital display shall meet the following requirements:

a. 55” diagonal
b. 3840 x 2160 minimal resolution
c. 500 nit minimal brightness
d. Approved for 24/7 operation
e. Includes a standard manufacturer 3-year warranty

3. CHIEF #MTM1U or approved equal
4. Include Chief #FHB5147 Universal Flat Panel Mount Hardware Kit

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that ratings and configurations of system components are consisted with the indicated requirements.
C. Verify that mounting surfaces are ready to receive the system components.
D. Verify that branch circuit wiring is installed, completed, tested, and ready for connection to system.
E. Verify that conditions are satisfactory prior to starting work.
F. Device Locations

1. All device locations are to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for outlet installation in areas not reviewed or approved by the Owner.

G. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space allocations, installation tolerance, hazards to camera installation, and other conditions affecting installation.
H. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install Video Surveillance system in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install cameras level and plumb.
D. Install cameras with 84-inch minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.
E. Set pan unit and pan-and-tilt unit stops to suit final camera position and to obtain the field of view required for camera. Connect all controls and alarms and adjust.
F. Install power supplies and other auxiliary components within the Telecommunication Room unless otherwise indicated.
G. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system-component enclosures and mounted in self-protected, inconspicuous positions.
H. Identify system components, wiring, cabling, and terminals according to industry standards.
I. Unless otherwise indicated, use wiring in conduit.

1. Use suitable listed cables in we locations, including underground raceways.
2. Use suitable listed cables for vertical wire applications.
3. All cabling shall be plenum rated.
4. Install wiring in conduit for the following:

    a. Where required for rough-in.
    b. Where required by the AHJ.
    c. Where exposed to damage.
    d. Where installed outside the building.
    e. For exposed connections from outlet boxes to devices.

5. Conduit: comply with Division 26.
6. Conceal cables unless specifically indicated to be exposed.
7. User power transfer hinges specified within Division 08 for concealed connections to door hardware.
8. Cables in the following areas may be exposed:

    a. Equipment Closets

9. Route exposed cables in parallel or perpendicular to building structural members and surfaces.
10. Do not exceed manufacturer's recommended maximum cable length between components.

J. Provide grounding and bonding in accordance with Division 26.
K. Install firestopping to preserve the fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
L. Install power supplies and other auxiliary components at control stations unless otherwise indicated.
M. Identify system components, wiring, cabling, and terminals according to ANSI/EIA/TIA standards.
N. Security System Integration

1. The Contractor shall be responsible for providing hardware and software interfaces to achieve the specified system performance described herein and, by reference, realize absolute and seamless compatibility with the related component systems.
2. The Contractor shall ensure system additions and modifications provided under this scope of work have no negative effect on the individual components and systems, and

their core functionality, and no permanent effect beyond that specified or implied by the scope of work.

3. Purpose

    a. Integration is the process of designing, deploying, and configuring independently operating systems with the ability to request, receive, extract, process, and act upon information from other systems.
    b. Successful system integration must address three fundamental issues:

        1) Functionality: What information is needed, how it is to be requested and processed, and what functions or activities need to occur upon receipt of the information.
        2) Connectivity: How systems will be connected to support the communication of information and commands. (Special interfaces, wiring, networks, databases.)
        3) Communication: How information will be communicated between systems. (Instruction sets, language, protocols, formats, priority.)

4. Environment

    a. Integration components shall generally comprise special elements of independent subsystems, and shall be located within, or in close proximity to, the processing components of each independent subsystem. Where subsystems require special hardware or communications interfaces to support integration, the special hardware should be located near the independent subsystem processing components or network appliance, based on the manufacturers' recommendation. See the drawings for details on mounting locations.

5. Infrastructure and Connectivity:

    a. Devices/Appliances: Appliances and devices shall be connected to their respective systems via the applicable communications network.
    b. System LAN/WAN Connectivity: System Servers and microprocessor-based Control Panels, shall reside on the Local Area Network (LAN) or Wide Area Network (WAN) tier designated for integrated components.
    c. Enterprise: LAN networks will be connected to the Wide Area Network, to establish connectivity between remote sites and both the Primary and Alternate Security Operations Center (SOC – room SB05-1).

6. Attributes

    a. The attributes of the integrated environment are primarily defined by the subsystems that are to be integrated. Verify existing system components to be expanded by this project.
    b. Integrated systems comprise the processors, software, electrical control panels, data gathering panels, special data interfaces, and converters required to allow systems to communicate with each other, process information, and allow users to program and perform operations.

7. Functions

    a. The system shall provide the following automated processing rules, at a minimum:
    b. The object of "Access Control system integration" is to automatically configure the system to display, record, and report appropriate system activity to various elements of the system. Automatic configuration can free operators from difficult

control tasks, give the operator more time to respond to events, reduce operator error, and ensure critical system tasks occur consistently.

c. Electronic Access Control system elements shall be electronically integrated in such a way as to enable detection, database records and/or event-initiated instructions to be communicated between system components, to initiate recording, display, communication, and control activities.

d. Event-Initiated Interface, General:

1) The system shall support the capability to send and receive alarm and control messages between the Access Control System and video systems via a LAN communications link, using API, XML, or other industry-standard communication languages and formats, and shall act upon those messages received.
2) The system shall support the capability to send and receive alarm and control messages and alarm signal between the Access Control system and Intrusion Detection System for lockdown / duress / and panic button initiation.
3) Where integration may require the implementation of data interfaces, Contractor shall propose such integration to the Owner for approval, before proceeding with the work.
4) Software routines required to accomplish the required data-interface with external equipment and controls will be fully developed, installed, tested and supported by the Contractor.
5) The manufacturer of each applicable system will also support the data interface and will be engaged by the Contractor to provide on-site technical assistance where required to prepare, repair, configure, and test the system to operational condition.
6) Communication of event information between systems shall take place automatically and immediately when the event is sensed by the System.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall engage a qualified testing agency to perform tests and inspections with the Owner and appointed project manager.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Camera Field Verification:

1. All camera locations MUST to be field verified with the Owner prior to start of project. Architectural drawings are for approximation purposes only. Additional charges will not be allowed for installation in areas not reviewed or approved by the Owner.
2. Camera images will be reviewed with the Owner and the Security Consultant. The contractor shall plan for three adjustments of the camera’s field of view as follows:

a. Initial setup and testing
b. Owner and / or Security Consultant adjustments #1
c. Owner and / or Security Consultant adjustments #2

D. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

E. Tests and Inspections:

1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:

    a. Prepare equipment list described in "Submittals" Article.
    b. Verify operation of auto-iris lenses.
    c. Set back-focus of fixed focal length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
    d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object 50 to 75 feet away. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
    e. Set and name all preset positions; consult Owner's personnel.
    f. Set sensitivity of motion detection.
    g. Connect and verify responses to alarms.
    h. Verify operation of control-station equipment.

3. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least fourteen (14) days. Provide a minimum of ten (10) days notice of test schedule.
4. Operational Tests: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

F. Video Surveillance System shall be considered defective if it does not pass tests and inspections.
G. Prepare test and inspection reports.
H. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to this Project location during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

1. Check cable connections.
2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's use of video surveillance system.
5. Provide a written report of adjustments and recommendations

3.4 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.
B. Clean video-surveillance-system components, including camera-housing windows, lenses, and monitor screens before installation and prior to final acceptance.
C. Remove rubbish and debris: Installation contractor is not allowed you use the onsite dumpster and is responsible to discard their own debris off site.

3.5 CLOSEOUT ACTIVITIES

A. See Division 01 – Closeout Submittals for Closeout Submittals.
B. Demonstration: Demonstrate proper operations of system to Owner and correct deficiencies or make adjustments as directed.
C. Training:

1. By means of training classes augmented by individual instruction as necessary, the Bidding contractor shall fully instruct the BOE's designated staff and personnel in the operation, adjustment and maintenance of all products, equipment and systems.
2. General Training Requirements:

a. The security contractor shall submit proposal to conduct training courses for the security personnel in the operation and maintenance of the security systems within this security project.
b. The security contractor shall include training manuals and aids in the quantity as requested by the Owner. The training manuals shall include an agenda, defined objectives for each lesson, and a detailed description of the subject matter for each lesson. All personnel providing the instructions shall be certified by the equipment manufacturer for all applicable hardware and software.
c. Approval of the planned training content and training schedule shall be obtained by the Owner at least 45 days before the training is scheduled.
d. Training shall be provided by qualified, factory trained and certified engineers familiar with each system and its operations and shall be provided at the site for a period of no less than the hours stipulated below.

3. Training Topics:

a. System Administration Training

1) This training shall focus on determining and implementing system operational parameters.
2) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. 8 Hours of Administration training; (2) 4-hour classes.
3) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of training; (2) 3-hour classes.
4) This Administrations training shall include:

(a) Overall architecture and configuration of each system.
(b) Use of all system functions.
(c) ID badging design and production.
(d) Card-holder setup and configuration.
(e) Card-holder access level assignment.
(f) Access Door programming.
(g) Alarm setup and implementation.
(h) Data storage and retrieval through reports.
(i) Creation of reports.
(j) System database backup procedures.
(k) Hardware specifications.
(l) Fault diagnosis and corrections.

b. System User Monitoring Training

1) This training shall be for each designated personnel at this school.
2) This training shall focus on day-to-day system operations. Each user shall be capable to start the systems, operate them, recover the systems after a failure, and describe the specific hardware architecture and operation of the systems.
3) The first training class shall be conducted so that it is completed approximately 30 days prior to acceptance of the system and final system reliability testing. All System User Training shall be performed at each school within this specification. 8 Hours of User training; (2) 4-hour classes.
4) The second training class shall be conducted so that it is completed approximately 7 days prior to acceptance of the system and final system testing. The system administrator shall be included as part of this final system acceptance and reliability testing. 6 Hours of User training; (2) 3-hour classes.
5) Training shall include:

   (a) Use of overall system monitoring functions as determined by the security administration staff.
   (b) Monitoring alarm events.
   (c) Monitoring personnel access into the facility.
   (d) Assessing, responding to, and clearing alarms and messages.
   (e) Monitoring access door status.
   (f) Running routine reports.
   (g) General hardware architecture.
   (h) Functional operation of each system and interaction between these systems.
   (i) All Operator commands.
   (j) Database entry.
   (k) Report generation.
   (l) Alarm assessment.
   (m) Simple diagnostics.
   (n) System Troubleshooting and Maintenance Training

6) Training shall be provided with the internal features and configuration of the security systems so the user can trouble shoot and repair most configuration and physical device problems.
7) The training class shall be conducted so that it is completed approximately 14 days prior to acceptance of the system and final reliability testing. The users shall be included as part of this reliability testing. 8 Hours of training; (2) 4-hour classes.
8) This training shall include:

   (a) System networking communications and diagnostics.
   (b) Device configuration and programming.
   (c) Controller setup.
   (d) Wiring and cabling overview.
   (e) System Diagnostics.
   (f) Software troubleshooting.
   (g) Physical layout of each piece of hardware.
   (h) Preventive maintenance procedures and schedules.
   (i) Calibration procedures.

c. IT Training

1) Training shall be provided information of the security systems to the IT staff. This shall include information as to how each system functions within the LAN/WAN network infrastructures. 4 Hours of training.
2) Topics shall include:

(a) Network topologies.
(b) Maintenance of data security.

4. Training hours and sessions must be documented by the instructor and approved by the Owner before project closeout.
5. Should the training be deemed as inadequate by the Owner, the owner reserves the right to retain outside manufacturer training. If this outside manufacturer training has an associated cost, this cost shall be deducted from the final invoice of this project.
6. The Owner reserves the right to request the Contractor to videotape training sessions and turn over video records (DVD format) to Owner as part of the “Owner Project Manuals” and Deliverables.

3.6 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.7 MAINTENANCE

A. See Division 01 – Execution and Closeout Requirements for additional requirements relating to maintenance service.
B. Adjustments:

1. Occupancy Adjustments: When requested within twelve (12) months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two (2) visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:

a. Check cable connections.
b. Check proper operation of video surveillance devices.
c. Provide a written report of adjustments and recommendations.

C. Provide to Owner, at no extra cost, a separate maintenance contract for the service and maintenance of the Access Control System for One Year from date of Substantial Completion. Include a separate description of preventative maintenance, systematic examination, cleaning, inspection, and testing, with a detailed schedule.
D. Conduct site visit at least once every three months to perform inspection, testing, and preventative maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.
E. Provide trouble call-back service upon notification by Owner:

1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at the site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

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SECTION 284600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system and associated components, including control units, related equipment, initiating devices, and notification appliances.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 087100 - Door Hardware:

C. Section 211300 - Fire-Suppression Sprinkler Systems: For interface with fire alarm system.

D. Section 213000 - Fire Pumps: For interface with fire alarm system.

E. Section 233300 - Air Duct Accessories: Smoke/fire dampers for interface with fire alarm system.

F. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: For non-power-limited cables.

G. Section 260526 - Grounding and Bonding for Electrical Systems.

H. Section 260533.16 - Boxes for Electrical Systems.

I. Section 275116 - Public Address Systems.

J. Section 284614 - Single and Multiple Station Alarms.

1.3 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authorities having jurisdiction.

B. BAS: Building automation system.

C. DMNS: Distributed mass notification system.

D. ECS: Emergency communications system.

E. EoL: End-of-line.

F. EVACS: Emergency voice/audio communication systems.

G. FACU: Fire alarm control unit.

H. HVAC: Heating, ventilation, and air conditioning.

I. IDC: Initiating device circuit.

J. LAN: Local area network.

K. MNS: Mass notification system.

L. NAC: Notification appliance circuit.

M. NPLFA: Non-power-limited fire alarm.

N. PLFA: Power-limited fire alarm.

O. SLC: Signaling line circuit.

P. SOO: Sequence of operation.

1.4 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

B. ADA Standards - 2010 ADA Standards for Accessible Design.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

D. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction.

F. NECA 90 - Standard for Commissioning Building Electrical Systems.

G. NECA 305 - Standard for Fire Alarm System Job Practices.

H. NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems.

I. NFPA 70 - National Electrical Code.

J. NFPA 72 - National Fire Alarm and Signaling Code.

K. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

L. NFPA 1225 - Standard for Emergency Services Communications.

M. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems.

N. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems.

O. UL 268A - Standard for Smoke Detectors for Duct Application.

P. UL 464 - Standard for Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories.

Q. UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems.

R. UL 864 - Control Units and Accessories for Fire Alarm Systems.

S. UL 1449 - Standard for Surge Protective Devices.

T. UL 1480 - Standard for Speakers for Fire Alarm and Signaling Systems, Including Accessories.

U. UL 1638 - Standard for Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories.

V. UL 1711 - Amplifiers for Fire Protective Signaling Systems.

W. UL 1971 - Standard for Signaling Devices for the Hearing Impaired.

X. UL 2075 - Standard for Gas and Vapor Detectors and Sensors.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate arrangement of equipment with dimensions and clearance requirements of actual equipment.

2. Coordinate placement of devices and notification appliances with potential conflicts or view obstructions.

3. Coordinate work to provide power for equipment at required locations (e.g., smoke dampers, type of actuators, line or local control transformer, zoning, grouping and circuit activations).

4. Coordinate fire suppression systemdevice requirements, monitoring, control, and associated interconnections.

5. Coordinate requirements for branch circuit protection, identification, and shunt trip if applicable.

6. Coordinate kitchen equipment requirements for fire alarm system interconnections based on selected equipment.

7. Coordinate reflected ceiling plans to avoid conflicting placements; maintain minimum diffuser and detector clearances as indicated.

8. Coordinate submittals to confirm equipment and associated components are capable of indicated settings, and manufacturer documentation identifies required compatible product listings.

9. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

10. Door Hardware: See Section 087100 and coordinate, including access control panel locations.

11. Non-Power-Limited Cables: See Section 260519.

12. See Section 019113 - General Commissioning Requirements and coordinate for supporting requirements, including support of services not limited to installation checklists, acceptance testing reports, functional testing, and integrated system testing.

B. Preinstallation Meetings:

1. Conduct meeting with facility representative to review devices, notification appliances, and equipment locations.

2. Conduct meeting with facility representative and other related equipment manufacturers to discuss fire alarm system interface requirements.

3. Conduct meeting to review anticipated installation of code-required smoke control requirements, product solutions, and SOO.

4. Convene one week before starting work for review of documented SOO for system applications.

C. Sequencing:

1. Verify exact termination locations required for boxes, enclosures, and equipment.

2. Do not install devices or notification appliances until final surface finishes, painting, and cleaning are complete, unless otherwise required by AHJ.

3. Do not begin installation of conductors and cables until installation of conduit and pathways between termination points is complete.

4. Sequence work to protect cabling (e.g., overspray painting, physical stress, and insulation damage or covering markings).

5. Verify naming convention for equipment identification, including room names and numbers, prior to creation of final drawings, reports, and labels.

D. Scheduling:

1. Arrange access to facility for data collection with facility representative.

2. Where work involves interruption of existing electrical or fire alarm system service, arrange interruption with Owner.

a. Arrange test start and end with responsible reporting service. Confirm system normal operating mode and record as-found and as-left settings.

b. Arrange work to disable individual devices or circuits for minimal disruption if possible.

c. Arrange in accordance with NFPA 72 fire alarm system impairment requirements.

d. Where required by AHJ, arrange systems or partial system out of service interruption in accordance with requirements of building, life safety, and fire codes (e.g., approved fire watch plus required notifications, tags at each fire department connection and control valve, and AHJ notification when excess hours).

1.6 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Evidence of designer qualifications.

C. Comply with NFPA 72 chapter "Documentation," including noting names of installers, owners, and system classification information.

D. Design Documents: Submit all information required for plan review and permitting by AHJ, including floor plans, riser diagrams, and description of operation.

1. Copy (if any) of list of data required by AHJ.

2. NFPA 72 "Record of Completion", filled out to extent known at time.

3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A, and complete listing of software required.

4. Manufacturer's detailed product data sheet for each component, including wiring diagrams, and circuit length limitations. Catalog pages and product descriptions include ratings, dimensions, finishes, service conditions, and included features.

5. Certification by manufacturer of FACU that system design complies with Contract Documents.

6. Certification by Contractor that system design complies with Contract Documents.

E. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ, including floor plans showing locations of fire alarm system components, enlarged drawn to identified scale plan view, and riser diagrams.

1. System zone boundaries and interfaces to fire safety systems.

2. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.

3. Include elevations and details of proposed equipment arrangements.

4. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application specific information required by NFPA 72.

5. Include typical wiring diagrams for devices, notification appliances, remote indicators, annunciators, remote test stations, and EoL and power supervisory devices.

6. Include requirements and control diagrams for interfacing with other systems.

7. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; standby and spare capacity calculations; notification appliance circuit loop resistance and voltage drop calculations, including spare capacity.

8. List of devices and notification appliances on each SLC, with spare capacity indicated.

9. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

10. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.

11. Detailed drawing of graphic annunciators, displays, and interfaces.

12. Certification by either FACU manufacturer or manufacturer of related equipment.

13. Certification by FACU manufacturer that system design complies with Contract Documents.

14. Certification by Contractor that system design complies with Contract Documents.

15. Mark existing components indicating to be removed.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Evidence of installer qualifications.

H. Evidence of maintenance contractor qualifications, if different from installer.

I. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.

2. Submit documentation of satisfactory inspections and tests.

3. Submit NFPA 72 "Inspection and Test," filled out.

J. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:

1. Complete set of specified design documents, as approved by AHJ.

2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.

3. Contact information for firm that will be providing contract maintenance and trouble call-back service.

4. List of recommended spare parts, tools, and instruments for testing.

5. Replacement parts list with current prices, and source of supply.

6. Detailed troubleshooting guide and large scale input/output matrix.

7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.

8. Detailed but easy to read explanation of procedures require recording of system trouble events by qualified personnel, such as when routine testing is being conducted for fire drills and when entering into contracts for building renovations.

K. Project Record Documents: See Section 01 7800 for additional requirements, have one set available during closeout demonstration:

1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.

2. "As installed" wiring and schematic diagrams, with final terminal identifications.

3. "As programmed" operating sequences, including control events by device, and updated input/output chart.

a. ECS: Voice messages by event.

L. Closeout Documents:

1. Certification by manufacturer that system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.

2. NFPA 72 "Record of Completion," filled out completely and signed by installer and authorized representative of AHJ.

3. Certificate of Occupancy.

1.7 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III (three) or Level IV (four) certified fire alarm technician or registered fire protection engineer, employed by FACU manufacturer, Contractor, or installer, with experience designing fire alarm systems in jurisdictional area of AHJ.

B. Installer Qualifications: Firm with minimum three years documented experience installing fire alarm systems of specified type and providing contract maintenance service as regular part of their business.

1. Authorized representative of FACU manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

2. Installer Personnel: At least two years of experience installing fire alarm systems.

3. Supervisor: Level III (three) or Level IV (four) certified fire alarm technician; furnish name and address.

4. Certified in the State in which the Project is located as fire alarm installer.

C. Manufacturer Qualifications: Company specialized in manufacturing products specified in this section with at least three years of documented experience.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.8 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 305.

C. Handle carefully to avoid damage to internal components, enclosure, and finish.

D. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.9 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

B. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

C. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer and obtain direction before proceeding with work.

D. Existing Conditions:

1. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system. Comply with NFPA 70.

    a. Maintain existing under warranty as if new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected.

2. On-Premises Supervising Station: Include modifications necessary to existing supervising station to accommodate new fire alarm work.

3. Modifications to Existing System:

    a. Remove inactive or abandoned cables and components from existing fire alarm system.

    b. Remove unused existing components and materials from site and dispose according to local and federal requirements.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Fire Alarm Control Units and Accessory Equipment: Provide minimum 3-year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Fire Alarm Manual Pull Stations: Provide minimum 1-year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

D. Fire Alarm System Detectors: Provide minimum 1-year year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

E. Fire Alarm System Notification Appliances: Provide minimum 1-year year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 FIRE ALARM SYSTEM

A. General Requirements:

1. Provide modifications and extensions to existing fire alarm system complying with NFPA 70, NFPA 72, NFPA 90A, and consisting of required equipment, conduit, cabinets, outlet boxes, wiring, connectors, hardware, supports, accessories, components, software, and system programming as necessary for complete operating system that provides functional intent indicated.

2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:

a. 36 CFR 1191 and ADA Standards.

b. ICC A117.1

c. Requirements of State Fire Marshal.

d. Requirements of AHJ.

e. Applicable local codes.

f. Contract Documents.

g. NFPA 72; "should" is mandatory; where conflicts between requirements require deviation, identify deviations clearly on design documents.

3. Fire Alarm System Products:

a. Listed, classified, and labeled as suitable for purpose intended.

b. Installation Environments: Provide products suitable for their respective indoor and outdoor applications.

4. Fire Alarm System Design Information:

a. Building Code: Comply with applicable building code.

1) Principle Occupancy: As indicated on Architect code summary drawings.

2) Principle Use: As indicated on Architect code summary drawings.

3) Occupant Evacuation Method: Total building.

4) Equipment Room Rating: None required.

5) Fire Suppression System: Fully sprinkled.

(a) Types:

(1) Wet-Pipe Sprinklers.

b. NFPA 72 Fire Alarm System Classification: Protected premises.

c. Smoke and Heat Detector Coverage: Partial or selective coverage in accordance with NFPA 72.

d. Notification Appliance Zones:

1) See fire alarm system floor plans on drawings.

e. Emergency Communications Systems (ECSs):

1) See respective Division 27 and 28 sections for additional requirements.

2) Design in accordance with intelligibility requirements listed in NFPA 72.

3) One-Way ECS:

(a) In-building fire EVACS.

4) Provide fire emergency command center for ECS in accordance with requirements of AHJ, building code, fire code, life safety code, and NFPA 72.

5. Provide fire alarm circuits in accordance with NFPA 70.

a. Comply with methods of interconnecting FACUs in accordance with NFPA 72 and NFPA 70.

b. Power Sources:

1) Comply with requirements for power supplies of emergency systems in accordance with NFPA 70.

2) Primary: Dedicated branch circuits from facility power distribution system.

3) Secondary: Storage batteries with capacity to operate system for period specified by NFPA 72.

c. Wiring and Wiring Methods:

1) General Requirements:

(a) Comply with requirements for wiring and wiring methods in accordance with NFPA 70.

(b) Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum-rated, listed and labeled as suitable for use in return air plenums.

(c) Special Occupancies: Comply with NFPA 70.

(d) Comply with NFPA 70 for wire and cable plenum, riser, general-purpose, limited-use, undercarpet, and underground applications.

2) Fire Alarm Circuits:

(a) Comply with NFPA 70 for conditions and types required for multiconductor cable systems.

(b) Non-Power-Limited Fire Alarm (NPLFA) Circuits:

(1) Provide dedicated NPLFA non-GFCI branch circuits for fire alarm equipment and marked by red identification in accordance with NFPA 70.

(c) Power-Limited Fire Alarm (PLFA) Circuits:

(1) Provide identification for PLFA circuits in accordance with NFPA 70.

3) Fire-Rated Cables and Cable Systems:

(a) Performance alternative approved by AHJ.

(b) Provide cable fastening and listing requirements in accordance with NFPA 70. Provide indication of application, use cases, and product make and model for which listing applies.

(c) Provide additional classification suffix marking on cable system; observable by AHJ.

(d) ECS: Provide two-hour fire-rated protection for control equipment and circuits in accordance with NFPA 72.

(e) Fire-Rated Cable in Accordance with NFPA 72:

(1) Two-hour fire-rated circuit integrity (CI) or fire-resistive cable.

(2) One-hour fire-rated circuit integrity (CI) or fire-resistive cable.

6. Provide pathway class designations and pathway survivability, as defined in NFPA 72.

a. Provide monitoring of conductors and other signaling channels for integrity and circuit performance.

b. Pathway Class Designations:

1) Unless otherwise indicated or required, pathways to meet the following requirements:

(a) SLCs: Class B (star, tee-tap, multi-tap, with no return).

(b) IDCs: Class B (daisy-chain with EoL resistor device installed at end of circuit).

(c) NACs: Class B (daisy-chain with EoL resistor device installed at end of circuit).

(d) Network Communications: Class B.

(e) Other Wiring:

(1) Other life safety control features not covered above (e.g., door holder circuits, elevator recall circuits, fire smoke dampers, and air handling system interfaces), wired as Class D (failsafe, intended operation is performed in event of pathway failure).

(2) Where Class D wiring is not possible due to limitation of equipment, wiring limited to 3-feet between addressable control module and equipment and be installed in metallic conduit.

c. Pathway Survivability:

1) Unless otherwise indicated or required, pathways to meet requirements for Pathway Survivability Level 1 (nonrated cable installed in metal raceway, building protected by automatic sprinkler system).

(a) Exceptions:

(1) For ECS employing relocation or partial evacuation, pathways for notification and communication circuits and other circuits necessary to ensure continued operation of emergency communication system to meet requirements for Pathway Survivability Level 3 (two-hour rated cable with performance approved by AHJ, building protected by automatic sprinkler system).

7. Spare System Capacity:

a. SLCs: Minimum 25 percent spare capacity.

b. NACs: Minimum 25 percent spare capacity.

c. Speaker Circuits: Minimum 25 percent spare capacity.

8. Secondary Power Source - Battery Storage Capacity:

a. Provide standby (nonalarm) operation sufficient for 24 hours.

b. Provide additional alarm operation for 15 minutes.

c. Calculate combined of standby load plus alarm load for overall battery storage capacity requirements, per power supply.

d. Provide 25 percent additional overall battery capacity correction factor.

B. Fire Alarm System Interfaces and Control Functions:

1. UL 864 listed unless otherwise indicated.

2. Descriptions below are intended to provide means for interface. See project SOOs, narrative, and input/output matrix for execution requirements.

3. Provide initiating devices, interfaces, and control functions for emergency control function interfaces in accordance with NFPA 72.

4. Provide monitoring of interconnected systems. Coordinate notification appliance alternate markings as indicated on drawings.

5. Fire Suppression Systems:

a. Provide minimum of four monitoring point inputs per system unless otherwise indicated.

b. Kitchen Hood Suppression Systems: Provide minimum of one monitoring point input per system.

c. Wet Pipe Fire Sprinkler Systems:

1) Waterflow Switches: Provide minimum of one monitoring point input per switch.

2) Control Valve Supervisory (Tamper) Switches: Provide minimum of one monitoring point input per switch.

3) Pressure Supervisory (High/Low Pressure) Switches: Provide minimum of two monitoring point inputs per switch (separate points for high/low pressure signals).

6. Fire and Smoke Doors/Shutters/Curtains:

a. Electromagnetic Door Holder Release:

1) Provide output signal for release of electromagnetic door holders via addressable relay module and power isolation relay.

2) Door holders powered via 24 VDC unless otherwise indicated.

3) Door release activated as determined by AHJ.

(a) Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.

7. Electrically Locked Doors:

a. Comply with NFPA 72, building code, and life safety code requirements for electrically locked doors.

b. Door Release:

1) Provide output signal for release of electrically locked doors via addressable relay module and power isolation relay.

2) Provide connection to UL 864 listed control system interface or interface with door control power where interruption of control power releases doors.

3) Activate door release as indicated on drawings and in accordance with NFPA 72.

(a) Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from.

c. Lock Power Supplies: Provide independent power supplies.

8. Lighting/Dimming Control Systems:

a. System Override:

1) Provide output signal to override lighting/dimming controls via addressable relay module and power isolation relay.

2) Provide connection to UL 864 listed control system interface or interface with system control power where interruption of control power overrides system.

9. Sound and Audio/Visual Media Control Systems:

a. System Override:

1) Provide output signal to override sound and audio/visual media controls via addressable relay module and power isolation relays.

2) Provide connection to UL 864 listed system interface or interface with system control power where interruption of control power overrides system.

10. Emergency Communication Systems (ECS):

a. Provide minimum of six monitoring point inputs per system, including associated enhancement systems.

11. Other Interconnected Systems: For systems listed below, provide minimum of two monitoring point inputs each.

a. Gas Detection Systems: Including providing notification appliances as indicated on plans for CO - Carbon Monoxide.

b. Security system; see Division 28.

12. HVAC Systems:

a. Air Handling Units (AHUs) and Roof Top Units (RTUs):

1) Provide duct smoke detector on supply side of air stream for units over 2,000 cfm.

2) Provide duct smoke detector on return side of air stream for units over 15,000 cfm.

3) Provide remote test station for each duct smoke detector unless explicitly indicated as not required.

4) Provide output signal to shut down units with at least one duct smoke detector via addressable relay module.

5) Where fire/smoke dampers are located downstream of unit, provide monitoring point input to determine that unit is not operational and subsequently provide output signal to close such dampers via addressable relay module and power isolation relay.

b. Energy Recovery Units (ERUs):

1) Provide duct smoke detector on supply side of air stream.

2) Provide duct smoke detector on return side of air stream.

3) Provide remote test station for each duct smoke detector unless explicitly indicated as not required.

4) Provide output signal to shut down units with at least one duct smoke detector via addressable relay module.

5) Where fire/smoke dampers are located downstream of unit, provide monitoring point input to determine that unit is not operational and subsequently provide output signal to close such dampers via addressable relay module and power isolation relay.

c. Remote Test Stations: Provide remote test station for each duct smoke detector unless explicitly indicated as not required. Unless otherwise indicated, use remote test stations only in clean, dry, indoor, nonhazardous locations.

13. Fire/Smoke Dampers:

a. Provide output signal to close fire/smoke damper via addressable relay module and power isolation relay.

b. Fire/smoke damper activated as indicated on drawings.

2.2 FIRE ALARM CONTROL UNITS AND RELATED EQUIPMENT

A. Manufacturers:

1. Honeywell International, Inc; Honeywell Notifier: www.honeywell.com/#sle.

B. Fire Alarm Control Units and Related Equipment: Listed and labeled as complying with UL 864.

C. Provide cabinets and enclosures as indicated or as required to house system components.

D. Fire Alarm Control Unit (FACU): Addressable.

1. SLCs and IDCs: Configurable for Class B or Class A with additional modules.

2. NACs: Integral and programmable with synchronization modules or cards as required.

3. Power Supply: 120 VAC, 60 Hz, supplying necessary power for FACU.

4. User-Interface: Touchscreen display for system interfacing and service mode settings, include password and user credentials; configurable for custom actions and incorporates historical event log.

5. Support self-testing detector capability.

6. Remote Annunciator Support: Up to 10.

7. Provide NAC expansion as required.

8. ECS: Separate system, integrated with FACU.

9. Products:

a. Honeywell International, Inc; Honeywell Notifier; ONYX Series NFS-320 Fire Alarm Panel: www.honeywell.com/#sle.

E. Basis of Design - Addressable Fire Alarm Control Unit (FACU): Honeywell International, Inc; Honeywell Notifier; ONYX Series; voice (but no networking) capability; www.honeywell.com/#sle.

1. Notifier Model NFS2-3030:

a. System Capacity: 3,180 device addresses (1,590 detectors and 1,590 modules) on 10 SLCs; one required NAC expansion card, minimum four NACs; one EIA-485 port for up to 32 remote annunciators and LCD displays; over 2,000 software zones.

b. Features: Strobe synchronization; dedicated alarm, supervisory, and trouble relays; 4,000 event history buffer; Boolean logic equations; releasing up to ten independent hazards; UL 864-listed for post-fire smoke removal and active smoke control.

2. Voice Integration: UL 864-listed control panel for emergency voice evacuation system (EVACS); 70 Vrms; twisted pair copper wire, single-mode fiber optic, and multimode fiber optic media.

a. For FACU NFS2-620 and NFS2-3030: Notifier Model DVC-EM; inclusive of system control equipment for audio transponder; field programmable components and digital distributed audio; digital distributed audio; include backup amplifier for full redundancy at each primary amplifier.

3. Remote Annunciators and Displays: Provide 80-character LCD annunciator, 160-character LCD annunciator, 640-character LCD display, and 1024 X 600 color touchscreen display.

F. Notification Appliance Circuit Expansion:

1. Where notification appliance circuit requirements exceed capacity of FACU, provide accessories and cabinets as required for expansion.

G. Emergency Communications System (ECS):

1. Comply with NFPA 1225.

2. Amplifiers listed and labeled as complying with UL 1711.

3. FACU Listed for ECS:

a. Provide digital ECS integrated with FACU and capable of automatic and manual paging, messaging, evacuation, and alerting on selective and all-call basis.

b. Provide all-call and total evacuation necessary switch points of command, manual controls of evacuation and paging, per zone, prerecorded messaging for nonemergency voice notifications, door unlock provisions, and commands for speaker bypass, unless otherwise approved by Engineer and AHJ.

c. Provide minimum of six switch points of command for speaker bypass, visual bypass, elevator recall bypass, door control bypass, HVAC bypass, and auxiliary bypass.

d. Local and Remote Transponders:

1) Audio hardware, including multiple primary and backup amplifiers, speaker circuit interfaces, power supplies, supervision hardware, cabinets, and battery backup systems may be configured to support multiple notification zones and packaged as audio transponders.

2) Transponders considered system control equipment and located, installed, and interfaced accordingly.

H. Addressable Interface Modules:

1. General Requirements:

a. Provide addressable modules suitable for connection to FACU SLCs.

b. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.

2. Addressable Monitor Modules: Unless devices are explicitly permitted connected together on one zone; provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable FACU.

3. Addressable Control Modules: Provide as indicated or as required for selective control of notification appliances.

4. Addressable Analog Input Modules: Provide as indicated or as required for monitoring and transmitting status signals from devices to FACU.

5. Addressable Relay Modules:

   a. Provide as indicated or as required to perform necessary functions via dry-contact interface.

   b. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.

I. Alarm Communication:

1. Protected Premises Alarm and Signaling Systems:

   a. Provide accessories as required for interface as indicated and as required by AHJ.

   b. Provide accessories in accordance with building code, fire code, and life safety code requirements for occupancy classifications and use cases.

   c. Include software and firmware control, required features, special requirements for low-power radio (wireless) systems, and fire alarm system interconnections required by NFPA 72.

2. Supervising Station Alarm Systems:

   a. Provide accessories as required for interface with supervising station as indicated and as required by AHJ.

   b. Communication Method: Single path, internet protocol (IP).

   c. Supervise communication paths at interval required by NFPA 72.

J. Remote Annunciators:

1. LCD Remote Annunciators:

   a. Provide backlit LCD display that mimics FACU display.

   b. Provide dedicated status indications for power and alarm, supervisory, and trouble conditions.

   c. Enable system control functions including acknowledge, silence, and reset.

   d. Provide local audible alarm.

   e. Mounting: Wall-mounted; provide flush-mounted or surface-mounted annunciator as indicated.

2.3 FIRE ALARM SYSTEM INITIATING DEVICES

A. Manufacturers:

1. Honeywell International, Inc; Honeywell Notifier: www.honeywell.com/#sle.

2. Source Limitations: Furnish initiating devices produced by same manufacturer as FACUs where possible.

B. General Requirements:

1. Addressable Systems:

a. Addressable Devices: Individually identifiable by addressable FACU; suitable for connection to FACU SLCs.

b. Conventional/Nonaddressable Devices: Provide addressable interface modules as indicated or as required for connection to addressable FACU. Unless devices are explicitly permitted to be connected together as one zone, provide separate addressable monitoring point for each device in order to be individually identifiable by addressable FACU.

2. Provide devices and associated accessories suitable for intended application and location to be installed. Unless otherwise indicated, use addressable devices and addressable interface modules only in clean, dry, indoor, nonhazardous locations.

3. Surface-Mounted Devices: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.

4. Devices for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes or enclosures in accordance with product listing.

5. Devices for Hazardous/Classified Locations: Listed and labeled as suitable for classification of installed location.

6. Protective Covers for Fire Alarm Devices: See "Accessories" below.

C. Manual Fire Alarm Boxes/Pull Stations:

1. Description: Noncoded manual signaling boxes listed and labeled as complying with UL 38.

2. Alarm Initiation: Configured for general alarm initiation unless otherwise indicated; presignal stations (where indicated) require use of key to initiate general alarm.

3. Operation: Dual-action unless otherwise indicated or required.

a. Dual-Action Operation: First requires pushing, pulling, or lifting, then pulling of lever.

4. Color: Red, in accordance with NFPA 72.

5. Station Reset: Requires use of key or tool.

D. Spot-Type Detectors:

1. Utilize plug-in mounting to separate base with tamper-resistant feature; provide bases as indicated or as required.

2. Addressable Detectors:

   a. Provide LED indication of normal operation and regular communication with FACU and alarm condition.

3. Smoke Detectors:

   a. Listed and labeled as complying with UL 268.

   b. Provide sensor type (e.g., photoelectric, ionization) as indicated.

4. Thermal/Heat Detectors:

   a. Listed and labeled as complying with UL 521.

   b. Provide sensor type (e.g., fixed temperature, rate-of-rise) and rating as indicated.

5. Carbon Monoxide Detectors:

   a. Listed and labeled as complying with UL 2075.

   b. Provide end-of-life notification.

6. Combination and Multi-Criteria Detectors: Comply with respective requirements for each detection method.

E. Duct Smoke Detectors:

1. Listed and labeled as complying with UL 268A.

2. Ratings: Compatible with air velocity, temperature, and humidity requirements for installed duct.

3. Housing: Select as required for application.

4. Sampling Tubes: Select as required for installation in duct to be monitored.

F. Accessories:

1. Remote Test Stations: Allows for detector key switch test and reset; provides visual and audible indication of alarm condition.

2.4 FIRE ALARM SYSTEM NOTIFICATION APPLIANCES

A. General Requirements:

1. Provide signaling notification appliances listed for fire-protective service and intended operating mode, public or private; suitable for connection to FACU notification appliance circuits.

2. Provide notification appliances and associated accessories suitable for intended application and location to be installed. Use notification appliances only according to listed mounting (e.g. ceiling, wall).

3. Surface-Mounted Notification Appliances: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.

4. Concealed Notification Appliances:

    a. Upon activation from fire alarm system, expose device for operation; return to concealed position upon system deactivation; motor-driven.

    b. Provide door position monitoring system for remote indication of concealed and exposed positions.

5. Exterior Notification:

    a. In addition to required occupant notification, provide notification appliances on exterior of building.

    b. Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes or enclosures in accordance with product listing.

    c. Visible Notification: Provide strobe beacon with red lens; interface to dedicated NAC or addressable control module, 24 VDC, supervised.

    d. Sprinkler System Waterflow Visible Notification: Provide strobe beacon with clear lens; interface to dedicated NAC or addressable control module, 24 VDC, supervised; same circuit as sprinkler system waterflow audible notification where provided.

    e. Sprinkler System Waterflow Audible Notification: Provide bell; interface to dedicated NAC or addressable control module, 24 VDC, supervised; same circuit as sprinkler system waterflow visible notification where provided.

6. Notification Appliance Derating: Include device derating adjustments in accordance with listing where applicable, including the following.

    a. Where accessory protective guards or enclosures are utilized.

    b. Where required by field conditions (e.g., ambient temperature and sound).

7. Notification Appliance Color:

    a. Wall-Mounted: White.

    b. Ceiling-Mounted: White.

    c. See drawings for mounting configuration indicated by symbols on floor plans, system interconnection diagrams, and details.

B. Visible Notification Appliances:

1. Public Mode Operation: Listed and labeled as complying with UL 1971.
2. Private Mode Operation: Listed and labeled as complying with UL 1638.
3. Strobes: Clear or nominal white lens with flash rate of 1 Hz unless otherwise indicated or required; xenon or LED light source with maximum pulse duration of 0.02 seconds; candela rating as indicated.

C. Audible Notification Appliances:

1. Listed and labeled as complying with UL 464.
2. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dBA at 10 feet for public mode operation or 45 dBA at 10 feet for private mode operation in accordance with UL 464.
3. Horns: Selectable tone, including at minimum NFPA 72 temporal 3 pattern and continuous; minimum of two selectable volume levels.

D. Speakers for ECS:

1. Listed and labeled as complying with UL 1480.
2. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dBA at 10 feet in accordance with UL 1480.
3. Frequency Range: 400 to 4,000 Hz minimum in accordance with UL 1480; listed for producing 520 Hz low frequency alarm signal for sleeping areas in accordance with NFPA 72.
4. Speaker Voltage: Field configurable, matched to audio distribution circuit voltage.
5. Provide minimum of four field-selectable power taps.

E. Combination Notification Appliances: Comply with respective requirements for each signaling method.

2.5 WIRE AND CABLE

A. General Requirements:

1. Comply with NFPA 70 listing and marking requirements for cables.
2. Substitution of fire alarm listed cables for communication wiring, in accordance with NFPA 70, is not permitted.
3. Provide cables as indicated or as required for connections between system components.

B. Power-Limited Fire Alarm Cables (PLFA):

1. Comply with applications of listed cables in accordance with Chapter 7 of NFPA 70.

C. Non-Power-Limited Fire Alarm Cables (NPLFA):

1. Comply with NPLFA circuit conductor properties in accordance with NFPA 72.

2. Comply with listing requirements in Chapter 7 of NFPA 70.

2.6 ACCESSORIES

A. Provide components as indicated or as required for connection of fire alarm system to devices and other systems indicated.

B. Provide EoL resistors as required for wiring supervision.

C. Protective Covers for Fire Alarm Devices:

1. Listed to same standard as device being protected.

2. Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor-rated devices.

3. Provide guards to protect devices where subject to mechanical damage; listed for use with detector.

a. Protective Covers for Manual Pull Stations:

1) Provide protective covers with hinged access for manual pull stations.

2) Listed and labeled as complying with UL 38.

3) Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor rated devices.

D. Surge Protection:

1. Line Voltage Surge Protection:

a. Provide for each line voltage circuit serving fire alarm system control units and related equipment (e.g., FACU, field booster panels, nodes, and transponders).

b. Listed and labeled as complying with UL 1449.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field measurements.

B. Verify that system capacities listed in manufacturer instructions align with designed system.

C. Verify that mounting surfaces are ready to accept components and equipment, with suitable support frames and anchors installed where required.

D. Verify ratings, configurations, and characteristics of system components.

E. Verify rough-ins for field connections.

F. Verify that work likely to damage fire alarm system has been completed.

G. Verify that interior of building has been protected from weather.

H. Perform preinstallation tests and inspections per manufacturer's instructions and in accordance with NECA 305.

I. Verify that system bonding is in accordance with Section 260526.

J. Do not energize system until deficiencies have been corrected.

K. Verify that branch circuit wiring installation is completed, tested, and ready for connection to fire alarm system. Overcurrent protection ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

3.2 PREPARATION

A. Prior to installation, confirm environment of installation area is clean, and with ambient temperature, humidity, and ventilation requirements are per manufacturer’s written instructions.

1. Clean and vacuum in accordance with manufacturer's written instructions. Confirm equipment ventilation holes are absent of obstructions and free for air flow.

2. Clean pathways thoroughly to remove foreign materials before installing conductors and cables.

3. Clean dirt, debris, plaster, and other foreign materials from equipment enclosures, cabinets, and outlet boxes.

4. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Follow tool requirements for installation, including torquing adjustments, as listed in manufacturer documentation.

C. Remove detector dust covers prior to system energization.

3.3 INSTALLATION

A. Install field-devices, components, FACU and related equipment, and accessories in accordance with the following:

1. Manufacturer's instructions, applicable codes, and Contract Documents.

2. NECA 1.

3. NECA 305.

4. NFPA 72.

5. NFPA 70; including requirements for mechanical execution of work.

B. Field Locations:

1. Obtain Owner's approval of locations of devices and notification appliances before installation.

2. Arrange equipment to provide minimum operational clearances and required maintenance access in accordance with manufacturer's instructions and NFPA 70.

3. Conceal wiring, conduit, outlet boxes, and supports where installed in finished areas; maintain code-required access.

C. Raceways and Supports:

1. Coordinate locations of outlet boxes as required for installation. Only install boxes and equipment at locations based on application standards indicated in NFPA 72.

2. Secure and support raceways at intervals complying with NFPA 70. Provide supports where vertical rise exceeds permissible limits.

3. Install firestopping to preserve fire resistance rating of partitions and other elements.

D. Wiring and Connections:

1. Maintain separation of Class 1, Class 2, Class 3 remote-control, signaling, fire alarm circuits, and power-limited circuits in accordance with cable insulation class and NFPA 70.

2. Maintain circuit pathway and class designations in accordance with NFPA 72 for configuration, separation, and survivability.

3. Comply with permitted and not permitted installations for wires, cables, cable routing assemblies, communications circuits, and fire alarm circuits in accordance with NFPA 70.

4. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by AHJ. Provide independent support from building structure and suspended ceiling systems. Do not provide support from raceways, piping, ductwork, or other systems.

5. Provide grounding and bonding in accordance with Section 260526.

6. Comply with manufacturer's minimum cable sizes or ratings.

7. Do not exceed manufacturer's recommended maximum power, signal, or network cable lengths between components.

8. Provide network wiring in accordance with NFPA 70.

9. Neatly train and bundle conductors inside boxes, wireways, and cabinets.

10. Fire-Rated Cables and Cabling Systems: Comply with listing requirements to maintain installation, including aspects of attachment surfaces, specific products, and requirements associated with vertical and horizontal routing.

11. See manufacturer's instructions for batteries.

E. Fire Alarm System Components:

1. Install field-installed devices, components, relays, notification appliances, accessories, and when applicable EoL resistors.

    a. Install wiring to supervisory devices and associated EoL resistors as required for supervision of hardwired connections

2. Install Wall-Mounted Equipment: Assemble component hardware within (e.g., card bays, sub-bays, expansion bays, signal cards, other card frames, networking, signal transmission, application modules, tamper monitoring devices, interconnecting modules, and auxiliary power supplies), including space for required spare capacity, and configure settings.

3. Install Interconnect Wiring: Connect system cabinets, install processor and cards, cabling, connectors, terminations, and bonding.

F. Branch Power:

1. After installation confirmations, follow manufacturer instructions to connect branch circuit power cables to premises fire alarm system components; comply with NFPA 70.

2. Where accessories require auxiliary power, provide control power source and monitoring as indicated or as required to complete installation.

3. Install auxiliary power supplies, including indicated monitoring, and connections necessary for remote equipment.

G. System Identification:

1. Identify devices, notification appliances, components, cables, and equipment in accordance with approved submittals. See Section 260553.

2. Confirm fire alarm system programming meets requirements of SOO and sub-system SOOs.

3. Mark location of disconnecting means for NPFLA circuits.

4. Coordinate to provide red branch power circuit protective devices or identify them accordingly as required by NFPA 72 and NFPA 70.

5. Mark date of batteries installed on inside cover of panels and formal maintenance logs.

H. Troubleshooting and Installer Checks:

1. Field test connectivity periodically during installation process to avoid unexpected troubleshooting.

2. Check system operation for notification, FACU functions, circuit supervision, alarm initiating devices, supervisory initiating devices, dress panels/doors/covers, and programming before performing field tests.

I. Fire Alarm System Tests:

1. Perform required tests of NFPA 72. Record measured values during operational checks.

2. Confirm functional testing of fire alarm system is as indicated in Contract Documents.

3.4 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide services of manufacturer's authorized representation to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's detailed testing procedures and field reports and with submittals.

C. Provide equipment, two-way radios for testing personnel use, tools, and supplies required to accomplish inspection and testing.

D. Notify Owner and Engineer at least two weeks prior to scheduled inspections and tests.

E. Inspect and test in accordance with manufacturer's instructions.

F. Inspect wiring and components for damage and defects.

G. Batteries and Power Supplies: Perform inspections and tests listed in manufacturer installation instructions.

H. Perform additional requirements related to testing and inspection during system startup.

I. Test for interface with other systems.

J. Test shunt trips to verify operation.

K. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

L. Submit detailed reports indicated inspection and testing results, corrective actions taken, and as-found and final adjusted settings.

M. Diagnostic Period: After successful completion of inspections and tests, operate system to normal mode for at least 14 days without system or equipment malfunctions.

3.5 SYSTEM STARTUP

A. Obtain Owner approval prior to performing system startup.

B. Manufacturer Services: Provide services of manufacturer's authorized representation to systems startup. Include manufacturer's detailed startup procedures with submittals.

C. Prepare and start equipment and systems in accordance with manufacturer's instructions and recommendations.

3.6 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust initiating device and notification appliance settings to achieve desired operation as indicated in submittals.

C. Measure power supply primary and secondary voltages, log values for records, and make appropriate adjustments.

D. Adjust alignment of equipment covers and doors. Provide keys and spare keys to Owner.

E. Reprint and reinstall damaged or misinstalled labels; maintain neat and square to installed location good workmanship - see NECA 1; maintain consistent placements for identification on products of similar type.

F. Adjust devices or notification appliances and associated bases to be flush and level.

G. Program system parameters according to requirements of Owner.

3.7 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. See Section 017419 - Construction Waste Management and Disposal for field-generated construction waste requirements.

C. Check tightness of electrical connections. Replace damaged components and provide closure plates for vacant positions. Provide circuit directory updates for related power branch circuits.

D. Clean and repair existing materials and equipment that remain or are indicated for reuse.

E. Clean dirt, debris, plaster, and other foreign materials from outlet boxes and fire alarm system equipment and components.

F. Clean fire alarm system equipment and components according to manufacturer's instructions and NECA 305.

G. Clean surfaces and interiors of boxes and device cover plates in accordance with manufacturer's instructions to remove dirt, fingerprints, debris, plaster, and other foreign materials.

H. Repair scratched or marred exposed surfaces to match original factory finish.

I. Comply with federal (EPA), state, and local regulations for battery handling and disposal. Do not spill battery fluids down plumbing drains. Only use containers safe for transportation marked 'nonspillable.'

3.8 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for additional requirements.

B. Comply with NFPA 3 for commissioning of fire protection and life safety systems.

C. Comply with NECA 90 for commissioning building electrical systems.

D. Support Commissioning Agent in assembling test data and generating reports.

E. Participate in four hours of seasonal testing, as scheduled by Commissioning Agent, six months from Date of Substantial Completion.

3.9 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide services of installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required.

E. Provide tools, software, and supplies required to accomplish inspection, testing, and document results.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of AHJ; document each inspection and test.

G. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

H. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without system or equipment malfunctions.

1. Record system operations and malfunctions.

2. If malfunction occurs, start diagnostic period over after correction of malfunction.

3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.

4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.10 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:

1. Hands-On Instruction: On-site, using operational system.

2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

B. Administrative: One-hour session(s) covering issues necessary for nontechnical administrative staff; classroom:

1. Initial Training: One session precloseout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:

1. Initial Training: One session precloseout.

D. Use operation and maintenance documentation as primary instruction material; have paper copies available for attendees and supplement training material aids.

3.11 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Closeout Demonstration: Demonstrate operation of all functions to Owner.

1. Be prepared to conduct any of required tests.

2. Have minimum one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.

3. Have authorized technical representative of FACU manufacturer present during demonstration.

4. Demonstration may be combined with inspection and testing required by AHJ; notify AHJ with enough time to schedule demonstration.

5. Repeat demonstration until successful.

D. Occupancy will not occur prior to Substantial Completion.

E. Substantial Completion of project cannot be achieved until inspection and testing is successful and the following:

1. Specified diagnostic period without malfunction has been completed.

2. Approved operating and maintenance data has been delivered.

3. All aspects of operation have been demonstrated to Owner.

4. Final acceptance of fire alarm system has been given by AHJ.

5. Occupancy permit has been granted.

6. Specified precloseout instruction is complete.

3.12 PROTECTION

A. Protect installed fire alarm system from subsequent construction operations.

3.13 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:

1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.

2. Repairs required, unless due to improper use, accidents, or negligence beyond control of maintenance contractor.

3. Record keeping required by NFPA 72 and AHJ.

C. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within two hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.

3. Owner will pay for call-back service outside of normal working hours on hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Provide complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with detailed schedule.

E. Maintain on-site log listing date and time of each inspection and call-back visit, condition of system, nature of trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

END OF SECTION 284600

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SECTION 284614 - SINGLE AND MULTIPLE STATION ALARMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single- and multiple-station alarms.

1.2 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 284600 - Fire Detection and Alarm: Fire alarm system.

1.3 REFERENCE STANDARDS

A. ICC (IFC) - International Fire Code.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction.

C. NFPA 70 - National Electrical Code.

D. NFPA 72 - National Fire Alarm and Signaling Code.

E. NFPA 101 - Life Safety Code.

F. UL 217 - Standard for Smoke Alarms.

G. UL 539 - Standard for Single and Multiple Station Heat Alarms.

H. UL 1971 - Standard for Signaling Devices for the Hearing Impaired.

I. UL 2034 - Standard for Single and Multiple Station Carbon Monoxide Alarms.

1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

1.5 QUALITY ASSURANCE

A. Comply with the following:

1. NFPA 70.

2. NFPA 72.

3. NFPA 101.

4. ICC (IFC).

5. Requirements of authorities having jurisdiction.

6. Applicable local codes.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.7 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 10-year manufacturer warranty for alarm units. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 SINGLE- AND MULTIPLE-STATION ALARMS

A. General Requirements:

1. Power Supply: 120 VAC with battery backup, alkaline or sealed lithium with 10-year life. Battery-operated only alarms not permitted.

2. Utilize plug-in mounting with tamper-resistant features.

3. Provide alarm test and silence features.

4. Self restoring; automatic alarm reset upon clearing of alarm condition.

5. Multiple-Station Alarms:

a. Utilize wired communication between interconnected alarms.

b. Limit number of interconnected alarms in accordance with manufacturer's requirements and applicable codes.

B. Smoke Alarms:

1. Listed and labeled as complying with UL 217.

2. Smoke Sensor: Photoelectric type unless otherwise indicated.

C. Heat Alarms:

1. Listed and labeled as complying with UL 539.

2. Thermal Sensor: Fixed temperature, 135 degrees F unless otherwise indicated.

D. Carbon Monoxide Alarms:

1. Listed and labeled as complying with UL 2034.

2. Provide end-of-life notification.

E. Combination and Multicriteria Alarms: Comply with respective requirements for each detection method.

F. Provide integrated voice notification in addition to required audible emergency evacuation signal.

G. Strobes Integrated or Interconnected with Multiple-Station Alarms:

1. Listed and labeled as complying with UL 1971.

2. Provide clear or nominal white lens with flash rate of 1 Hz unless otherwise indicated or required; xenon or LED light source with maximum pulse duration of 0.02 seconds; candela rating as indicated.

3. Provide distinguishable visible notification for smoke/heat and carbon monoxide alarms.

2.2 ACCESSORIES

A. Relay Modules:

1. Provide as required to activate external auxiliary devices.

2. Listed as accessory for use with connected alarms.

3. Activate relay contacts when alarm sounds, and deactivate after alarm stops sounding.

4. Contacts: Form C, one normally open and one normally closed.

5. Voltage: 120 VAC.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1 for general workmanship.

B. Install products in accordance with manufacturer's instructions.

C. Install new batteries in devices with field-installed battery backup.

D. Provide grounding and bonding; see Section 260526.

E. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

F. Identify system wiring, components, and overcurrent protective devices for branch circuits serving alarms; see Section 260553.

3.2 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Comply with requirements of authorities having jurisdiction for scheduling and observation of inspections and tests.

C. Perform initial acceptance inspection and testing in accordance with NFPA 72 and requirements of authorities having jurisdiction; document each inspection and test.

D. Use integral test feature to confirm operation of each alarm and activation of interconnected alarms.

E. Test for operation of connected external auxiliary devices.

F. Test for interface with other systems.

G. Correct deficiencies and replace damaged or defective alarms and accessories.

3.3 PROTECTION

A. Protect installed alarms from subsequent construction operations.

END OF SECTION 284614

SECTION 311100 – CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes

1. Cutting of trees and other vegetation.
2. Clearing of miscellaneous vegetation.
3. Removal of roots and related growth.
4. Disposal of all waste materials.

B. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 and any supplements.

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DEFINITIONS

A. Clearing: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.

B. Drainage Course: Layer supporting basement grade used to minimize capillary flow of pore water.

C. Grubbing: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter and debris, and stumps having a diameter of three inches or larger, to a depth of at least 18 inches below the surface and or subgrade; whichever is lower, and the disposal thereof.

1.6 SAFETY REQUIREMENTS

A. Contractor shall conduct all clearing and grubbing activities in conformance with applicable regulations, including those relating to barriers, warning signs, excavation safety, sheeting, shoring, and stabilization.

B. Contractor shall provide and maintain barricades, warning signs, signs, lights, etc., required for the protection of personnel, materials and property. Temporary barricades, etc. shall conform all applicable codes and regulations, and shall be lighted at night with lanterns, flares and reflectorized paint as required for safety. Adapt barricades, signs, lights, etc. to evolving site conditions throughout the progress of the work.

C. Provide other safety devices as required, including adaptation of such safety devices to changing site conditions, to prevent unauthorized entry to construction areas. Provide warning signs and other temporary construction safety devices necessary for proper completion of the work in compliance with applicable safety regulations.

1.7 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained, experienced, and as required licensed, in the necessary crafts and who are completely familiar with the specified requirements

and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Secure the work area and take precautions for preventing injuries to persons or damage to property in or about the work. Protect structures, utilities, sidewalks, pavements and other facilities or sensitive areas from damage by clearing and grubbing operations.

B. Establish all required erosion and sedimentation controls prior to initiating work.

3.2 CLEARING AND GRUBBING

A. Clear, grub, remove, and dispose of all vegetation and debris within the limits of construction, as designated on the plans or as required by Engineer. Contractor shall remove only those trees and shrubs absolutely necessary to allow for the construction. The work shall also include the preservation and protection of all vegetation designated to remain.

B. A preconstruction meeting shall be held with Engineer, Owner, local authorities, property owner(s) and other appropriate personnel, if required, prior to any clearing.

C. The area within the limits of construction or as designated shall be cleared and grubbed of all trees, stumps, roots, brush, undergrowth, hedges, heavy growth of grasses or weeds, debris and rubbish of any nature which, in the opinion of Engineer, is unsuitable for foundation material. Nonperishable items that will be a minimum of five (5) feet below the finish elevation of the earthwork or slope of the embankment may be left in place.

D. Contractor shall provide barricades, fences, coverings, or other types of protection necessary to prevent damage to existing improvements, not indicated to be removed, and improvements on adjoining property. All improvements damaged by this work shall be restored to their original condition or to a condition acceptable to the owner or other parties or authorities having jurisdiction.

E. Protection of Trees and Vegetation: Contractor shall protect existing trees and other vegetation indicated on the Drawings to remain in place against cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary fences or barricades as required to protect trees and vegetation to be left standing at no additional cost.

F. Trees and shrubs that are to remain within the construction limits will be indicated on the Drawings or conspicuously marked on the Project Site. Unless otherwise noted, trees within the construction limits shall become the property of the Contractor and shall be removed from the site.

G. Carefully and cleanly cut roots and branches of trees indicated to remain where the roots and branches obstruct construction of utilities or other subsurface improvements. Contractor shall provide protection for roots and branches over 1 ½ inches diameter that are cut during construction operations. Temporarily cover all exposed roots with wet burlap to prevent roots from drying out. Provide earth cover as soon as possible.

H. Damaged trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to Engineer if they are damaged by construction operations. Repair tree damage as directed by a qualified tree surgeon.

I. Trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to Engineer if they are damaged by construction operations. Repair tree damage as directed by a qualified arborist.

J. All brush, tree tops, stumps, and debris shall be hauled away and disposed of in accordance with all applicable laws and regulations. Contactor shall clean up debris resulting from clearing operations continuously with the progress of the work and remove promptly all salvageable material that becomes his property and is not to be reused in construction. Sale of material on the site is prohibited. Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

K. The method of stripping, clearing and grubbing the site shall be at the discretion of the Contractor. However, all stumps, roots and other debris protruding through the ground surface or in excavated areas shall be completely removed to a minimum depth of 18 inches below surface and/or subgrade whichever is lower and disposed of off the site by the Contractor, at his expense.

L. Marginal Areas: In marginal areas, with Engineer's permission, remove trees where the following conditions exist.

1. Root Cutting: When clearing up to the "clearing limits," the Contractor shall also remove any tree which is deemed marginal such that when the roots are cut and the tree could be rendered unstable by the affects of high winds and in danger of toppling into either the right-of-way or onto private property.
2. Slender Bending Trees: Where young, tall, thin trees are left unsupported by the clearing operation, and are likely to bend over into the right-of-way, Contractor, during the clearing operation, shall selectively remove those trees which are located outside and adjacent to the clearing limits and any right-of-way or easement as well. During the course of construction and during the one-year warranty period, the Contractor shall remove such young trees that overhang into the right-of-way or cleared area.

M. Stripping of Topsoil: Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall be stored in stockpiles, separate from the excavated material, if the topsoil is to be respread. Otherwise material shall be disposed of off-site at Contractor's expense.

3.3 DISPOSAL

A. Contactor shall consolidate and clean-up debris resulting from clearing and grubbing operations continuously with the progress of the work.

B. All brush, treetops, stumps, and debris resulting from clearing and grubbing operations shall be hauled away and disposed of in accordance with all applicable laws and regulations. Any

materials salvaged by Contractor from clearing and grubbing operations shall be promptly removed from the Project Site.

C. Contractor will be responsible for obtaining all applicable permits and paying all fees for the disposal of excess material.

D. Sale of material on the Project Site is prohibited.

E. Burning of material is prohibited.

END OF SECTION 311100

SECTION 312310 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Preparation and grading subgrades for slabs-on-grade, walks, pavements, and landscaping.
2. Excavating and backfilling for structures.
3. Excavation and backfilling for underground utilities and associated appurtenances.
4. Excavation, backfill and compaction for the demolition/removal of subsurface utilities and improvements.
5. Earth retention systems.

B. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 GENERAL

A. Contractor is advised that lines and grades, as shown on the Drawings, are subject to change. Although it is intended to adhere to what is shown on Drawings, Engineer reserves the right to make changes in lines and grades of utilities or other subsurface construction when such changes may be necessary or advantageous.

B. In open trenching on public roadways, Contractor shall be governed by the conditions, restrictions and regulations made by the local or state authority as applicable. All such regulations shall be in addition to those set down in the Specifications.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.

3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 EXCAVATION CLASSIFICATIONS

A. Excavation - Excavation shall be unclassified and no consideration will be given to the nature of the materials. Excavation shall comprise and include the satisfactory removal and disposal of all materials encountered regardless of the nature of the materials and shall be understood to include but not limited to earth, fill, boulders, foundations, pavements, curbs, piping, cobbles, stones, footings, bricks, concrete, previously abandoned drainage structures and utility structures abandoned and not removed by the utility and debris.

B. Common Excavation - Excavation of all materials that can be excavated, moved, loaded, transported, and unloaded using heavy equipment or that can be excavated and dumped into place or loaded onto hauling equipment by excavation equipment (shovel, bucket, backhoe, dragline, or clam shell) or moved with dozer-type equipment, appropriate to the material type, character, and nature of the materials. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material. All Common Excavation shall be included in the Base Bid.

C. Rock Excavation - Rock Excavation as defined herein. The excavation and removal of isolated boulders or rock fragments larger than 1 cubic yard encountered in materials otherwise conforming to the definition of Common Excavation shall be classified as rock excavation. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material.

1.6 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 and any supplements.

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction

D. American Concrete Institute (ACI)

1. ACI 229R-99 - Controlled Low-Strength Materials (CLSM).

E. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO Method T 90 - Determining the Plastic Limit and Plasticity Index of Soils.
2. AASHTO T104 - Standard Method of Test for Soundess of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
3. AASHTO Method T146 - Standard Method of Test for Wet Preparation of Disturbed Soil Samples for Test.

F. ASTM International (ASTM).

1. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soils.
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3(2,700 kN-m/m3)).
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
7. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.7 DEFINITIONS

A. Backfill: Soil material or flowable concrete used to fill an excavation.

B. Bedding Course: Layer placed over the excavated sub-grade in a trench before laying pipe.

C. Benching: A method of limiting cave-in potential by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Clearing: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.

F. Drainage Course: Layer supporting basement grade used to minimize capillary flow of pore water.

G. Earth Retention Systems: Any structural system, such as sheeting and bracing or cofferdams, designed to retain in-situ soils in place and prevent the collapse of the sides of an excavation in order to protect employees and adjacent structures.

H. Excavation: Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

1. Additional Excavation: Excavation beyond required dimensions or below subgrade elevations that is requested and/or directed by Engineer. Additional Excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
3. Unauthorized Excavation: Excavation below the elevations specified on the plans, beyond the limits indicated on the plans, or where no dimensions are indicated, beyond depths, elevations, and dimensions reasonably necessary for construction of the work without the request and/or direction of the Engineer. Unauthorized excavation, as well as any remedial work directed by Engineer, or if applicable Geotechnical Engineer, shall be without additional compensation.

I. Fill: Soil materials used to raise existing grades.

J. Finished Grade: The proposed final elevations shown on the Drawings or called for in the Specifications.

K. Geotechnical Engineer: A qualified and licensed entity designated for the project as the authority on the assessment, design, and oversight of soil and/or rock conditions and construction affected by such conditions.

L. Geotechnical Testing Agency: An independent testing agency employed by Owner, or by Contractor is called-for, and qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

M. Grubbing: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter and debris, and stumps having a diameter of three inches or larger, to a depth of at least 18 inches below the surface and or subgrade; whichever is lower, and the disposal thereof.

N. Protective System: A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include earth retention systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

O. Regular Excavation: Removal and disposal of any and all material above subgrade elevation, except solid rock and undercut excavation, located within the limits of construction.

P. Rock: Solid ledges, bedded deposits, unstratified masses and conglomerations of material so firmly cemented as to possess the characteristics of solid rock which cannot be removed without systematic drilling or hoe ramming. All boulders containing a volume of more than one (1) cubic yard shall be considered rock.

Q. Rock Excavation: Removal and satisfactory disposal of Rock, which, in the opinion of Engineer, cannot be excavated except by drilling, wedging, jack hammering or hoe ramming or the excavation of boulders or rock fragments containing a volume of more than one (1) cubic yard. The presence of isolated boulders or rock fragments larger than 1 cubic yard is not in itself sufficient cause to change the classification of the surrounding material.

R. Licensed Professional Engineer: A person who is licensed as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is

deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

S. Satisfactory Materials: Earth material that meets the classification, use, and/or gradation requirements herein that does not contain limestone, shale, clay, ash, slag, friable material, organic or vegetative materials, topsoil, wood, trash, broken concrete, masonry rubble, trash, refuse, or frozen materials.

T. Shield System: A structure that is designed to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built in accordance with 29 CFR 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

U. Sloping: A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

V. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

W. Sub-grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below drainage fill.

X. Surplus Material: Excavated acceptable material that cannot be utilized elsewhere on the site as backfill or embankment fill, or as otherwise directed by the Engineer.

Y. Temporary Dewatering System: A system to lower and control water to maintain stable, undisturbed subgrades at the lowest excavation levels. Dewatering shall be provided for all pipelines, structures and for all other miscellaneous excavations.

Z. Testing Laboratory: A qualified entity engaged to perform specific laboratory tests.

AA. Testing Agency: A qualified entity engaged to collect samples, perform specific in-field tests, and/or inspections. The Testing Laboratory may provide the services of the Testing Agency.

BB. Trench: A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet.

CC. Unacceptable Material: Soil material that contains organic silt, peat, vegetation, wood or roots, stones or rock fragments over six (6) inches in diameter or exceeding 40 percent by weight of the backfill material, porous biodegradable matter, loose or soft fill, construction debris, or refuse, or material which cannot be compacted to the specified or indicated density.

1.8 SUBMITTALS

A. Site Characterization of Off-Site Borrow Sources: The following information shall be submitted to Engineer for review at least two weeks prior to use of an off-site borrow source:

1. Location and name of the borrow source site.
2. Owner and contact information for the borrow source site.
3. Present and past usage of the source site and materials.
4. Any previously existing report(s) associated with an assessment of the source site as relates to the presence of oils, hazardous materials, or other organic and non-organic constituents which may be considered contaminants.
5. Location within the site from which the material will be obtained.

B. Chemical Testing Data: For each type/classification of earth material proposed and each source of earth material proposed: Submit a letter signed by an authorized representative of material supplier stating that such proposed material is free of oils, hazardous materials, or other organic and non-organic constituents which may be considered contaminants.

C. Material Testing Data: Provide results for all proposed bedding, fill, aggregates, and backfill. Submit complete laboratory reports.

1. Gradation analysis.
2. Soil classification and Moisture-Dry Density Curve.
3. Loss on Abrasion.
4. Soundness.

D. Samples: 50-pound sample of each type of off-site bedding, fill, aggregates, and backfill that are proposed for use at the Project Site in an air-tight container for the testing laboratory, a minimum of two weeks prior to delivery of such material to the site. Use of these proposed materials by Contractor prior to testing and approval or rejection shall be at Contractor's risk.

E. Product Data

1. Plastic warning tape.
2. Separation fabric, filter fabric, geogrids, or similar geotextiles.

F. Field Testing Results

1. Compaction test results keyed to date and specific location of testing. Provide Engineer with copies of testing reports within 24 hours of field test.

1.9 SAFETY

A. Contractor shall conduct all excavation activities in conformance with applicable regulations, including those relating to warning signs, excavation safety, sheeting, shoring, and stabilization.

B. Contractor shall provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Temporary barricades, etc. shall conform all applicable codes and regulations, and shall be lighted at night with lanterns, flares and reflectorized paint as required for safety. Adapt barricades, signs, lights, etc. to evolving site conditions throughout the progress of the work.

C. Provide other safety devices as required, including adaptation of such safety devices to changing site conditions, to prevent unauthorized entry to construction areas and open excavations. Provide warning signs and other temporary construction safety devices necessary for proper completion of the work in compliance with applicable safety regulations.

D. Contractor shall properly design and furnish all labor, materials, equipment, and tools necessary to construct permanent or temporary excavation support systems, including, but not necessarily limited to, sheet piling, trench shields, trench boxes, timber trench shoring, pneumatic/hydraulic shoring, steel sheeting or sheeting using other materials, sloping, and benching.

E. Any time an excavation is to remain open, at a minimum, provide full enclosure with safety barriers and fencing, warning signs, and additional safety control measures as appropriate for the condition.

1.10 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

B. Utility Mark-out

1. Prior to commencing work, comply with utility mark-out requirements of the Call-Before-You-Dig System (1-800-922-4455).
2. Verify the location of all subsurface utilities marked through the Call-Before-You-Dig System.
3. Not all subsurface facilities or structures will be identified through the Call-Before-You-Dig System. Confirm the location of other subsurface utilities and other subsurface facilities or structures prior to commencing work. Field-mark utilities as required.

C. Codes and Standards: Perform the work of this Section in accordance with all applicable codes, standards, and the requirements of authorities having jurisdiction.

D. Engineer reserves the right to perform all in-field testing specified in this Section and reserves the right to determine the suitability of all materials to be used for fills and reject any fill not meeting the specifications.

E. Field Density testing and subgrade observation shall be performed by the designated entity

F. Weather Limitations:

1. Material excavated when frozen or when air temperature is less than 32 degrees Fahrenheit (32 F) shall not be used as fill or backfill until material completely thaws.
2. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.11 TESTING

A. The Owner will retain a testing entity to perform sampling and testing of the work under this Section during construction. The testing entity’s presence does not constitute supervision or direction of Contractor’s work. Neither the presence of the testing entity nor any observations and testing performed by him, nor any notice or failure to give notice shall excuse Contractor from conformance with these Specifications or from defects discovered in his work. Contractor shall remain responsible for all pre-construction sapling and testing.

B. Borrow and Fill: Contractor shall provide testing as defined below.

1. Gradation analysis for each type of borrow and on-site fill materials by ASTM D422.
2. Soil classification (ASTM D2487) and Moisture-Dry Density Curve (Proctor Test-Modified) by ASTM D1557 for all proposed fill and backfill materials at the frequency specified below:

   a. For suitable soil materials removed during Trench Excavation, perform one test for every 1,000 cubic yards of similar soil type. Similarity of soil types will be as determined by the Engineer.
   b. For borrow materials, perform tests from each proposed source, at a rate of one test for every 1,000 cubic yards of soil type. Similarity of soil types will be as determined by the Engineer.

3. Loss on Abrasion: Where called-for, AASHTO Method T 96.
4. Soundness: Where called-for, AASHTO Method T 104.

C. Compaction Testing: Owner will conduct compaction testing (i.e. ASTM D2922 and ASTM D3017 or ASTM D1556) at the frequency indicated below.

1. Trench: 1 test per lift, every 1,000 square feet or 200 feet of trench.
2. Embankment: 1 test per lift, every 1,000 square feet.
3. Additional compaction testing may be required when there is evidence of a change in the quality of moisture control or the effectiveness of compaction.
4. If all compaction test results within the initial 25% of the total anticipated number of tests indicate compacted field densities equal to or greater than 95% of maximum dry density at optimum moisture content, Engineer may reduce frequency of compaction testing. In no case will the frequency be reduced to less than one test for every 500 cubic yards of material backfilled.
5. If testing indicates that compacted subgrade, backfill, or fill are below specified density, additional compaction and/or replacement of material shall be provided at no expense to Owner.

D. Chemical Testing: Prior to delivery of any earth material to the Project Site, Contractor shall conduct chemical testing to demonstrate that such material is free of oils, hazardous materials, or other organic and non-organic constituents which may be considered contaminants.

1.12 EXCAVATED MATERIAL

A. Placement

1. Excavated material shall be so placed as not to interfere with travel or movement on existing streets, driveways, sidewalks or other areas designated to remain undisturbed. Excavated material shall not be deposited on private property without the written consent of the property owner(s) and approval of Engineer.
2. No excavated material shall be stored on top of installed pipe or other construction. Contractor shall consider surcharge loads when stockpiling excavated material adjacent to trenches, and take any measure required to prevent cave-in, including but not limited to, trench support systems and/or stockpiling excavated material remote from trench.

B. Suitable excavated material may be used for Common Fill or Backfill on other parts of the Work, if specifically approved by Engineer.

C. Material excavated from private property shall belong to the property Owner, or his representative, and shall be disposed of by the Contractor, as required by said Owner or his representative. If the Contractor fails to promptly remove such surplus material, Engineer may have the same done and charge the cost thereof as money paid to the Contractor.

D. Contractor shall be responsible for the proper disposal of all unsuitable excavated materials. Engineer shall determine what is suitable or unsuitable material where questions arise. Generally, unsuitable material shall include, but not be limited to, pavement (bituminous and concrete), large boulders, pipe, conduit and metal.

E. Contractor shall submit to Engineer, for approval, the location(s) to be utilized during the Contract period for waste material disposal. This approval must occur before any export of waste material from the project site. Any change in the disposal site during construction shall be submitted for approval.

1.13 SHEETING, SHORING AND BRACING

A. Provide earth retention systems as required by federal, state and local regulations. Shoring and bracing of trenches and other excavations shall be in accordance with the latest OSHA Standards and Interpretations, and to all other applicable codes, rules and regulations of federal, state and local authorities.

1.14 DRAINAGE

A. At all times during construction, Contractor shall temporarily provide, place and maintain ample means and devices with which to remove promptly, and dispose of properly, all water entering trenches and other excavations, or water that may flow along or across the site of the Work, and keep said excavations dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be damaged. At the conclusion of the work, Contractor shall remove such temporary means and devices.

B. All groundwater which may be found in the trenches and foundation excavations, and any water which may get into them from any cause whatsoever, shall be pumped or bailed out, so that the trench shall be dry during pipe laying and backfilling and during the placement of concrete.

C. All water pumped or drained from the Work shall be managed in accordance with applicable discharge permits, without undue interference with other work or damage to pavements, other surfaces, or property.

1.15 COORDINATION

A. Prior to commencing earthwork operations, meet with representatives of governing authorities, Engineer, testing entity, and other pertinent entities.

1. Review earthwork procedures and responsibilities including Contractor's schedule of operations, scheduling observation and testing procedures and requirements.
2. Notify participants at least three (3) working days prior to convening conference. Record discussions and agreements and furnish copies to each participant.
3. Contractor shall at all times so conduct his work as to insure the least possible inconvenience to the general public and the residents in the vicinity of the work. Fire hydrants on or adjacent to the work shall be kept accessible to firefighting equipment at all

times. Temporary provisions shall be made by Contractor to ensure the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed except as approved by Engineer.

B. Benchmark/Monument Protection: Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, replace at no cost to Owner.

C. Provide five (5) days advance notice to Engineer and testing entity for any proposed earthwork operation requiring observation and/or testing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. All materials used in the work of this Section shall be Satisfactory Material, and any material that does not meet this classification shall be considered an Unsatisfactory Material and shall not be used.

B. Unsatisfactory Soils: Soil materials not meeting the requirements for Satisfactory Soils.

1. Unsatisfactory soils also include satisfactory soils not maintained within two (2) percent of optimum moisture content at time of compaction.

2.2 COMMON FILL/ORDINARY BORROW

A. Earth materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GP-GC, SW, SP, and SM that are free of clay.

B. Common Fill material is subject to the approval of Engineer and may be either material removed from excavations or borrow from off site. It shall have physical properties such that it can be readily spread and after it has been placed and properly compacted, it will form a dense, stable fill.

C. Common Fill shall be graded as follows:

Gradation of Common Fill

Sieve	Percent Passing by Weight
6”	100
3.5 ”	50-100
3/4”	50-90
No. 4	25-55
No. 200	0-20

1. Less than twenty (20) percent of material by weight passing the No. 4 sieve shall pass the No. 200 sieve.
2. Common Fill shall not be used at locations where use of select fill is indicated.

2.3 COMMON FILL/ORDINARY BORROW

A. Satisfactory Material that is well-graded meeting ASTM D 2487 classification group GW, GP, GM, SW, SP, and SM. No particle shall exceed 6-inches in size and no greater than 10% by weight of the material shall pass the No. 100 sieve and no greater than 5% by weight of the material shall pass the No. 200 sieve.

B. Common Fill is subject to the approval of Engineer and may be either material removed from on-site excavations or borrow pits or imported from off-site, approved sources. It shall have physical properties such that it can be readily spread and after it has been placed and properly compacted, it will form a dense, stable fill.

Bank Run Gravel

C. Granular material, well graded from fine to coarse, obtained from approved natural deposits and unprocessed, except for the removal of unacceptable material and stones larger than the maximum size permitted.

D. Bank Run Gravel shall be graded as follows:

Gradation of Bank Run Gravel (ConnDOT Grading “C”)

Sieve	Percent Passing by Weight
1 ½”	100
¾”	45-80
¼	25-60
No. 10	15-45
No. 40	5-25
No. 100	0-10
No. 200	0-5

2.4 GRANULAR FILL

A. Broken or crushed stone, gravel, or a mixture thereof.

B. Broken or crushed stone

1. The product resulting from the artificial crushing of rocks, boulders or large cobblestones, substantially all faces of which have resulted from the crushing operation. Broken or crushed stone shall consist of sound, tough, durable stone, reasonably free from soft, thin, elongated, laminated, friable, micaceous or disintegrated pieces.

C. Bank or crushed gravel

1. Sound, tough, durable particles of crushed or uncrushed gravel, free from soft, thin, elongated or laminated pieces and vegetable or other deleterious substances. Crushed gravel shall be the manufactured product resulting from the deliberate mechanical crushing of gravel with at least 50% of the gravel retained on the No. 4 sieve having at least one fractured face.

D. Granular Fill shall be graded as follows:

Gradation of Granular Fill (ConnDOT M.02.01 Grading “A”)

Sieve	Percent Passing by Weight
3 ½”	100
1 ½”	55-100
1/4”	25-60
No. 10	15-45
No. 40	5-25
No. 100	0-10
No. 200	0-5

2.5 SCREENED GRAVEL AND CRUSHED STONE

A. Screened gravel, well graded in size from 3/8 inch to 3/4 inch. The gravel shall consist of clean, hard, and durable particles or fragments. Crushed rock of suitable size and grading may be used instead of screened gravel.

B. Screened Gravel shall be graded as follows:

Gradation of Screened Gravel (ConnDOT Gradation No. 6)

Sieve	Percent Passing by Weight
1”	100
3/4”	90-100
1/2”	20-55
3/8”	0-15
No. 4	0-5

2.6 PROCESSED AGGREGATE BASE

A. Coarse aggregates and fine aggregates shall be combined and mixed by approved methods so that the resulting material shall conform to the following gradation:

Gradation of Processed Aggregate Base

Sieve	Percent Passing by Weight
2 1/2”	100
2”	95-100
3/4”	50-75
1/4”	25-45
No. 40	5-20
No. 100	2-12

B. Coarse Aggregate: Either gravel, broken stone or a combination thereof. When tested by means of the Los Angeles Machine, using AASHTO Method T 96, the coarse aggregate shall not have a loss of more than 50%.

1. If gravel is used for the coarse aggregate, it shall consist of sound, tough, durable particles of crushed or uncrushed gravel or a mixture thereof, free from soft, thin, elongated or laminated pieces, lumps of clay, loam and vegetable or other deleterious substances.
2. If broken stone is used for the coarse aggregate, it shall consist of sound, tough, durable fragments of rock of uniform quality throughout. It shall be free from soft disintegrated pieces, mud, dirt, organic or other injurious material.
3. Soundness for Gravel and Broken Stone: When tested by magnesium sulfate solution for soundness using AASHTO Method T 104, the coarse aggregate shall show a loss of not more than 15% at the end of 5 cycles.

C. Fine Aggregate: Natural sand, stone sand, screenings or any combination thereof. The fine aggregate shall be limited to material 95% of which passes a No. 4 (4.75-mm) sieve having square openings and not more than 8% of which passes a No. 200 (75-µm) sieve. The material shall be free from clay, loam and deleterious materials.

1. Plasticity: When natural sand is used, the fine aggregate shall conform to the following:

    a. When the fraction of the dry sample passing the No. 100 mesh sieve is 4% or less by weight (mass), no plastic limit test will be made.
    b. When the fraction of the dry sample passing the No. 100 mesh sieve is greater than 4% and not greater than 8% by weight (mass), that fraction shall not have sufficient plasticity to permit the performing of the plastic limit test using AASHTO Method T 90.
    c. When the fraction of the dry sample passing the No. 100 mesh sieve is greater than 8% by weight (mass), the sample will be washed; and the additional material passing the No. 100 mesh sieve shall be determined by AASHTO Method T 146, except that the No. 100 mesh sieve will be substituted for the No. 40 mesh sieve where the latter is specified in AASHTO Method T 146. The combined materials that passed the No. 100 mesh sieve shall not have sufficient plasticity to permit the performing of the plastic limit test using AASHTO Method T 90.

2. Plasticity: When screenings or any combination of screenings and natural sand or any combination of stone sand and natural sand are used, the following requirements shall apply:

    a. When the fraction of the dry sample passing the No. 100 mesh sieve is 6% or less by weight (mass), no plastic limit test will be made.
    b. When the fraction of the dry sample passing the No. 100 mesh sieve is greater than 6% and not greater than 10% by mass, that fraction shall not have sufficient plasticity to permit the performing of the plastic limit test, using AASHTO Method T 90.

c. When the fraction of the dry sample passing the No. 100 mesh sieve is greater than 10% by weight (mass), the sample shall be washed; and additional material passing the No. 100 mesh sieve shall be determined by AASHTO Method T 146, except that the No. 100 mesh sieve shall be substituted for the No. 40 mesh sieve where the latter is specified in AASHTO Method T 146. The combined materials that have passed the No. 100 mesh sieve shall not have sufficient plasticity to permit the performing of the plastic limit test using AASHTO Method T 90.

2.7 BEDDING

A. Slabs on grade

1. Granular Fill unless otherwise indicated.

B. Utilities

1. Unless otherwise indicated, bedding shall consist of screened gravel, maximum size 3/4 inches and minimum size 3/8 inches.
2. When clay, wet, soft or silty soil conditions prevail, 3/4-inch crushed stone shall be used for bedding of pipe.

2.8 SAND

A. Sand shall consist of clean, hard, durable, uncoated particles of quartz or other rock. It shall not contain more than 3% of material finer than a #200 sieve.

B. Organic Impurities: Fine aggregate subjected to the colorimetric test shall not produce a color darker than Gardner Color Standard No. 11, using AASHTO T 21. If the fine aggregate fails to meet this requirement, the provisions of AASHTO M 6, Section 5.2, will govern.

C. Sand shall be uniformly graded as follows:

Gradation of Sand

Sieve	Percent Passing by Weight
3/8”	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

D. The above gradation represents the extreme limits which shall determine suitability for use from all sources of supply. The gradation from any one source shall be reasonably uniform and not subject to the extreme percentages of gradation specified above. For the purpose of determining the degree of uniformity, a fineness modulus determination will be made upon representative samples from any source. Fine aggregate from any one source having a variation in fineness modulus greater than 0.20 either way from the fineness modulus of the representative sample will be rejected.

2.9 FLOWABLE CONCRETE FILL/BACKFILL (FLOWFILL)

A. Cementitious material, ACI 229R, comprised of cement, aggregates, fly ash, water, and admixtures, capable of being poured or pumped, self-leveling, self-curing to specified strengths.

B. Excavatable flowfill: Concrete strength shall be liquid enough to flow, be self-leveling and excavatable by hand methods. Unless otherwise specified, excavatable flowfill shall have a minimum 28 day compressive strength of 30 psi, and shall not exceed 100 psi.

C. Non-excavatable flowable: Concrete strength shall be liquid enough to flow and be self-leveling and excavatable by machine equipment. Unless otherwise specified, non-excavatable flowfill shall have a minimum 28-day compressive strength of 125 psi, and shall not exceed 200 psi.

2.10 DETECTABLE WARNING TAPE

A. Acid and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric power lines, electric power conduits and other electric power facilities.
2. Blue: Water.
3. Orange: Communication lines or cables, including but not limited to telephone, fire signals, cable television, and electronic controls.
4. Green: Storm drainage and sanitary sewer systems, including force mains and other non-hazardous materials.

PART 3 - EXECUTION

3.1 PREPARATION

A. Notify “Call-Before-You-Dig” to request a utility mark-out for the Project Site prior to any earth disturbance. Provide written confirmation to Engineer that such mark-out has been completed.

B. Verify site conditions before proceeding with demolition work. Field check the accuracy of the Drawings and inspect structures, utilities, and other site features prior to start of work and notify Engineer in writing, of any discrepancies or hazardous conditions.

C. Take precautions for preventing injuries to persons or damage to property in or about the work. Protect structures, utilities, sidewalks, pavements and other improvements from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

D. Protect sub-grades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

E. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

F. When excavations are to be made in paved surfaces, the pavement shall be removed so as to provide a clean uniform edge with a minimum disturbance of remaining pavement. Saw cutting the pavement to provide a clean, uniform edge shall unless otherwise indicated.

G. If pavement is removed in large pieces, it shall not be mixed with other excavated material, but shall be disposed of away from the site of the Work before the remainder of the excavation is made.

3.2 CLEARING AND GRUBBING

A. Clear, grub, remove, and dispose of all vegetation and debris within the limits of construction, as designated on the plans or as required by Engineer. Contractor shall remove only those trees and shrubs absolutely necessary to allow for the construction. The work shall also include the preservation from injury of defacement of all vegetation or object designated to remain.

B. Refer to Section 31 1100 – Clearing and Grubbing.

3.3 PROTECTION OF EXISTING FEATURES

A. General

1. Protect all existing improvements from damage unless those improvements are specifically designated for permeant removal, relocation, or temporary removal and replacement.
2. As excavation approaches underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools.
3. Pavements: On paved surfaces to remain, do not use or operate tractors, bulldozers, or other power operated equipment, the treads or wheels of which are so shaped as to cut or otherwise damage such surfaces. All surfaces, which have been damaged by Contractor's operations, shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations. Suitable materials and methods shall be used for such restoration.

B. Utilities

1. Existing utilities remaining in service, including those remaining in service until after relocation, and relocated utilities shall be protected from damage. Before excavating near any existing utilities, notify the utility owner, coordinate protective work and comply with the utility owners' requirements. Coordinate with respective utility owners/operators as required.
2. Safeguard and protect from damage or movement any existing services, utilities, and utility structures uncovered or encountered which are to remain in service.
3. All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs.
4. Where known utilities are encountered, notify Engineer and document location and type of utility before proceeding with work in such area.
5. When uncharted or incorrectly charted piping or utilities are encountered during excavation, stop work and notify Engineer immediately. Cooperate with the utility owners in maintaining their utilities in operation prior to resuming work.

C. Retaining Structures: Provide bracing, shoring, sheeting, sheet piling, underpinning or other retaining structures necessary to guard against any movement or settlement of existing or new construction, utility systems, paving, or other improvements. Assume responsibility for the

strength and adequacy of retaining structures, and for the safety and support of construction, utilities or paving, and for any movement, settlement or damage thereto. Retain the services of a licensed engineer as required to design bracing, shoring, sheeting, sheet piling, underpinning or other retaining structures.

D. Replacement and Relocation

1. In case of damage, Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done. When the Owner does not wish to make the repairs themselves, all damage shall be repaired by Contractor, or, if not promptly done by him, Engineer may have the repairs made at the expense of Contractor.
2. If certain existing structures are encountered that in the opinion of Engineer require temporary or permanent relocation or removal, Engineer may order in writing that Contractor undertake all or part of such work or to assist the Owner in performing such work. For such occurrences, Contractor shall be compensated as applicable, as extra work.
3. In removing existing structures, Contractor shall use care to avoid damage to the material, and Engineer shall include for payment only those new materials, which, in his judgment, are necessary to replace those unavoidably damaged.
4. The structures to which the provisions of the preceding two paragraphs shall apply include structures which (1) are not indicated on the Drawings or otherwise provided for, (2) encroach upon or are encountered near and substantially parallel to the edge of the excavation, and (3) in the opinion of Engineer will impede progress to such an extent that satisfactory construction cannot proceed until they have been changed in location, removed (to be later restored), or replaced. (See Item 3.19, "Sub Surface Obstructions" also).

3.4 DEWATERING

A. Comply with all applicable permit requirements.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrade and from flooding Project site and surrounding area.

C. Protect sub-grades from softening, undermining, washout and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install de-watering system to keep subgrades dry and convey ground water away from excavations.

3.5 EXCAVATION

A. Dust Control: During the progress of the Work, Contractor shall conduct his operations and maintain the area of his activities in order to minimize the creation and dispersion of dust. Refer to Section 01 5714- Temporary Dust Control.

B. Excavate to the exact elevations shown on the plans, or as directed by Engineer. Where no dimensions are indicated, make excavations in such manner, and to such depths, elevations, and dimensions, that will give suitable room for construction of the work indicated on the Drawings. As applicable for utility installations, comply with trench limits shown on the Drawings.

C. Furnish and place all sheeting, bracing, and supports, and render the bottom of the excavation firm and dry, and in all respects, acceptable for construction of the work.

D. If Contractor excavates below the elevations specified on the plans, beyond the limits indicated on the plans, or where no dimensions are indicated, beyond depths, elevations, and dimensions reasonably necessary for construction of the work, Contractor shall bring the excavation back to the proper elevation and/or dimension by backfilling with Suitable Material that is approved by Engineer in accordance with the backfilling provisions specified herein. Engineer, or if applicable Geotechnical Engineer, shall have sole authority in determining the specific composition of such Suitable Material.

1. Any increase in cost resulting from Unauthorized Excavation, including but not necessarily limited to backfilling, haul-off, increasing the size of footings or foundations, testing, schedule impact, or administrative impact shall be at Contractor's sole expense.

E. If utilities are to be laid in new embankments, or other new fill areas which are more than 12 inches deep below the invert of the pipe, the fill material shall be placed and properly compacted to final grade or to a height of at least 3 feet above the top elevation of the pipe, whichever is the lesser, before laying pipe. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall then be excavated as though in undisturbed material.

3.6 TRENCH EXCAVATION

A. In general, trenches shall be excavated to such depth as will provide a cover depth as indicated on the Drawings from finished grade to the top of the pipe barrel. Deeper trenches shall be provided where necessary on account of the conformation of the ground and to permit the alignment of the pipe without undue deflection of joints.

B. Trenches shall be excavated by hand or machinery to the width and depth indicated on the Drawings and specified herein. Depth shall account for thickness of the pipe and thickness of bedding. All loose materials shall be removed from the bottom of the trench so that the bottom of the trench will be in an undisturbed condition.

C. If in the opinion of Engineer, the material at or below the depth to which excavation for structures and pipes would normally be carried is unsuitable for foundation, it shall be removed to such widths and depths as directed and replaced with suitable material.

D. Trench widths shall be 3 feet greater than the nominal inside diameter of pipe for such diameters of 36 inches or less. For diameters greater than 36 inches, the width shall be 4 feet greater than nominal inside diameter. Trench excavation for manholes, catch basins, drop inlets, etc. shall be two (2) feet outside the neat lines of the foundations. These limits may be adjusted for field conditions at the direction of Engineer.

E. Bedding for pipe and utility structures will be as detailed on the Drawings.

3.7 APPROVAL OF SUBGRADE

A. Notify Engineer, and Geotechnical Engineer if applicable, when excavations have reached required subgrade elevation.

B. If Engineer and, if applicable, Geotechnical Engineer determines that Unacceptable Material is present, continue excavation of such Unacceptable Material and replace with approved Satisfactory Materials as directed. The replacement of Unacceptable Material with Satisfactory Materials will be paid for as a change in the work according to applicable provisions of the contract.

C. Protect subgrade from disturbance at all times. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water or construction activities, as directed by Engineer. Excavation and replacement with structural fill of any disturbed or softened materials resulting from inadequate preparation, inadequate dewatering, or inadequate protection, shall be at Contractor's sole expense.

3.8 FILL AND BACKFILL

A. Fill: Contractor shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from areas upon which embankments will be built or material will be placed as fill to adjust subgrade prior to final grading. The subgrade shall be prepared by forking, furrowing, or plowing such that the first layer of the new material placed thereon, will be well bonded to it.

B. Backfill: Common Fill material may be used as backfill when indicated on the Drawings or when authorized by Engineer (or as applicable Geotechnical Engineer) if Contractor can achieve required minimum dry density after compaction. Backfilling shall be done as promptly as is consistent with non-injury to pipe or structures, but no backfilling shall be done before Engineer (or as applicable Geotechnical Engineer) gives permission.

C. Frozen material shall not be placed in any fill or backfill, nor shall any fill or backfill be placed upon frozen material. Previously frozen material shall be removed, or shall be otherwise treated as required, before new fill or backfill is placed.

D. After the subgrade has been prepared, fill material shall be placed thereon and built up in successive layers not exceeding twelve (12) inches before compaction until it has reached the required elevation.

1. When gravel fill or other material is used for foundation of structures, it shall be spread in layers of uniform thickness not exceeding six (6) inches before compaction.

E. Upon completion of filling and backfilling, all surplus material shall be removed and surfaces to remain which are affected in any way by the work restored to the condition in which they were before ground was broken. All surplus materials shall become the property of Contractor. If Contractor fails to promptly remove such surplus materials, Engineer may have the same done and charge all associated costs to Contractor, including deduction from payments due.

3.9 BACKFILLING UTILITIES

A. As soon as practical after utility has been placed into bedding and joints properly made, backfilling shall begin, and shall continue without delay.

B. Placement of bedding over pipe prior to placement of backfill shall be as indicated on the Drawings. Hand-place bedding at the sides of the pipe and to the limits indicated on the Drawings over the pipe. Bedding placed over pipe shall be in 6-inch layers, leveled along the length and width of the trench and thoroughly compacted with approved tampers.

C. Install warning tape as indicated o the Drawings unless otherwise specified by the utility owner/operator.

3.10 BACKFILLING AT STRUCTURES

A. No backfill shall be deposited against concrete until the concrete has obtained sufficient strength to withstand the earth pressure placed upon it and in no case less than seven days, nor before carrying out and satisfactorily completing the tests for watertight structures specified elsewhere.

B. Prior to placing backfill, subgrade shall be thoroughly compacted. Soft or loose material evident during compaction shall be removed and replaced with Granular Fill.

C. Fill placed around arches, rigid frames, box culverts and piers shall be deposited on both sides of the structure to approximately the same elevation at the same time. Each layer of backfill shall be spread to a thickness not exceeding 6 inches deep after compaction and shall be thoroughly compacted by the use of power rollers or other motorized vehicular equipment, by tamping with mechanical rammers or vibrators, or by pneumatic tampers. Any equipment not principally manufactured for compaction purposes or which is not in proper working order in all respects shall not be used within the area described above.

D. Bring backfill to sub-grade elevations. Slope backfill at exterior of building to drain water away from building.

3.11 COMPACTION

A. Each layer of fill or backfill material shall be compacted by the use of compaction equipment consisting of rollers, compactors or a combination thereof. Earth-moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment. At such points as cannot be reached by mobile mechanical equipment, or where such equipment is not permitted, the materials shall be thoroughly compacted by the use of suitable power- driven tampers.

B. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compacting shall be done when the material is too wet, from either rain or application of water, to compact it properly. At such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions shall be taken as may be necessary to obtain proper compaction.

C. Special attention shall be given to compaction in places close to walls where motorized vehicular compaction equipment cannot reach. Within 3 feet of the back face of walls and within a greater distance at angle points of walls, each layer of backfill shall be compacted by mechanical rammers, vibrators or pneumatic tampers.

D. Each layer of fill or backfill shall be compacted at optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

E. Compaction Density: Compaction density shall be expressed as a percentage of maximum dry density at optimum moisture content according to ASTM D 1557 Method C. Density indicated is minimum required.

1. Under structures, building slabs, and steps: 95 %

2. At building foundations: 95 %
3. Utilities, below pipe centerline: 95%
4. Utilities below unpaved surface, above pipe centerline: 92%
5. Utilities below paved surface, above pipe centerline: 95%
6. Embankments: 92%
7. Landscaped areas: 90 %.
8. Natural grass athletic fields and similar recreational fields: 93%

3.12 SUBSURFACE OBSTRUCTIONS

A. As a general rule, sub-surface obstructions encountered along the route of the pipeline shall be considered as follows:

1. Crossing Obstruction: All pipes, conduits, wires, etc. of whatever nature whose centerline lies at an angle of 20 degrees or greater to the centerline of the pipe being installed shall be considered as crossing obstructions and shall be protected, or repaired or replaced if damaged, or relocated, all at no additional cost to the Owner.
2. Interfering Obstructions: All pipes, conduits, wires, etc. of whatever nature whose centerline lies at an angle of less than 20 degrees, but more than 5 degrees to the centerline of the pipe being installed, shall be considered as interfering obstructions. Costs for supporting such obstructions in place during installation of the new pipe shall be paid for by the Owner. Costs for supporting interfering obstructions shall not be construed to include any costs for excavation. Repairing or replacing damaged interfering obstructions, or relocation shall be accomplished at no additional cost to the Owner.
3. Parallel Obstructions: All pipes, conduits, wires, etc. of whatever nature whose centerline lies at an angle of 5 degrees or less, or is truly parallel and less than 0.5 feet offset from outside the normal trench limits, as specified in Subarticle 3.5 B. of this Section, of the pipe being installed, shall be considered parallel obstructions. Costs for supporting such obstructions in place during installation of the new pipe, including excavation, may be paid for by the Owner, or Owner may elect to pay for the cost of replacing such obstructions. Should Owner first elect to pay the cost of supporting the obstruction and then elect to pay the cost of replacing the obstruction, approved costs for supporting the obstruction, including excavation, incurred prior to electing replacement costs shall also be paid. After Owner elects to pay replacement costs, only replacement costs will be paid for all additional work in the vicinity of the parallel obstruction.
4. Angle measurement between centerline of obstructing pipe, conduit, wire, etc. and centerline of the pipe being installed shall be taken from between the horizontal projection of the centerlines at ground surface. Parallel offset distance between centerline of obstructing pipe, conduit, wire, etc. and the outside of normal trench limits of the pipe being installed shall be taken from between the horizontal projection of the centerlines and outside trench limit at ground surface.

END OF SECTION 312310

SECTION 312319 – DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. Removal of surface water and ground water as necessary to perform the construction required by the contract.
2. Constructing, installing, building, and maintaining all necessary temporary water extraction and management facilities.
3. Furnishing, installing, and operating all necessary pumps, piping, and other equipment.
4. Complying with all applicable approvals, authorizations or permits associated with the management of dewatering wastewaters.
5. Removing all such temporary works and equipment after their intended function is no longer required.

B. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. Connecticut Department of Energy and Environmental Protection (DEEP)

1. Connecticut Guidelines for Soil Erosion and Sediment Control, State of Connecticut Council on Soil and Water Conservation, 2023.
2. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities, (DEEP-WPED-GP-015), latest issue.

3. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Groundwater Remediation Wastewater to a Sanitary Sewer (DEP-WD-GP-007), latest issue.
4. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water (DEP-PED-GP-020), latest issue.
5. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water (DEP-PED-GP-020), latest issue.

D. Regulations of Connecticut State Agencies (RCSA)

1. RCSA Section 22a-372-1, 22a-377(b)-1, 22a-377(c)-1, 22a-377(c)-2, Water Diversion.
2. RCSA Section 22a-430-3 through 4, General Conditions Applicable to Water Discharge Permits and Procedures and Criteria for Issuing Water Discharge Permits.
3. RCSA Section 22a-430-8, Underground Injection Control.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DESCRIPTION OF THE WORK

A. Prevent surface water and subsurface or groundwater from flowing into excavations or earthwork areas which would cause flooding of the Project Ste and surrounding area, or softening or loosening of the soil at excavation or earthwork subgrade.

B. Provide adequate and satisfactory dewatering and drainage of excavations and furnish all materials and equipment and do all incidental work required in conjunction with the furnishing, installing, and maintaining of same to permit proper and timely completion of all work required.

C. Contractor may choose any satisfactory dewatering method he wishes subject to the approval of Engineer, provided such method performs the dewatering required and complies with applicable approvals, authorizations and permits.

D. Contractor shall assume all responsibility for the adequacy of the methods, materials, and equipment employed. Contractor shall take all precautions necessary to prevent loosening or softening of the subgrade. In this regard, Contractor shall at all times be prepared to alter his construction method or sequence.

E. The work shall be maintained dry until the structures (building slabs and footings, paved area, pipe, drainage structure, embankments, etc.) are completed.

F. All dewatering required by pumping and drainage shall be performed without damage to the excavation, pipe trench, pavements, pipes, electrical conduits, other utilities and any other work or property. Existing or new sanitary sewers shall not be used to dispose of drainage.

1.6 SUBMITTALS

A. Dewatering Plan: Prior to installation of the dewatering system, submit design data showing the following, for review by Engineer:

1. Locations and associated construction where dewatering is required.
2. Specific methods and devices proposed for dewatering.
3. Details on protection at the inlet and outlet of pumps, method for floating the pump intake, or other methods to minimize and retain the sediment.
4. Proposed location of dewatering discharge and details of infiltration basins or other discharge location. Per the General Permit, where feasible and appropriate, dewatering wastewaters will be infiltrated into the ground.
5. Details on any containment berm construction when dewatering earth materials.
6. Identification of a contingency plan for emergency operations should the dewatering operation prove inadequate to meet the dewatering need or is found to be causing unacceptable turbidity problems (e.g., alternative discharge locations or use of a portable sediment tank). If turbidity or siltation problems are not adequately controlled by the contingency plan, then the operation will be ceased and a revised dewatering plan submitted for approval prior to further implementation.

1.7 REGULATORY COMPLIANCE

A. Comply at all times with the following as applicable to the Project:

1. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities, (DEP-PED-GP-015), latest revision. Conditions of such permit, other conditions of approval or authorizations, and any Stormwater Pollution Prevention Plans shall become part of the Contract Documents.
2. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Groundwater Remediation Wastewater to a Sanitary Sewer (DEP-PERD-GP-007), latest revision. The conditions of such permit, other conditions of approval or

authorizations, and any supplemental plans shall become part of the Contract Documents.

3. Connecticut Department of Energy and Environmental Protection General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water (DEP-PED-GP-020), latest revision. The conditions of such permit, other conditions of approval or authorizations, and any supplemental plans shall become part of the Contract Documents.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 JOB CONDITIONS

A. Surface Drainage: Intercept and divert precipitation, and surface water, away from excavations through the use of temporary diversion swales, temporary sediment traps, pipes, sumps or other approved means.

B. Drainage of Excavated Areas: Provide and maintain ditches of adequate size to collect surface and seepage water, which may enter the excavations. Divert the water into sumps and storm drains or pump into drainage channels or storm drains. When water is to be diverted into a storm drain, provide dewatering settling basins, or other accepted apparatus, such as fractionation tanks, as required to reduce the amount of fine particles, which may be carried into the drain. If a storm drain becomes blocked due to dewatering operation, it shall be cleaned by the Contractor at his own expense.

3.2 DEWATERING

A. Where feasible and appropriate, dewatering wastewaters will be infiltrated into the ground. Dewatering wastewaters discharged to surface waters will be discharged in a manner that minimizes the discoloration of the receiving waters. The following measures will be employed to ensure that dewatering wastewaters will not cause scouring or erosion or contain suspended solids in amounts that could reasonably be expected to cause pollution:

B. Divert surface waters away from areas needing dewatering.

C. Consider if well points and sumps can be used to lower the groundwater table reducing the need for settling facilities.

D. For sites that don’t require continuous pumping, pump work areas before construction activities begin each work day.

E. Provide filtration near the suction intake.

F. Locate pumps, intake sumps, and other intake structures in areas which will not require constant moving, when possible.

G. Locate pump discharge facilities (portable, permanent, or bio-filtering structures) such that a minimum disturbance of existing wetlands and watercourses is incurred.

H. Provide protection at outlets from pumping operations to dissipate pumping surges and prevent erosion at the point of discharge.

I. Maintain the water level at such lowered elevations that no danger to structures can occur because of the buildup of excessive hydrostatic pressure on the subgrade, or bottom of trench, unless otherwise permitted by Engineer.

J. Do not allow water to accumulate in excavations. At all times during construction, provide ample means and devices with which to remove promptly and dispose properly of all water entering roadway, trench, and structure excavations and keep them dry until the structures to be built thereon are completed.

K. No pipe/culvert/structure shall be laid in water. No masonry shall be laid in water, and no water shall be allowed to rise over masonry (either concrete or brick) in 24 hours after being placed. Nor shall moving water be allowed to rise over masonry for four days. In no event shall water be allowed to rise so as to set up unequal pressures in the structures until the concrete or mortar has set at least 24 hours. The Contractor shall constantly guard against the possibility of flotation of pipe or structures after installation. He shall place adequate backfill promptly in accordance with Section 31 2310 - Earthwork to prevent this occurrence, and his method of handling drainage and carrying on these operations shall always be adequate to prevent flotation.

END OF SECTION 312319

SECTION 312543 – GEOTEXTILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Furnishing and installation geotextile materials for the separation of earth materials.
2. Furnishing and installation geotextile materials for the stabilization of earth materials.

A. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

B. Contractor is responsible for all health and safety.

1.3 REFERENCES

C. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 and any supplements.

B. ASTM International (ASTM).

1. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
2. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
3. ASTM D4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
4. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
6. ASTM D4873 – Guide for Identification, Storage, and Handling of Geotextiles.
7. ASTM D6241 – Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
8. ASTM D6706 – Standard Test Method for Measuring Geosynthetic Pullout Resistance in Soil.

C. Code of Federal Regulations (CFR)

1. 29 CFR Part 1926 Subpart P – OSHA Excavation Regulations 1926.560 through 1926.562 including Appendices A through F.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section.

1.6 SUBMITTALS

A. Submit to Engineer for approval material specifications, manufacturer’s product data, manufacturer’s installation guidelines, and shop drawings for all materials furnished under this Section.

B. Connection details for geotextile.

C. Proposed mechanical connection devices.

1.7 DELIVERY, STORAGE AND HANDLING

A. Geotextile labeling, shipment, and storage shall follow ASTM D4873. Product labels shall be clearly labeled and/or marked to specifically identify each product and clearly show the manufacturer’s name, style name, and roll number.

B. Each geotextile roll shall be wrapped with a material that will protect the geotextile from damage due to shipment, water, sunlight, and contaminants. Protect rolls from crushing or abrasion during shipping and hauling.

C. Geotextile shall be stored on a prepared surface (not wooden pallets) and should not be stacked more than two rolls high. Storage shall be such that the geotextile is protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or cold, or other damaging circumstances. Temporary storage at the Project Site shall be away from standing water such that crushing or flattening of roll goods does not occur.

PART 2 - PRODUCTS

2.1 SEPARATION GEOTEXTILE

A. Separation Geotextile shall be utilized to separate layers of earth materials in utility trenches, drains, layered systems and similar installations in a non-structural configuration.

1. Composition: Woven geotextile made of 100% polypropylene slit film yarns.
2. Physical properties:

Mechanical and Physical Properties of Separation Geotextile

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
Grab Tensile Strength, Ultimate	ASTM D4632	Pounds	120
Grab Tensile Strength, Elongation at Ultimate	ASTM D4632	Percent (%)	50
Trapezoid Tear Strength	ASTM D4533	Pounds	50
CBR Puncture Strength	ASTM D6241	Pounds	310
Apparent Opening Size (AOS)	ASTM D4751	(U.S. Sieve)	70
Permittivity	ASTM D4491	sec^{-1}	1.7
Flow Rate	ASTM D4491	$gal/min/ft^2$	135
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70

2.2 LIGHT-DUTY STABILIZATION GEOTEXTILE

A. Light-Duty Stabilization Geotextile shall be utilized under temporary sidewalks and unit pavers when called-for.

1. Composition: Woven geotextile made of 100% polypropylene slit film yarns.
2. Physical properties:

Mechanical and Physical Properties of Light-Duty Stabilization Geotextile

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
Tensile Strength @2% Strain (MD/CD)	ASTM D4595	Pounds/foot	600/600
Tensile Strength @5% Strain (MD/CD)	ASTM D4595	Pounds/foot	1620/1620
Flow Rate	ASTM D4491	Gal/min/ ft^2	70
Permittivity	ASTM D4491	sec^{-1}	90
Apparent Opening Size (AOS)	ASTM D4751	(U.S. Sieve)	40
Interaction Coefficient	ASTM D6706	-	0.89
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	90

MD – Machine Direction
CD – Transverse (Crosswise) Direction

2.3 STABILIZATION GEOTEXTILE

A. Stabilization Geotextile shall be utilized for stabilization of subgrades where unsuitable subsurface soil conditions are present. Stabilization geotextile shall only be utilized with the approval of Engineer.

1. Composition: Woven geotextile made of 100% polypropylene slit film yarns.
2. Physical properties:

Mechanical and Physical Properties of Stabilization Geotextile

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value
Grab Tensile Strength, Ultimate (MD/CD)	ASTM D4595	Pounds/foot	7200/5760
Tensile Strength at 2% Strain	ASTM D4595	Pounds/foot	1370/1560
Tensile Strength at 5% Strain	ASTM D4595	Pounds/foot	3600/3600
Tensile Strength at 10% Strain	ASTM D4595	Pounds/foot	6600/5760
Flow Rate	ASTM D4491	Gal/min/ ft^2	15
Permittivity	ASTM D4491	sec^{-1}	0.23
Apparent Opening Size (AOS)	ASTM D4751	(U.S. Sieve)	20
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	80

MD – Machine Direction
CD – Transverse (Crosswise) Direction

PART 3 - EXECUTION

3.1 GENERAL

A. Install geotextile as shown on the Drawings or as called-for in the Specifications. Follow manufacture's guidelines.

B. Ensure that geotextile is protected during installation from clogging, tears, and other damage.

3.2 PIPE OR DRAINAGE SYSTEMS

A. Provide smooth side and bottom trench surfaces so the fabric does not bridge depressions in the soil and is not damaged by rock projections.

B. Use fabric of a width to permit a minimum trench-width overlap across the backfill at the trench top.

C. Lay the fabric flat in the prepared trench without stretching. Lay the top of the fabric back on the sides to allow for the placement of the aggregate backfill and pipe.

D. Overlap ends of rolls an amount equal to the trench width prior to fabric placement. Where pockets or cavities occur in the trench bottom or sides, fill them with acceptable granular material to prevent distortion or damage to the fabric.

E. Backfill aggregate and install pipe in a manner to prevent damage to the fabric. Compact aggregate backfill and overlap the fabric across the trench top. Do not allow the fabric to be exposed for more than 2 weeks without covering with backfill.

3.3 LAYER SEPARATION AND/OR STABILIZATION

A. Place fabric on a normally prepared subgrade area attending the full width of the sub-base layer being protected.

B. Place fabric in a loose and unstretched condition to minimize shifting, puncture, and/or tearing. Overlap fabric roll-ends and edges a minimum of 12 inches with adjacent material.

C. Place subbase material within 2 weeks after placement of fabric to minimize exposure. Place sub-base material in a manner to minimize slippage of the fabric. If excessive slippage occurs, use steel securing pins per manufacturer's guidelines.

END OF SECTION 312543

SECTION 314143 – SHEETING AND STAYBRACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes

1. Shoring and bracing necessary to protect existing buildings, existing culvert, streets, walkways, utilities, and other improvements and excavation against loss or ground caving embankments.
2. Maintenance of shoring and bracing.
3. Removal of shoring and bracing, as required.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges and Incidental Construction, Form 819, and any supplements.

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DESCRIPTION OF THE WORK

A. Contractor shall install sheeting or staybracing as necessary in order to comply with the Applicable Safety Code; to accommodate traffic; to permit access to existing utilities; to provide an opening of proper depth and width in which to install the proposed pipes and other underground structures; and to protect his workmen, employees of the Owner and (Insert Name), State and the public, from death or injury from bank failure, earth collapse or earth movement of any nature whatsoever. In general, all trenches and excavations over 5 feet in depth, any other unstable excavations or excavations in unstable material, shall be protected against the hazard of collapse.

1.6 SHEETING/STAYBRACING DESIGN

A. Contractor shall be entirely and solely responsible for the adequacy and sufficiency of all supports and for all sheeting, bracing, shoring, underpinning, cofferdamming, etc. The Contractor shall assume the entire and sole responsibility for damages on account of injury to persons or damage to adjacent pavements and public and private property (including but not limited to, the Work under construction, existing buildings, facilities, etc.) which injury or damage results directly from said Contractor's failure to install, or to leave in place, adequate and sufficient supports, sheeting, bracing, underpinning, cofferdamming, etc.

B. Contractor shall submit, in triplicate, a detailed written description of the equipment and sheeting methods he proposes to use to Engineer prior to the installation of any sheeting and/or shoring. These plans should include, but not be limited to, the type of sheeting or shoring, sizes and dimensions, bracing, spacing, methods of installation and removal, etc.

C. All sheeting shall be designed and sealed by a Professional Engineer licensed to practice in the State where the Work is being performed. He shall be known as the Contractor's Engineer. Sheeting computations and sketches shall be submitted for Engineer's review.

1.7 SHEETING LEFT-IN-PLACE

A. Sheeting, shoring or other timbering may be left-in-place at the option of the Contractor when needed to protect other existing facilities or the Work built or to be built under this Contract. However, steel sheeting left-in-place will be paid for only where specifically shown as "Steel Sheeting Left-in-Place" on the Contract Drawings or where ordered by Engineer.

B. It is expressly understood and agreed that removing or leaving-in-place any sheeting or shoring, etc., as noted above, shall not relieve the Contractor from any responsibility for any loss damage whatever due to omission of, or failure of, the sheeting, etc., failure to leave it in place, or the settling of the backfill, or any movement of the ground or any structure or object adjacent to any trench or excavation made by Contractor. Engineer will not order sheeting left-in-place at the expense of the Owner in order to accommodate the convenience of the Contractor or to save him the cost of its removal.

1.8 OPTIONAL METHOD OF TRENCHING

A. Contractor may, with the approval of Engineer, lay back slopes in accordance with the provisions of the Applicable Safety Code in order to avoid the necessity of sheeting or limiting the quantity thereof. However, in the case of trenches, the toe of this slope will not be lower than one foot above the top of the pipe to be installed. A level bench of at least two (2) feet in width shall be maintained between the toe of the sloped section and vertical trench excavation for pipes with an outside diameter of six (6) feet or less; for pipes with an outside diameter over six (6) feet, a minimum four (4) foot bench shall be provided. Where sloping is used as a substitute for sheeting or staybracing, or used in combination therewith, it shall be sloped a minimum of one horizontal to one vertical except where instability of the material requires a slope flatter than one to one. If the Contractor elects and is allowed to lay back the slopes, there will be no additional payment made for the extra excavation outside of the normal trench or structure excavation payment limits.

1.9 RESPONSIBILITY OF ENGINEER

A. There shall be no obligation on the part of Engineer to issue orders for sheeting, staybracing or sheeting left-in-place and/or to pass upon sufficiency and adequacy of sheeting; nor shall the failure on the part of Engineer to give such orders relieve the Contractor from liability for damages occasioned by negligence, or otherwise growing out of the Contractor's failure to either install sufficient and adequate sheeting and/or staybracing or to leave in place in the excavation sufficient and adequate support to prevent the caving in or moving of the ground adjacent to the sides of the excavation during and after the backfilling operation.

PART 2 - PRODUCTS

2.1 WOOD STAYBRACING

A. Wood Staybracing

2.2 STEEL SHEETING

A. Steel sheeting: continuous and interlocking sheets, ASTM A-328.

2.3 TRENCH BOXES

A. Trench boxes shall not be used unless requested by the Contractor and authorized by Engineer. If authorized, they shall be used only when the protection of workmen is involved, not

for support of existing adjacent utilities, structures, embankments, etc. A trench protected by the use of a trench box shall not be considered a sheeted trench.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless expressly authorized by Engineer, sheeting shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting to facilitate driving, care shall be taken to avoid trimming behind the face along which the sheeting will be driven. Care shall be taken to prevent voids outside of the sheeting.

B. All sheeting and staybracing shall be securely installed and properly braced in accordance with the Applicable Safety Code. Engineer may direct the Contractor at any time in writing to have sheeting, bracing, etc. in place to be embedded in backfill or concrete for the purpose of preventing subsequent injury to structures and property.

C. The depth of pilot cuts for trenches/structures shall not exceed five (5) feet in depth at any time. Engineer may reduce the depth of the pilot cut should the soil and subsurface conditions warrant such action. Sheeting must be driven by drop hammer or other methods approved in writing by Engineer below the area of the pilot cut. Driving of sheeting above the pilot cut is subject to the directions of Engineer. Engineer may direct the Contractor to use other types of equipment, and to revise the procedure during the excavation of the pilot cut and the driving of the sheeting should it be found necessary to do so.

D. Vibratory driving hammers shall not be used unless specifically authorized by Engineer.

E. Where sheeting is specified to be left-in-place, it shall be wood sheeting unless otherwise specifically noted on the Contract Drawings. Where wooden sheeting cannot be driven due to the nature of the material, then steel sheeting may be driven and removed in lieu of the wooden sheeting providing the following procedures are followed:

1. Simultaneously with the withdrawal of sheeting and as each layer is compacted in accordance with Section 312310 - Earthwork; or
2. The trench/area will be backfilled to the surface. If the sheeting is to be withdrawn, backfilling will proceed up to each set of rangers and braces; the rangers and braces will be removed; the backfilling will proceed up to the next set of rangers and braces, etc. up to the top of the excavation. The backfill material shall be compacted to 98% of the maximum dry density as determined by AASHTO T 99, Method C. Alternate sections of sheeting from the left side and right side of the trench/area shall be removed and the cavity remaining there from shall be jetted thoroughly by high-pressure water, starting at the toe of the sheeting and being drawn to the surface. Sand shall be inserted with the jetting process.
3. Where the bottom of the excavation is not free draining material (some areas of organic material or miscellaneous fill) or where granular backfill is not available or ordered by Engineer, the jetting shall be very carefully done with a minimum amount of water being expended. In such locations, the Contractor may request the approval of Engineer for other compaction methods in the sheeting cavity.
4. Contractor shall remove the sheeting and/or staybracing from the excavation, except where it is specifically indicated on the Contract Drawings "To be Left- in-Place", or the Contractor may elect to leave in place the sheeting and/or staybracing for his own convenience, or to serve his own interest to protect existing facilities, the Work built or to

be built under this Contract, or for the safety of the public, etc., at no cost to the Owner. No sheeting or bracing which is within three feet of the existing or proposed finished grade may be left-in-place without the prior permission of Engineer. This may require the Contractor cut off sheeting at this elevation and at no additional cost to the Owner.

5. Where sheeting, regardless of the type of sheeting used, is left in place, as specified or ordered or at the Contractor's convenience/option, unless otherwise specifically permitted in writing by Engineer, all elements such as rangers, braces, wales, etc. shall be left in place except as specified hereinbefore; and, except such temporary braces required to be removed to make way for the structure/utility. Where it is necessary to remove such temporary braces, the sheeting shall be rebraced, but in no case shall the sheeting be braced against the sides of the structure/utility to be constructed unless approved in writing by the owner of the structure/utility. Where lagging and "soldier" beams are used, the "soldier" beams and all the braces shall also be left in place.
6. Where wood sheeting has been driven below the excavation bottom to provide for a "toe-in", no wood sheeting below the top of pipe or structure shall be removed, but it shall be cut off at this elevation and the remaining sheeting above this line removed as described herein. There will be no payment made for this work, nor for the wood sheeting left-in-place.
7. Sheeting shall be cut away and removed from in front of capped outlets or other braces or inlets set in the pipe for future connections.
8. All sheeting, shoring and bracing removed shall be carefully removed from the excavation in such a manner as not to endanger the completed work or any adjacent pavements, buildings, structures, utilities, property, etc. The sheeting shall be withdrawn to such an extent that it is just above the backfill material being compacted and all voids left or caused by the withdrawal of such sheeting, shall be immediately refilled with approved material and compacted at no additional cost to the Owner.
9. Where the excavation is to be left open during non-working hours, the sheeting shall extend 42 inches above existing grade to protect pedestrian and vehicular traffic from the open excavation.

END OF SECTION 314143

SECTION 321216 – BITUMINOUS CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:
   1. Bituminous concrete paving for streets, driveways, playgrounds, and parking areas.
   2. Installation of bituminous concrete overlays over existing pavement, including surface preparation, truing and leveling pavement, tack coating and all other associated items and operations necessary and required to complete the installation.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

   1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. State of Connecticut Department of Transportation (ConnDOT).

   1. Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 and any supplements.
   2. Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 Supplemental Section 4.06 – Bituminous Concrete (Revised 3/17/14).
   3. Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 Supplemental Section M.04 – Bituminous Concrete (Revised 1/28/15).

D. American Association of State High and Transportation Officials (AASHTO).

   1. AASHTO M-17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
   2. AASHTO M 82, Cutback Asphalt (Medium-Curing Type) .
   3. AASHTO M-208 - Standard Method of Test for Unconfined Compressive Strength of Cohesive Soil-ASTM Designation D 2166.
   4. AASHTO M-320 - Standard Specification for Performance-Graded Asphalt Binder.
   5. AASHTO R-26 - Standard Recommended Practice for Certifying Suppliers of Performance-Graded Asphalt Binders.
   6. AASHTO R-29 - Standard Practice for Grading or Verifying the Performance Grade of an Asphalt Binder.
   7. AASHTO T-27 - Sieve Analysis of Fine and Course Aggregates.
   8. AASHTO T-84 - Specific Gravity and Absorption of Fine Aggregates.

9. AASHTO T-85 - Specific Gravity and Absorption of Coarse Aggregates.
10. AASHTO T-96 - Standard Method of Test for Resistance to Degradation of small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
11. AASHTO T 104 Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
12. AASHTO T-209 - Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
13. AASHTO T-245 - Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

E. American Society for Testing and Materials (ASTM)

1. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
2. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SPECIFICATIONS

A. All work performed under this Section shall conform to the Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 Supplemental Section 4.06 – Bituminous Concrete (Revised 3/17/14). This Specification is hereby incorporated into this Section by reference.

1.6 TESTING

A. Owner will retain a testing entity to perform observation and testing of the work under this Section. The testing entity's presence does not constitute supervision or direction of Contractor's work. Neither the presence of the testing entity nor any observations and testing performed by him, nor any notice or failure to give notice shall excuse Contractor from conformance with these Specifications or from defects discovered in his work.

B. Each week, Contractor shall advise the Owner's Representative of anticipated testing requirements during the following week, based on anticipated construction activities. The Contractor shall also notify the Owner's Representative and testing laboratory 24 hours before the expected time of testing.

PART 2 - PRODUCTS

2.1 GENERAL

A. All work performed under this Section shall conform to the Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 Supplemental Section M.04 – Bituminous Concrete (Revised 1/28/15). This Specification is attached hereto and is herby incorporated into this Section.

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall install all pavements as specified in the location and to the grades as shown on the Drawings and/or approved by Engineer. Materials, methods of construction, and type and thickness of pavement courses shall be as shown on the Details of the Drawings and as specified herein.

B. Owner and its representatives shall have access to all parts of the Work under construction at all times.

3.2 SPECIFICATIONS

A. Execute the work of this Section in accordance with the Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 Supplemental Section 4.06 – Bituminous Concrete. This Specification is attached hereto and is hereby incorporated into this Section.

END OF SECTION 321216

SECTION 321316 - DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled "Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Stamped concrete paving with integral color and stained individual stones.
2. Stamped concrete frost pads with integral color and stained individual stones.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for non-stamped concrete sidewalk pavement and general building applications of concrete.
2. Division 32 Section "Cement Concrete Paving" for cast-in-place concrete paving with other finishes, curbs and gutters, stamped detectable warnings, pavement markings, and wheel stops.
3. Division 32 Section "Pavement Joint Sealants" for joint sealants in expansion and contraction joints within decorative concrete paving and in joints between decorative concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and PR consumer recycled content. Include statement indicating cost for each product having recycled content.

4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color, pattern, or texture selection.

C. Samples for Verification: For each type of exposed color, pattern, or texture indicated.

D. Other Action Submittals:

1. Design Mixtures: For each decorative concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

E. Qualification Data: For qualified Installer, ready-mix concrete manufacturer and testing agency.

F. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Joint fillers.

G. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

H. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain decorative concrete paving products and each type or class of cementitious material of the same brand from same manufacturer's plant and obtain each aggregate from single source.

E. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

F. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

G. Sample Mockup: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of decorative concrete paving to demonstrate typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
2. Build mockups of decorative concrete paving as directed by Landscape Architect to be not less than 96 inches (2400 mm) by 96 inches (2400 mm).

H. First-pour Mockup: Following approval of sample mockup, build first-pour mockup to verify on a large scale the aesthetic effects and quality standards made during the sample mockup approval process.

1. Build mockups of full-thickness sections of decorative concrete paving to confirm typical joints; surface color, pattern, and texture; curing; and standard of workmanship.
2. Build mockups of decorative concrete paving at the project site not less than the size of the smallest pour.

I. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to decorative concrete paving, including but not limited to, the following:

a. Concrete mixture design.
b. Quality control of concrete materials and decorative concrete paving construction practices.

2. Require representatives of each entity directly concerned with decorative concrete paving to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Decorative concrete paving Installer.
    e. Manufacturer's representative of decorative concrete paving system.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves of a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, gray Portland cement Type I, II or IV.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Aggregate Size: 3/4-inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.

2.5 FIBER REINFORCEMENT

A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

2.6 SURFACE COLORING MATERIALS

A. Pigmented Mineral Dry-Shake Hardener: Factory-packaged, dry combination of Portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.

B. Liquid Release Agent: Manufacturer’s standard, clear, evaporating formulation that facilitates release of stamp mats and texture rollers.

2.7 STAMPING DEVICES

A. Stamp Mats: Semirigid polyurethane mats with projecting textured and ridged underside capable of imprinting texture and joint patterns on plastic concrete.

B. Texture Rollers: Manually controlled, abrasion-resistant polyurethane rollers capable of imprinting texture on plastic concrete.

2.8 STAIN/HIGHLIGHTING MATERIALS

A. Stain: Water-based, acrylic latex, penetrating stain with colorfast pigments or other product as recommended by manufacturer for use as staining solution to achieve desired effect.

2.9 CURING AND SEALING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

B. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type I, Class B, manufactured for colored concrete.

1. For integrally colored concrete, curing compound shall be pigmented type approved by coloring admixture manufacturer.
2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

C. Clear Acrylic Sealer: Manufacturer's standard, waterborne, nonyellowing and UV-resistant, membrane-forming, medium-gloss, acrylic copolymer emulsion solution, manufactured for colored concrete, containing not less than 15 percent solids by volume.

1. Finish: Matt.

D. Slip-Resistance-Enhancing Additive: Manufacturer's standard finely graded aggregate or polymer additive, designed to be added to clear acrylic sealer to enhance slip resistance of sealed paving surface.

2.10 GROUT MATERIALS

A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

B. Sand: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

2.11 RELATED MATERIALS

A. Polyethylene Expansion Joint Filler: Flexible, lightweight, non-staining, polyethylene, close-celled expansion joint filler that shall be a chemical-resistant, ultraviolet stable, non-absorbent, low density, compressible foam.

1. Products: Subject to compliance with requirements, provide the following:

a. Meadows, W. R., Inc.; DECK-O-FOAM Expansion Joint Filler.
b. A.H. Harris & Sons, Inc.

2. Requirements:

a. Density, ASTM D1751: 2.0 lbs/cu.ft. (32.04 kg/cu. m)
b. Compression, ASTM D3575
c. 10% Deflection: 10 psi (69 KPa) maximum.

d. 80% Deflection: 125 psi (862.49 KPa) max.
e. Tensile Strength, ASTM D3575: 55 psi (379.50 KPa)
f. Water Absorption, ASTM D3575: 0.5% vol. maximum.
g. Temperature Stability: -40ºC to 71ºC (-40ºF to 160ºF).

B. Polyethylene Film: ASTM D 4397, 1 mil (0.025 mm) thick, clear.

2.12 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Cementitious Materials: Limit percentage by weight of cementitious materials other than Portland cement according to ACI 301 (ACI 301M) requirements for concrete exposed to deicing chemicals.

G. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

H. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below stamped concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Division 31 Section "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

B. Protect adjacent construction from discoloration and spillage during application of color hardeners, release agents, stains, curing compounds, and sealers.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and control joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints where indicated on the Drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Control Joints: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of adjacent decorative concrete paving:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) in both directions from center of dowels.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging tool marks on concrete surfaces.

F. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

G. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

H. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

I. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

J. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

K. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

L. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.

M. Screed paving surface with a straightedge and strike off.

N. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

O. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

P. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3.7 INTEGRALLY COLORED CONCRETE FINISH

A. Integrally Colored Concrete Finish: After final floating, apply the following finish:

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 STAMPING

A. Mat Stamping: After floating and while concrete is plastic, apply mat-stamped finish.

1. Liquid Release Agent: Apply liquid release agent to the concrete surface and the stamp mat. Uniformly mist surface of concrete at a rate of 5 gal/1000 sq. ft. (0.2 L/sq. m).
2. After application of release agent, accurately align and place stamp mats in sequence.
3. Uniformly load mats and press into concrete to produce required imprint pattern and depth of imprint on concrete surface. Gently remove stamp mats. Hand stamp edges and surfaces unable to be imprinted by stamp mats.
4. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

B. Roller Stamping: After floating and while concrete is plastic, apply roller-stamped finish.

1. Cover surface with polyethylene film, stretch taut to remove wrinkles, lap sides and ends 3 inches (75 mm), and secure to edge forms. Lightly broom surface to remove air bubbles.
2. Accurately align roller and perform rolling operation to produce required imprint pattern and depth of imprint on concrete surface. Hand stamp surfaces inaccessible to roller.
3. Carefully remove polyethylene film immediately after roller stamping.

3.9 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Compound: Apply curing compound immediately after final finishing. Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after application. Maintain continuity of coating and repair damage during curing period.

1. Cure integrally colored concrete with a pigmented curing compound.
2. Cure concrete finished with pigmented mineral dry-shake hardener with a pigmented curing compound.

3.10 STAINING/HIGHLIGHTING

A. Newly placed concrete paving shall be at least 28 days old or as suggested by manufacturer before staining/highlighting.

B. Prepare surfaces according to manufacturer's written instructions and as follows:

1. Clean concrete thoroughly by scraping, applying solvents or stripping agents, sweeping and pressure washing, or scrubbing with a rotary floor machine and detergents recommended by stain manufacturer. Rinse until water is clear and allow surface to dry.
2. Neutralize concrete surfaces and rinse until water is clear. Test surface for residue with clean white cloth. Test surface according to ASTM F 710 to ensure pH is between 7 and 8.

C. Allow paving surface to dry before applying stain. Verify readiness of paving to receive stain according to ASTM D 4263 by tightly taping 18-by-18-inch (450-by-450-mm), 4-mil- (0.1-mm-) thick polyethylene sheet to a representative area of paving surface. Apply stain only if no evidence of moisture has accumulated under sheet after 16 hours.

D. Stain: Apply stain to paving surfaces according to manufacturer's written instructions and as follows:

1. Mask off individual stones prior to application of stain to ensure no color spill onto adjacent stones. Apply each coat of stain to entire surface of individual stones in sufficient quantity to obtain color consistent with approved mockup.
2. Apply first coat of stain to dry, clean surfaces by airless sprayer or by high-volume, low-pressure sprayer.
3. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup.
4. Rinse until water is clear. Control, collect, and legally dispose of runoff.

3.11 SEALER

A. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type I, Class A, manufactured for use with colored concrete.

B. Clear Acrylic Sealer: Apply uniformly in two coats in continuous operations according to manufacturer's written instructions. Allow first coat to dry before applying second coat, at 90 degrees to the direction of the first coat using same application methods and rates.

1. Begin sealing dry surface no sooner than 28 days after concrete placement.
2. Thoroughly mix slip-resistance-enhancing additive into sealer before applying sealer according to manufacturer's written instructions. Stir sealer occasionally during application to maintain even distribution of additive.

3.12 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/2 inch (12 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
5. Vertical Alignment of Dowels: 1/4 inch (6 mm).
6. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
7. Joint Spacing: 3 inches (75 mm).
8. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
9. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mixture placed each day.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Decorative concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.14 REPAIRS AND PROTECTION

A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Detailing: Grind concrete "squeeze" left from tool placement. Color ground areas with slurry of color hardener mixed with water and bonding agent. Remove excess release agent with high-velocity blower.

C. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321316

SECTION 321500 – AGGREGATE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Stone Mulch Surfacing.

1.3 RELATED REQUIREMENTS

A. Section 31 2310 – Earthwork: Preparation of site paving, compacted subbase for paving, and base courses.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification:

1. For each stone type indicated. Include at least two samples in each set for each type of stone, exhibiting extremes of the full range of color and other visual characteristics expected in completed Work. Samples will establish the standard by which stone provided will be judged.
2. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).
3. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of aggregate through one source from a single manufacturer.

B. Pre-installation conference: Conduct conference at project site to comply with requirements in Section 01 3000 - Administrative Requirements.

PART 2 - PRODUCTS

2.1 STONE SOURCE

A. Varieties and Sources: Obtain materials of each type from same source for the entire project. Approval of stone supplier is required prior to purchase. Subject to compliance with requirements, provide stone of one of the following varieties from the following source or equivalent:

2.2 STONE MULCH SURFACING

A. Riverwashed Stone Mulch: Screened, off-site uncrushed rounded stone free of iron, fines, dust (less than 2 percent passing the No. 200 sieve), organic materials, snow, ice, and other unsuitable materials as approved by Landscape Architect.

B. Size: 2-to-3-inch (50 to 76 mm) diameter. Mulch shall be washed free of all fines.

C. Color: Readily available natural gravel color range as approved by Landscape Architect.

D. Crushed Stone Mulch: Screened, off-site crushed stone free of iron, fines, dust (less than 2 percent passing the No. 200 sieve), organic materials, snow, ice, and other unsuitable materials as approved by Landscape Architect.

E. Size: 3/4-inch (19 mm) diameter. Mulch shall be washed free of all fines.

F. Color: Readily available natural gravel color range as approved by Landscape Architect.

G. Stone Mulch Edge Restraints: Standard commercial-aluminum angle edging, rolled edge, fabricated in sections of standard lengths.

1. Basis-of-Design Product: Subject to compliance with requirements, provide “Perma-Strip” angled aluminum landscape edging as manufactured by Permaloc Corporation or comparable product by a licensee of one of the following:

    a. Brickstop Corporation.
    b. Curv-Rite, Inc.
    c. Sure-loc Edging Corporation.

2. Edging Size: 3/16 inch (3.2 mm) thick by 6 inches (102 mm) tall by 1-1/2 inches wide.
3. Stakes: 18 inches (300 mm) long, 3 minimum per 8-foot section.
4. Accessories: Standard tapered ends, corners, and splicers.
5. Finish: Electrostatically-applied baked on paint.
6. Color: Black.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 STONE MULCH INSTALLATIONS

A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.

B. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm) and secure seams with galvanized pins.

1. Mulch backfilled and compacted surfaces areas to receive stone mulch. Apply 4-inch (100-mm) average thickness of mineral mulch over whole surface, and finish level with adjacent finish grades.

3.3 CLEANUP AND PROTECTION

A. During installation, keep adjacent paving and construction clean and work area in an orderly condition.

B. After completing installation of stone materials, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

3.4 DISPOSAL

A. Remove surplus stone materials and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 321500

SECTION 321623 – CURBING

PART 1 - SUMMARY

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES**:**

A. Precast concrete curb.

B. Cast-in-place concrete curb.

C. Work shall also include all associated items and operations necessary and required to complete the installations, including, but not limited to, surface preparation, finishing and cleanup.

D. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

E. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. United States Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819, 2016 and any supplements.

D. ASTM International (ASTM).

1. ASTM C33 – Standard Specification for Concrete Aggregates.
2. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
3. ASTM C150 – Standard Specification for Portland Cement.
4. ASTM D235 – Standard Specification for Mineral Spirits (Petroleum Spirits).
5. ASTM C207 – Standard Specification for Hydrated Lime for Masonry Purposes
6. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
7. ASTM C309 – Standard Specification for Liquid Membrane - Forming Compounds for Curbing Concrete.

8. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
9. ASTM C989 – Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
10. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
11. ASTM D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

E. American Concrete Institute (ACI)

1. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

F. American Association of State High and Transportation Officials (AASHTO)

1. AASHTO M 6 – Standard Specification for Fine Aggregate for Portland Cement Concrete.
2. AASHTO M 85 – Standard Specification for Portland Cement (Chemical and Physical).
3. AASHTO M 133 – Standard Specification for Preservatives and Pressure Treatment Processes for Timber.
4. AASHTO M 213 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
5. AASHTO M 233 – Standard Specification for Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.
6. AASHTO M 240 – Standard Specification for Blended Hydraulic Cement.
7. AASHTO T11 – Standard Method of Test for Materials Finer Than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
8. AASHTO T21 – Standard Method of Test for Organic Impurities in Fine Aggregate for Concrete.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of

Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. Submit Shop Drawings, manufacturer's literature, material certificates or other data indicating compliance with these Specifications.

B. Precast Curbing: Submit for approval, data indicating size, shape and dimensions, finish and setting method.

C. Stone Curbing: Submit for approval, the name of the quarry and the type of curb which the Contractor proposes to use. Samples of curbing shall be submitted for approval only when requested by the Engineer. Such submission shall be made sufficiently in advance of ordering so that the Engineer may have an opportunity to judge the granite, both as to quality and appearance.

D. Precast Curbing: Submit representative test specimens of the cured concrete used in precast units showing a compressive strength of 4,000 pounds prior to shipping any units.

E. Submit testing data for concrete as required by Section 03 3200 – Site Cast-in-Place Concrete.

1.6 DELIVERY, STORAGE AND HANDLING

A. Granite and precast concrete curb units shall be delivered to the job adequately protected from damage during transit.

B. Curbing shall be protected against staining, chipping, and other damage. Cracked, badly chipped, or stained units will be rejected and shall not be employed in the Work.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE CURB

A. Concrete for precast concrete curbing shall have a minimum compressive strength of 4,000 psi at 28 days, and shall contain 5 to 7 percent entrained air.

B. Precast concrete curb shall be treated with a protective coating of Linseed Anti-Spalling Compound. Boiled linseed oil mixture shall conform to AASHTO M 233 and shall be composed of 50 percent (50 %) double boiled linseed oil and 50 percent (50%) petroleum spirits, ASTM D235, by volume.

C. Finish and Color: Precast curb units shall be rub-finished in the following manner:

1. After the concrete has properly hardened, the exposed surfaces shall be rubbed with a No. 16 carborundum stone or an abrasive of approved equal in a manner to fully remove cement enamel finish and expose a durable sand grain finish satisfactory to Engineer. No cement shall be used in the rubbing process.
2. The finish of these units shall be uniform and shall conform to those of adjacent work in their final position.

D. Precast concrete curb sections shall be furnished with sockets in each end to receive dowels to maintain the horizontal and vertical alignment of the curb. The dowel socket shall be $1\frac{1}{16}$ inch by 2½ inches.

E. Dowels: Steel, ⅝ inch by 4 inch with minimum yield strength of 36,000 psi. Dowels shall be supplied by the curb manufacturer.

2.2 CAST-IN-PLACE CONCRETE CURB

A. Concrete and reinforcement for cast-in-place concrete curbs shall be as specified in Section 03 3200 – Site-Cast-in-Place Concrete.

2.3 CEMENT MORTAR

A. Mortar shall be composed of one part Portland Cement, ASTM C150, and two parts, by volume, of surface dry fine aggregate. Hydrated lime, ASTM C207, in an amount not to exceed 4 pounds of lime to each bag of Portland Cement, may be added at the option of Engineer. Cement and hydrated lime shall conform to the following requirements:

1. Portland cement: Types I, II or IS.
    a. Cement having a temperature exceeding 160°F (71°C) at the time of delivery to the mixer shall not be used in the concrete.
    b. Types I, II, and III Portland cement shall conform to the requirements of AASHTO M 85.
    c. Type IS, Portland blast-furnace slag cement and Type IP, portland-pozzolan cement shall conform to the requirements of AASHTO M 240. The use of other approved cementitious material as a partial replacement for Type IS or Type IP cement will not be permitted.
    d. Type I and Type III Portland cement shall be used only when required or expressly permitted by Contract or Engineer.
2. Hydrated lime: ASTM C6.
3. Fine aggregate: Fine aggregate shall be sand consisting of clean, hard, durable, uncoated particles of quartz or other rock, free from lumps of clay, soft or flaky material, loam, organic or other injurious material. In no case shall sand containing lumps of frozen material be used.
    a. Fine aggregate shall contain not more than 3% of material finer than a No. 200 (75 µm) sieve, using AASHTO T 11.
    b. Organic Impurities: Fine aggregate subjected to the colorimetric test shall not produce a color darker than Gardner Color Standard No. 11, using AASHTO T 21. If the fine aggregate fails to meet this requirement, the provisions of AASHTO M 6, Section 5.2, will govern.
    c. Gradation: For laying stone or precast units, fine aggregate shall be uniformly graded from coarse to fine and shall meet the following gradation requirements:

Aggregate Gradation (Cement Mortar for Laying Stone or Precast Units)

Sieve	Percent Passing
⅜″	100
No. 4	95–100
No. 8	80–100
No. 16	50–85
No. 30	25–60
No. 50	10–30
No. 100	2–10

d. Gradation: For pointing stone or precast units, fine aggregate shall be uniformly graded from coarse to fine and shall meet the following gradation requirements:

Aggregate Gradation (Cement Mortar for Pointing Stone or Precast Units)

Sieve	Percent Passing
No. 8	100
No. 50	10–40
No. 100	0–10

e. Water: Potable quality.

2.4 JOINT FILLER

A. Preformed expansion joint filler or wood joint filler as indicated on the plans.

B. Preformed expansion joint filler shall be the bituminous cellular type and shall conform to the requirements of AASHTO M213.

C. Boards for wood joint filler shall be planed on two sides and shall be either redwood, cypress or white pine. Redwood and cypress boards shall be of sound heartwood. White pine boards shall be of sound sapwood.

1. Occasional small, sound knots and medium surface checks will be permitted provided the board is free of any defects that will impair its usefulness for the purpose intended. The joint filler may be composed of more than one length of board in the length of the joint, but no board of a length less than 6 feet may be used; and the separate boards shall be held securely to form a straight joint. Boards composed of pieces that are jointed and glued shall be considered as one board.
2. Dimensions shall be as specified or shown on the plans; and tolerances of plus $1/16$-inch thickness, plus ⅛-inch depth and plus ¼-inch length will be permitted.
3. All wood joint filler boards shall be given a preservative treatment by brushing with a creosote oil conforming to AASHTO M133. After treatment, the boards shall be stacked in piles, each layer separated from the next by spacers at least ¼ inch thick; and the boards shall not be used until 24 hours after treatment.

2.5 TRANSITION SECTIONS

A. Horizontal transition sections shall be provided at all locations where curb sections change (i.e., vertical to sloped). Vertical transition sections shall also be provided for precast curb sections at

handicapped ramps to create a smooth transition with a doweled joint. Vertical transition sections for stone curb shall be made as shown on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Trenching, excavation, backfilling, and compaction shall be completed in accordance with Section 31 2310 – Earthwork, except as modified within this Section.

B. Cement Mortar Bedding, if required, shall be placed as indicated in details in accordance with Section 03 3200 – Site Cast-In-Place Concrete.

3.2 PRECAST CONCRETE CURB

A. Precast units delivered to the site shall be inspected for damage, unloaded and placed along excavated trench or other designated location with the minimum amount of handling.

1. Materials shall be handled in such a manner as to insure delivery to trench in a sound and undamaged condition.
2. All individual pieces of curbed curbing shall be marked to correspond to the radius and location where curbing is to be set.

B. Excavation shall be made in accordance with details on the plans and shall extend 6 inches below and behind finished curb sections.

1. Screened gravel base shall be compacted to a firm, even surface.

C. Installation of precast concrete curb shall be completed within the prepared trench such that each section is doweled to the next continuously and conforming to the line, grade, and cross-section shown on the plans, unless otherwise directed by Engineer. Installation shall be completed in such a manner as to prevent damage to the precast units.

D. After the curb is set, trench shall be backfilled immediately with approved material. The first layer to be 4 inches in depth, thoroughly rammed, the other layers to be not more than 6 inches in depth and thoroughly rammed until the trench is filled. Care is to be taken not to affect the line or grade of the curb during this procedure.

E. All curb joints shall be filled with caulking compound (color-cement mortar grey). One joint every 50 feet shall be left clean of caulk to allow for expansion.

3.3 CAST-IN-PLACE CONCRETE CURB

A. General Requirements: Concrete curb shall be constructed of concrete and shall be cast-in-place on the prepared subbase in accordance with the dimensions and details line and grade shown on the Drawings. Curbing shall be constructed using conventional forms and in segments separated by construction joints and expansion joints as specified herein. This item shall consist of concrete curbing constructed or as ordered and in conformity with these specifications.

B. Forms: Forms shall be metal or acceptable planed and matched lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall conform to the curb cross-section shown on the Drawings and shall be carefully set to line and grade and thoroughly braced and secured in place so that there will be no displacement during placement of the concrete. All forms shall be thoroughly cleaned prior to reuse.

C. Placing of Concrete: Prior to placement of the concrete, the subgrade shall be moistened and the contact surfaces of the forms shall be given a light coating of oil that will not discolor the concrete. Concrete shall then be placed in the form as near to its final position as practicable, struck off with a template, spaded to prevent “rock-pockets” or “honey combing” adjacent to the forms and finished to a smooth even surface. The concrete may be compacted by mechanical vibrators if approved by Engineer. Placing by slip form methods shall be approved by Engineer.

D. Expansion Joints: Vertical expansion joints shall be located approximately every seventy-five (75) feet and shall be so arranged that they shall match expansion joints in any adjacent concrete pavements and sidewalks. Unless directed otherwise, expansion joints shall also be installed at the PC and PT of all radius curb. Expansion joints shall be constructed vertical, plumb, and at right angles to the face of the curb.

1. Prior to concreting, all exposed surfaces of the wood filler shall be given a light brush coating of form oil.
2. They shall be one-half (½) inch in width and formed with premolded bituminous joint filler cut to conform to the cross-section of the curb/curb gutter.

E. Construction Joints: Vertical construction joints shall be located approximately every fifteen (15) feet being equally spaced between expansion joints. The length of these curb/curb gutter segments may be varied slightly for closures but in no case shall they be less than eight (8) feet. Construction joints shall be vertical, plumb and at right angles to the face of the curb and shall be formed by approved method that will provide complete separation of the curb segments during the placing of the concrete. If curb is formed by slip form methods, the joints shall be sawed as soon as practicable after the concrete has set to preclude raveling during the sawing and before any shrinkage cracking occurs in the concrete.

F. Finishing: Forms shall be left in place for twenty-four (24) hours or until the concrete has sufficiently hardened as determined by Engineer so that they can be removed without injury to the curb. Upon removal of the forms, the exposed faces of the curb/curb gutter shall be immediately rubbed to a uniform surface. Rubbing shall be performed by experienced and competent concrete finishers. No plastering will be permitted.

END OF SECTION 321623

SECTION 321723 – PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Temporary or permanent painted pavement markings, including but not limited to center lines, lane lines and shoulder lines, stop bars, crosswalks, parking stalls, lane arrows, legends, markings within gore areas, and painting of paved islands or medians.
2. Maintaining access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

B. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 SUBMITTALS

A. Submit material specifications and shop drawings for all materials furnished under this Section.

B. Submit material certificates signed by the material producer and Contractor, certifying that materials comply with these Specifications.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include

statement indicating cost for each regional material and the fraction by weight that is considered regional.

5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. State of Connecticut Department of Transportation (ConnDOT)

1. Standard Specifications for Roads, Bridges and Incidental Construction, Form 819 and any supplements.

C. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction

D. ASTM International (ASTM)

1. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
2. ASTM D211 - Standard Specification for Chrome Yellow and Chrome Orange Pigments.
3. ASTM D476 - Standard Classification for Dry Pigmentary Titanium Dioxide Products.
4. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
5. ASTM D605 - Standard Specification for Magnesium Silicate Pigment (Talc).
6. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
7. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
8. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
9. ASTM D869 - Standard Test Method for Evaluating Degree of Settling of Paint.
10. ASTM D1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
11. ASTM D1763 - Standard Specification for Epoxy Resins.
12. ASTM D2240 - Standard Test Method for Rubber Property- Durometer Hardness.
13. ASTM D2486 - Standard Test Methods for Scrub Resistance of Wall Paints.
14. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
15. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life.
16. ASTM E303 - Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
17. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.

E. American Association of State High and Transportation Officials (AASHTO)

1. AASHTO M 247 - Standard Specification for Glass Beads Used in Traffic Paints.

F. American Concrete Institute

1. ACI 503R - Use of Epoxy Compounds with Concrete.

G. United States General Services Administration, Federal Specifications.

1. Federal Specification TT-P-1952D - Paint, Traffic and Air Field Marking, Water Emulsion Base.

H. United States General Services Administration, Federal Standards.

1. Federal Standard No. 595 - Colors Used in Government Procurement.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

B. Contractor shall furnish one technical expert, who shall be fully knowledgeable about all equipment operations and application techniques, to oversee the work of this Section.

PART 2 - PRODUCTS

2.1 WATERBORNE PAVEMENT MARKING PAINT

A. General

1. White and yellow fast-drying waterborne pavement marking paint, low VOC, ready-mixed, one component, 100 percent acrylic, Federal Specification TT-P-1952D.
2. Paint shall be capable of being applied with paint striping equipment at ambient temperatures.
3. Weight per gallon shall not be less than 12.5 pounds/gallon when tested in accordance with ASTM D 1475.
4. Colors: ASTM D211 and per Federal Standard No. 595.

B. Manufacturer:

1. Paint shall be formulated and manufactured from first-grade raw materials and shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. The materials shall not exhibit settling or jellying after storage in the sealed containers as received that will affect the performance of the products. The paint shall provide the proper anchorage, refraction and reflection for the finished glass spheres when applied as specified.

C. Composition

1. Composition of the paint shall be at the discretion of the manufacturer, provided that the finished product meets the requirements of any applicable Federal, State or Local regulations for products of this type and the requirements as follows:

    a. Paint shall not contain more than 0.06% lead.
    b. Total nonvolatile shall not be less than 70% by weight (mass).
    c. Pigment shall be 45-55% by weight (mass).
    d. Resin solids shall be composed of 100% acrylic emulsion polymer.
    e. Volatile organic compounds shall not exceed 150 grams/liter, excluding water.
    f. Closed-cup flash point shall not be less than 100°F (38°C), and weight per gallon shall not be less than 12.5 pounds/gallon when tested in accordance with ASTM D 1475.

D. Viscosity

1. Consistency of the paint shall not be less than 80, nor more than 90 Kreb units when tested in accordance with ASTM D562. The paint shall have good spraying characteristics when the material is heated to application temperature of 130°F to 145°F.

E. Flexibility

1. Paint shall not show cracking or flaking when subjected to the TT-P-1952D flexibility test in which the panels used shall be tin plates that are 3 inches x 5 inches in area and 35 - 31 U.S. Gauge in thickness. The tin panels shall be lightly buffed with steel wool and thoroughly cleaned with solvent before being used for tests.

F. Dry Opacity

1. Both white and yellow paints shall have a minimum contrast ratio of 0.96. Contract ratio shall be determined by applying a wet film thickness of 0.005 inches (127 microns) to a standard hiding power chart. After drying, the black and white reflectance values shall be determined using a suitable reflectometer and the contrast ratio determined.

G. Bleeding

1. Paints shall have a minimum bleeding ratio of 0.97 when tested in accordance with FS TT-P-1952D.

H. Abrasion Resistance

1. No less than 210 liters of sand shall be required to remove paint film when tested in accordance with TT-P-1952D.

I. Colors

1. Yellow: FS 595, No. 13538, latest issue.
2. White: No darker or yellower than FS 595, No. 17778, latest issue, when the material is placed in a type EH weatherometer for a period of 500 hours and weathered according to ASTM G153.
3. Car/Van Pool and Electric Vehicle Parking Space Marking Color: Red FS595, No. 12199 or approved equal.
4. Fuel Efficient Vehicle Parking Space Marking Color: Green FS 595, No. 14187 or approved equal.

5. Hopscotch and Four Square colors: As selected from FS 595 colors by Landscape Architect.
6. Color determination shall be made without beads, after a minimum of 24 hours. If not a visual match, the diffuse day color of the paint shall conform to the CIE Chromaticity coordinate limits as follows:

Paint CIE Chromaticity Coordinate Limits

	x	Y	x	y	x	y	x	y	Brightness
White	0.305	0.295	0.360	0.360	0.388	0.377	0.280	0.310	84.0 Min
Yellow	0.485	0.455	0.506	0.452	0.484	0.428	0.477	0.438	50.0 Min

7. Paint shall not discolor in sunlight and shall maintain colorfastness throughout its life, approximately two years.

J. Glass Bead Adhesion

1. Paint with glass beads conforming to M.07.30, applied at the rate of 6.0 pounds/gallon of paint, shall require not less than 150 liters of sand to remove paint film and glass beads.

K. Scrub Resistance

1. Paint shall pass 300 cycles minimum when tested in accordance with ASTM D2486.

L. Drying time

1. Reflectorized line shall dry to no pick up in 15 minutes or less as tested by ASTM D711 when applied at the ratio provided for specified glass spheres to paint (the paint at 15+ 1 mil (381 millimeters + 25 millimeters) wet film thickness equivalent to 100-115 square foot/gallon and the glass spheres at the equivalent rate of 6.0 pounds/gallon.

2.2 HOT-APPLIED WATERBORNE PAVEMENT MARKING PAINT

A. General

1. White and yellow fast-drying waterborne pavement marking paint, low VOC, ready-mixed, one component, 100 percent acrylic, Federal Specification TT-P-1952D.
2. Paint shall be capable of being applied with paint striping equipment at an application temperature of 130°F to 145°F.
3. Color: ASTM D211 and per Federal Standard No. 595.
4. Glass Beads: AASHTO M 247, Type 1.

B. Manufacture

1. Paint shall be formulated and manufactured from first-grade raw materials and shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. The materials shall not exhibit settling or jellying after storage in the sealed containers as received that will affect the performance of the products. The paint shall

provide the proper anchorage, refraction and reflection for the finished glass spheres when applied as specified.

C. Composition

1. Composition of the paint shall be at the discretion of the manufacturer, provided that the finished product meets the requirements of any applicable Federal, State or Local regulations for products of this type and the requirements as follows:

a. Paint shall not contain more than 0.06% lead.
b. Total nonvolatile shall not be less than 76% by weight (mass).
c. Pigment shall be 58-63% by weight (mass).
d. Resin solids shall be composed of 100% acrylic emulsion polymer.
e. Volatile organic compounds shall not exceed 150 grams/liter, excluding water.
f. Closed-cup flash point shall not be less than 100°F, and weight per gallon shall not be less than 12.5 pounds/gallon when tested in accordance with ASTM D 1475.

D. Viscosity

1. Consistency of the paint shall not be less than 80, nor more than 90 Kreb units when tested in accordance with ASTM D562. The paint shall have good spraying characteristics when the material is heated to application temperature of 130°F to 145°F.

E. Flexibility

1. Paint shall not show cracking or flaking when subjected to the TT-P-1952D flexibility test in which the panels used shall be tin plates that are 3 inches x 5 inches (76 millimeters x 127 millimeters) in area and 35 - 31 U.S. Gauge in thickness. The tin panels shall be lightly buffed with steel wool and thoroughly cleaned with solvent before being used for tests.

F. Dry Opacity

1. Both white and yellow paints shall have a minimum contrast ratio of 0.96. Contract ratio shall be determined by applying a wet film thickness of 0.005 inches (127 microns) to a standard hiding power chart. After drying, the black and white reflectance values shall be determined using a suitable reflectometer and the contrast ratio determined.

G. Bleeding

1. Paints shall have a minimum bleeding ratio of 0.97 when tested in accordance with FS TT-P- 1952D.

H. Abrasion Resistance

1. No less than 210 liters of sand shall be required to remove paint film when tested in accordance with TT-P-1952D.

I. Color

1. Yellow: FS 595, No. 13538, latest issue.
2. White: No darker or yellower than FS 595, No. 17778, latest issue, when the material is placed in a type EH weatherometer for a period of 500 hours and weathered according to ASTM G153.

3. If not a visual match, the diffuse day color of the paint shall conform to the CIE Chromaticity coordinate limits as follows:

Paint CIE Chromaticity Coordinate Limits

	x	Y	x	y	x	y	x	y	Brightness
White	0.305	0.295	0.360	0.360	0.388	0.377	0.280	0.310	84.0 Min
Yellow	0.485	0.455	0.506	0.452	0.484	0.428	0.477	0.438	50.0 Min

4. Paint shall not discolor in sunlight and shall maintain colorfastness throughout its life, approximately two years. Color determination shall be made without beads, after a minimum of 24 hours.

J. Glass Bead Adhesion

1. Paint with glass beads shall require not less than 150 liters of sand to remove paint film and glass beads.

K. Scrub Resistance

1. Paint shall pass 300 cycles minimum when tested in accordance with ASTM D2486.

L. Drying time

1. Reflectorized line shall dry to no pick up in 120 seconds or less when applied at the ratio provided for specified glass spheres to paint (the paint at 15+ 1 mil (381 millimeters + 25 millimeters) wet film thickness equivalent to 100-115 square foot/gallon (2.45-2.82 square meters/liter) and the glass spheres at the equivalent rate of 6.0 pounds/gallon (0.72 kilograms/liter). The paint shall be applied with equipment so as to have the paint at a temperature of 130°F to 145°F (54°C to 63°C) at the spray gun.

2.3 EPOXY RESIN PAVEMENT MARKINGS

A. Epoxy Resin Material: The material shall be composed of epoxy resins and pigments only.

B. Composition:

1. White (percent by weight): 20% +/- 2% Titanium Dioxide, ASTM D476 Type 3 and 80% +/- 2% Epoxy Resins.
2. Yellow (percent by weight): 25% +/- 2% Chrome Yellow, ASTM D211 Type 3 and 75% +/- 2% Epoxy Resins.
3. Epoxy Resins: ASTM D1763.

C. Color

1. Yellow: FS 595, No. 13538, latest issue.

2. White: No darker or yellower than FS 595, No. 17778, latest issue, when the material is placed in a type EH weatherometer for a period of 500 hours and weathered according to ASTM G153.

D. Adhesion Capabilities

1. When the adhesion of the material to portland cement concrete (test concrete shall have a minimum of 300 psi tensile strength) is tested according to ACI 503R testing procedure, the failure of the system must take place in the concrete. The concrete shall be 90 °F when the material is applied, after which the material shall be allowed to cure for 72 hours at 73 +/- 3.5 °F.

E. Abrasion Resistance

1. When the abrasion resistance of the material is tested according to ASTM C 501 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82. (The wear index is the weight (mass) in milligrams that is abraded from the sample under the test conditions).

F. Hardness

1. The Type D durometer hardness of the material shall be not less than 75 nor more than 90 when tested according to ASTM D2240 after the material has cured for 72 hours at 73 +/- 3.5 °F.

G. Tensile Strength

1. Tensile strength of the material, when tested according to ASTM D 638, shall not be less than 6,000 psi after 72 hours cure at 73 +/- 3.5 °F.

H. Compressive Strength

1. Compressive strength of the material, when tested according to ASTM D 695, shall not be less than 12,000 psi after 72 hours cure at 73 +/- 3.5 °F.

I. Shelf Life

1. Individual components shall not require mixing prior to use when stored for a period of 12 months.

2.4 GLASS BEADS

A. Beads shall be transparent, clean, colorless glass, smooth and spherically shaped, free of milkiness, pits, or excessive air bubbles.

B. Quality Assurance Control

1. Beads shall be segregated into maximum lots of 2,500 pounds (1125 kilograms) and lot numbers shall be stamped onto each lot. Each lot shall be tested for gradation, rounds and embedment coating.

C. Gradation - The glass spheres shall meet the following gradation requirements:

Glass sphere gradation (ConnDOT Grading “A”)

Sieve Size	% Passing
20 (850 um)	100
30 (600 um)	80-95
50 (300 um)	9-42
80 (180 um)	0-10

Glass sphere gradation (ConnDOT Grading “B”)

Sieve Size	% Retained
10 (2.0 mm)	0
12 (1.7 mm)	0-5
14 (1.4 mm)	5-20
16 (1.18 mm)	40-80
18 (1.0 mm)	10-40
20 (850 um)	0-5
Pan	0-2

1. Roundness: Glass beads shall have a minimum of 80% rounds per screen for two highest sieve quantities and no more than 3% angular particles per screen for Grading “B”. The remaining sieve fractions shall typically be no less than 75% rounds.

D. Refractive Index: Glass beads shall have a refractive index of 1.50 to 1.52.

PART 3 - EXECUTION

3.1 GENERAL

A. Pavement markings shall be applied in accordance with the details shown on the plans and the control points established by the Contractor and approved by the Engineer.

B. No paint shall be applied to new bituminous pavement until the top course has cured at least one week minimum.

C. Pavement areas to be painted shall be dry and sufficiently cleaned of sand and road debris so as to provide an acceptable bond between the paint and the pavement.

D. All painting shall be performed in a neat and workmanlike manner. The lines shall be sharp and clear with no feathered edging or fogging and precautions shall be taken to prevent tracking by tires of the striping equipment. Paint shall be applied as shown on the Drawings with no unsightly deviations.

E. Contractor shall protect the buildings, walks, pavement, curbing, trees, shrubs, mulch, etc. from over-spray of paint and damage by his operations.

F. Operations shall be conducted only when the road surface temperature is at least 40°F or as allowed by Engineer. They shall be discontinued during periods of rain, and shall not continue until Engineer determines that the pavement surface is dry enough to achieve adhesion.

G. After application, paint shall be protected from crossing vehicles using traffic cones or other acceptable method for a time at least equivalent to the drying or curing time of the paint.

H. The material shall be applied to the pavement by equipment used specifically for the application of pavement markings and shall be of a standard commercial manufacturer.

I. Contractor shall provide survey control for layout of pavement markings by utilizing his own surveyor or hiring a registered land surveyor. The cost of this survey control shall be included in other items of work.

3.2 WATERBORNE PAVEMENT MARKINGS

A. Painted legend, arrows, and markings includes paint installed with a hand striping machine such as: stop bars, crosswalks, parking stalls, lane arrows, legends, markings within gore areas, and painting of paved islands or medians.

B. Painted pavement markings and hot applied painted pavement markings include paint installed with a truck-mounted painting machine such as center lines, lane lines and shoulder lines.

C. Waterborne Paint, Ambient Temperature

1. Apply paint at a rate of 100 to 115 square feet per gallon, with glass beads applied at a rate of 6 pounds per gallon of paint for painted pavement markings and painted legend, arrows, and markings

D. Waterborne Paint, Hot-Applied

1. Hot-applied paint shall be applied at a temperature of 130°F to 145°F at the spray gun.
2. Apply paint at a rate of 8 pounds per gallon of paint for hot-applied painted pavement markings.

3.3 EPOXY RESIN PAINTED PAVEMENT MARKINGS

A. Epoxy resin pavement markings includes epoxy resin installed with a truck-mounted machine such as center lines, lane lines, and shoulder lines.

B. Epoxy resin pavement markings, symbols and legends include stop bars, crosswalks, parking stalls, lane arrows, legends, and markings within areas such as paved islands, gore areas and paved medians.

C. Equipment

1. Equipment furnished shall include an applicator truck of adequate size and power, together with the following:

    a. Remote application equipment designed to apply an epoxy resin material in a continuous pattern.
    b. Portable glass bead applicators, one for each size bead, designed to provide uniform and complete coverage of the epoxy binder by a controlled free-fall method. Pressurized glass bead application shall not be used. Before epoxy color is changed, equipment shall be cleaned out sufficiently to ensure that the color of material applied will be correct.

2. When working on a highway with more than one lane in either direction, the applicator truck (striper) shall have a permanently mounted direction variable illuminated arrow board, fully operational and visible to approaching traffic. There will be no additional payment for the arrow board. Its cost shall be included in the bid price for this item.
3. For markings applied on pavements over one year old, equipment furnished shall also include a power washing machine capable of cleaning the pavement with a pressure of 2,400 to 2,800 psi with water heated to 180°F - 195°F. No chemicals shall be added to the water used in the process. The power washer shall be equipped with a turbo blast tip with an oscillating head and shall be capable of supplying a minimum of 5 gallons/minute gun.
4. All guns on the spray carriages shall be in full view of the operator(s) during operation.

D. Procedures

1. The road surface shall be cleaned at the direction of the Engineer just prior to application. Pavement cleaning shall consist of power washing using clean water heated to 180°F – 195 °F at a pressure of 2,240 - 2,800 psi. The areas to be power washed shall include all areas where epoxy marking symbols and legends (including stop bars and crosswalks) are to be applied and at least 1 inch beyond the area to be marked. The surface shall be cleaned to the satisfaction of the Engineer.

    a. For other pavement areas, cleaning shall consist of brushing with rotary broom (non-metallic), and any additional work as recommended by the material manufacturer and acceptable to the Engineer.
    b. New portland cement concrete surfaces shall be cleaned by abrasive blasting to remove any surface treatments and/or laitance.
    c. New bituminous concrete surfaces are not to be power washed.

2. All surfaces that are power washed shall be allowed to dry sufficiently prior to the application of the epoxy markings. The areas to be marked shall be broom cleaned immediately prior to the application of the epoxy markings. Glass beads shall be applied immediately after application of the epoxy resin marking to provide an immediate notrack system.
3. Contractor will place necessary “spotting” at appropriate points to provide horizontal control for striping and to determine necessary starting and cutoff points. Broken line intervals will not be marked. Longitudinal joints, pavement edges and existing markings shall serve as horizontal control when so directed.
4. A tolerance of 0.25 inch under or 0.25 inch over the specified width shall be allowed for striping provided the variation is gradual and does not detract from the general appearance. Alignment deviations from the control guide shall not exceed 2 inches provided the variation is gradual and does not detract from the general appearance. Material shall not be applied over a longitudinal joint. Establishment of application tolerances shall not relieve Contractor of the responsibility to comply as closely as practicable with the planned dimensions.
5. Glass beads conforming to the requirements of Grading “B” (larger beads) as specified herein shall be applied at a rate of 12 pounds per gallon of epoxy pavement marking material, immediately followed by a second drop of glass beads conforming to the requirements of Grading “A” (smaller beads) as specified herein applied at a rate of 13 pounds per gallon of epoxy pavement marking material.
6. Time to No-Track: The material shall be in “no-tracking” condition within 15 minutes, or as allowed by Engineer. The no-tracking time shall be determined by passing over the line with a passenger car or pickup truck in the simulated passing maneuver. A marking showing no visual deposition of the material to the pavement surface when viewed from a distance of 50 feet (15 meters) shall be considered as showing “no-tracking” and conforming to this requirement for time to no-track.
7. When stencils are used during the application of epoxy markings, care must be used when removing the stencils so that the epoxy resin does not drip on the road, sidewalk, grass, etc., and so that the applied markings have edges which are clean, straight and neat.
8. Epoxy resin pavement markings may be applied over existing painted markings provided they are sufficiently worn to allow adequate adhesion. If required by the Engineer, existing plastic, thermoplastic, epoxy or freshly painted markings shall be removed prior to the application of epoxy markings.

E. Crosswalks

1. Only glass beads conforming to the requirements of Grading “A” (smaller beads) as specified herein shall be applied at a rate of 25 pounds per gallon of epoxy pavement marking material.

F. Performance

1. In order to be accepted, the applied markings must meet the following minimum retroreflectivity reading as measured using an LTL 2000 Retrometer with 30-meter geometry 1 to 2 weeks after installation:

    a. White Epoxy 250 millicandelas per square foot per foot candle (millicandelas per square meter per lux).
    b. Yellow Epoxy 175 millicandelas per square foot per foot candle (millicandelas per square meter per lux).

END OF SECTION 321723

SECTION 32 1726 - TACTILE WARNING SURFACING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Cast iron tactile and detectable warning tiles for pedestrian walking surfaces.

1.3 RELATED REQUIREMENTS

A. Section 32 1313 - Concrete Paving: Concrete sidewalks.

1.4 REFERENCE STANDARDS

A. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA) current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

C. ASTM A48/A48M - Standard Specification for Gray Iron Castings 2003 (Reapproved 2021).

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar 2015.

E. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way 2011.

1.5 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from

Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Warranty: Submit manufacturer warranty; complete forms in Owner's name and register with manufacturer.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years documented experience.

B. Installer Qualifications: Company certified in writing by product manufacturer as having successfully completed work substantially similar to the work of this section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40- and 90-degrees F (4 and 32 degrees C).

1.9 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Cast Iron Tiles: Provide manufacturer's standard ten-year warranty against manufacturing defects, breakage, or deformation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cast Iron Detectable Warning Plates:

1. Neenah Foundry, a division of Neenah Enterprises, Inc; [_____]: www.nfco.com/#sle.
2. East Jordan Iron Works Inc.

2.2 TACTILE AND DETECTABLE WARNING DEVICES

A. Cast Iron Detectable Warning Plates:
   1. Material: Cast gray iron; ASTM A48/A48M, Class 30 A (minimum).
   2. Installation Method: Cast in place.
   3. Square Dimensions: 24 inches square (610 mm square) and 24 inches by 24 inches (610 mm by 610 mm).
   4. Pattern: Truncated cones in compliance with ADA Standards.
   5. Joint: Manufacturer standard, bolted connection.
   6. Finish: Unfinished.

2.3 ACCESSORIES

A. Fasteners: ASTM A666, Type 304 stainless steel
   1. Size: 1/4-inch (6.35 mm) diameter and 1-1/2 inches (38 mm) long.

PART 3 EXECUTION

3.1 EXAMINATION

A. When installation location is near site boundary or property line, verify required location using property survey.

B. Verify that work area is ready to receive work:
   1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
   2. Do not proceed with installation until deficiencies in existing conditions have been corrected.

C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.2 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.
   1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
   2. Do not install when ambient or substrate temperature has been below 40 degrees F (4 degrees C) during the preceding 8 daylight hours.

B. Field Adjustment:
   1. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
   2. Orient so dome pattern is aligned with the direction of ramp.
   3. Align truncated dome pattern between adjacent units.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.3 INSTALLATION - CAST IN PLACE, CAST IRON PLATES

A. Concrete Paving: See Section 32 1313.

B. When installing multiple adjacent units, connect plates before placing.

C. Install by method described in manufacturer's written instructions.

D. Place units into wet concrete.

E. Press assembly into concrete to achieve final elevation.

F. Finish concrete adjacent to plate. Remove wet concrete spilled onto plate surface.

3.4 PROTECTION

A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.

B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

SECTION 321816.13 – PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Poured in Place Rubber protective surfacing for playground areas.

B. Subbase under resilient surfacing.

1.3 RELATED REQUIREMENTS

A. Section 11 6813 - Playground Equipment.

B. Section 31 2310 - Earthwork: Subbases for surfacing.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 REFERENCE STANDARDS

A. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)) 2012 (Reapproved 2021).

B. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine 2017.

C. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment 2018.

D. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use 2021.

E. ASTM F1951 - Standard Specification for Determination of Accessibility of Surface Systems under and around playground equipment; 2014.

F. CPSC Pub. No. 325 - Public Playground Safety Handbook 2010.

G. Americans for with Disabilities Act (ADA).

1.6 DEFINITIONS

A. Use Zone: The area beneath and immediately adjacent to a play structure or equipment (play event) that is designated for unrestricted circulation around equipment, and on whose surface it is predicted that a user would land when falling from or exiting the equipment.

B. Critical Fall Height: The maximum fall height at which the protective surfacing meets the requirements of ASTM F1292.

C. Fall Height: The vertical distance between the finished elevation of the designated play surface and the finished elevation of the protective surfacing beneath it as defined by ASTM F1487.

D. Protective Surfacing: Resilient ground surfacing. The characteristics of the protective surfacing are based on the fall height of the playground equipment. Changes in either the surfacing or the fall height, particularly reducing the resilience of the protective surfacing or increasing the fall height, will reduce safety-related performance.

E. Subbase: A layer under the resilient layer of the protective surfacing but over the subgrade; may be rigid, as in concrete or bituminous, or aggregate.

F. Subgrade: The surface of the ground on which the protective surfacing is installed.

1.7 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of this work; require attendance by affected installers.

1. Conduct meeting to verify product requirements, substrate conditions, utility connections as required, and manufacturer's installation instructions.

1.8 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements - Administrative Requirements, for submittal procedures.

B. Product Data: For all manufactured surfacing products, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, and safety limitations.

1. Include IPEMA certifications for all surfaces.

C. Shop Drawings: Detailed scale drawings showing locations of existing playground equipment and exposed footings, bases, and anchorage points.

1. Clearly identify footing and base elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing, surveyed by land surveyor licensed in the State in which the Project is located.
2. Show locations of underground utilities, storm-drainage system, and irrigation system.
3. Show locations of related construction such as walkways and roadways, fences, site furnishings, and plantings.
4. Show measured fall height for each playground equipment item, determined in accordance with ASTM F1487.
5. Show Use Zone perimeters, determined in accordance with ASTM F1487.

D. Samples: For each product for which color must be selected provide color chart showing full range of colors.

E. Maintenance Data:

1. For manufactured surfacing products, provide manufacturer's recommended maintenance instructions and list of repair products, with address and phone number of source of supply.

F. Manufacturer's Field Report.

1.9 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Manufacturer Qualifications: Company regularly engaged in manufacturing products specified in this section, with not less than three years of documented experience.

1. Surfacing installed in minimum 10 sites and been in successful service minimum 5 years.
2. Provide certificate of Insurance AA rated for minimum 1,000,000 dollars covering both product and general liability.
3. Manufacturer's Representative: Provide name, company name and address, and qualifications.

C. Installer Qualifications: Company certified by manufacturer for training and experience installing the protective surfacing; provide installer's company name and address, and training and experience certificate.

1.10 PRE-INSTALLATION MEETING

A. Coordinate with Section 11 68 00 – Playfield Equipment and Structures.

B. Convene a meeting one week before starting earthwork for playground to discuss coordination between various installers.

1. Require attendance by personnel responsible for grading and installers of playground equipment, protective surfacing, footings, and adjacent work.
2. Include representatives of Contractor.
3. Notify Architect at least 2 weeks prior to meeting.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store protective surfacing to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.12 STANDARD WARRANTY

A. See Section 01 7800 - Closeout Submittals - Closeout Submittals, for additional warranty requirements.

B. Provide minimum 5 year warranty for poured in place playground surfacing.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Because the safety of the playground depends on strict compliance with the performance criteria, this information is provided for Contractor's information.

1. The protective surfacing constitutes a resilient layer installed over a non-resilient layer, which is installed over the subgrade, with the top of playground equipment footings and anchorage devices covered by full depth of the resilient portion of the protective surfacing.
2. The total depth available for protective surfacing, from surface of subgrade, is indicated on drawings.
3. The top elevation of the protective surfacing is intended to be flush with adjacent grades.
4. Use Zone: The protective surfacing shall be designed to provide acceptable impact attenuation as defined in ASTM F1292 for Critical Height as indicated on the Drawings.
5. High Play Activity Area: The protective surfacing has been designed to provide impact acceptable attenuation as defined in ASTM F1292 for Critical Fall Height as indicated on the Drawings.
6. Accessibility: Surface material must provide accessible routes for maneuvering in and around play events and comply with ASTM F1951.
7. All playground components' use and layout shall conform to recommendations of U.S. Consumer Product Safety Commission "Public Playground Safety Handbook" (CGS Section 21a-12a) and ASTM International standards.

B. If deviation from specified depth is required, it is the Contractor's responsibility to make all changes required to maintain specified top elevation and required impact attenuation at no extra cost to Owner; obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

2.2 MATERIALS

A. Poured-In-Place Membrane Surfacing: Weather-resistant wear layer over impact attenuating substrate over aggregate subbase.

1. Wear Layer: Ethylene propylene diene monomer (EPDM) particles adhered with an ultraviolet-stabilized polyurethane binder to produce an even, uniformly colored surface.
2. Wear Layer Thickness: 3/8 inch (10 mm), minimum.
3. Coefficient of Friction, when wet: 0.8, minimum, when tested in accordance with ASTM D2047.
4. Wear Layer Color(s): As indicated on drawings.
5. Impact Attenuating Substrate: 100 percent recycled shredded styrene butadiene rubber (SBR) shreds or granules with 100 percent solids polyurethane binder to form a resilient material; do not use foam rubber.
6. Resilient Depth: As required to achieve acceptable impact attenuation as defined in ASTM F1292 for Critical Fall Height, but not more than depth indicated; maintain top elevation flush with adjacent grades.
7. Certification: Provide IPEMA certification of ASTM F1292 Critical Fall Height at thickness specified.
8. Manufacturers:

a. GameTime, Inc: www.gametime.com/#sle.
b. No Fault Sport Group; No Fault Safety Surface for Playgrounds: www.nofault.com/#sle.
c. Play Safe Surfacing, Inc: www.playsafesurfacing.com/#sle.
d. Hanover Specialties Inc: www.vitriturf.com/#sle.

B. Geotextile: Nonwoven polypropylene sheet.

C. Aggregate Subbase: See Section 32 2310.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Playground equipment installer will perform playground layout prior to installation of footings; verify correctness of layout before starting this work.

B. Verify that playground equipment and site furnishings and irrigation system located within playground area are complete.

C. Verify location of underground utilities and facilities in the playground area. Damage to underground utilities and facilities will be repaired at Contractor's expense.

D. Verify that subgrades are at proper elevations and that smooth grading is complete.

E. Verify that proper depth of surfacing is marked on base supports of playground equipment.

3.2 PREPARATION

A. Correct subgrade irregularities to ensure that required depth of protective surfacing can be installed, and subgrade elevation is in accordance with manufacturer's requirements.

B. Inside Use Zones remove all obstructions that would extend into the resilient protective surfacing.

C. Remove rocks, debris, and other similar items.

3.3 SUBBASE

A. Install aggregate subbase as indicated on drawings and in Section 32 1123. Compact aggregate to maximum 95 percent, in accordance with ASTM D1557.

B. Install with top surface of subbase no higher than grades and levels indicated and not more than 1/4 inch (6 mm) lower than grades and levels indicated.

C. Install in true, even plane, sloped to provide positive drainage.

D. Flatness Tolerance: 1/4 inch in 10 feet (6 mm in 3 m), maximum.

3.4 RESILIENT SURFACING LAYER

A. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

B. Install proper thickness throughout Use Zone(s).

C. Clean and dry surface of subbase.

D. Cover aggregate subbase with geotextile:

1. Verify that aggregate is free of ruts or protruding objects.
2. Lap minimum 4 inches (100 mm) width at seams. Adhere seams in accordance with manufacturer's recommendations.
3. Install smooth, and free of tensile stresses, folds, or wrinkles.
4. Protect from clogging, tears, or other damage during surfacing installation.
5. Repair or replace damaged geotextile in accordance with manufacturer's recommendations.

E. Poured In Place Surfacing:

1. Mix components mechanically on-site in accordance with manufacturer's directions; do not mix by hand.
2. Install seamlessly; ensure complete bond to subbase.
3. Cover footings and foundations and adhere tightly around penetrating elements.
4. Maintain full thickness of resilient layers within Use Zone; cover or abut containment curbs as indicated on drawings; completely cover tapered transition edges.
5. Hand trowel exposed surface to smooth, even finish.
6. Impact Attenuation Layer: Install entire layer in one continuous pour on the same day.

7. Wear Surface: Bond wear surface to substrate with adhesive. Apply adhesive in small quantities so that wear surface can be applied before adhesive dries.

    a. Install surfacing seamlessly. When wear surface is composed of different color patterns, pour surface continuously and seamlessly.
    b. When seams are required due to color change or field conditions, place adjacent wear surface as soon as possible, before initial pour has cured. Coat edge of initial pour with adhesive and apply wear surface mixture immediately.
    c. Add a minimum of 1/16 inch (2 mm) depth to specified surfacing depth to ensure required impact attenuation performance is met.
    d. Install wear surface to cover foundations and adhere tightly around elements penetrating the surface.

3.5 FIELD QUALITY CONTROL

A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review.

B. Owner or Owner's representative will inspect playground surfacing after installation to verify that surfacing is of proper type and depth and that playground meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliance is achieved.

3.6 CLEANING AND PROTECTION

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation. Clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction.

E. Protect installed products until Date of Substantial Completion.

F. Replace damaged products before Date of Substantial Completion.

END OF SECTION 321816.13

SECTION 323113 – CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Furnishing and installing woven wire fencing systems of the type and height specified and supported by metal posts erected where indicated on the Drawings and as specified herein, including fence and gates.

B. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. ASTM International (ASTM).

1. ASTM A90 – Standard Test Method for Weight (Mass) of Coating on Iron or Steel Articles with Zinc or Zinc Alloy.
2. ASTM A123 – Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
4. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
5. ASTM A392 – Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
6. ASTM A428 – Standard Test Method for Weight (Mass) of Coating on Aluminum-Coated Iron or Steel Articles.
7. ASTM A491 – Standard Specification for Aluminum Coated Steel Chain Link Fence Fabric.
8. ASTM A780 – Standard Specification for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

9. ASTM A819 – Standard Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric and Marcelled Tension Wire.
10. ASTM A824 – Standard Specification Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.
11. ASTM B211 – Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
12. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
13. ASTM F552 – Standard Terminology Relating to Chain Link Fencing.
14. ASTM F567 – Standard Practice for Installation of Chain Link Fence.
15. ASTM F626 – Standard Specification for Fence Fittings.
16. ASTM F668 – Specification for Polymer Coated Chain Link Fence Fabric.
17. ASTM F900 – Standard Specification for Industrial and Commercial Swing Gates.
18. ASTM F934 – Specification for Standard Colors for Polymer-Coated Chain Link.
19. ASTM F1043 – Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
20. ASTM F1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
21. ASTM F1183 – Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
22. ASTM F1664 – Standard Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used with Chain-Link Fence.

D. Chain Link Fence Manufacturer's Institute

1. Chain Link Fence Manufacturer's Institute Product Manual, latest revision.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section "Sustainable Design Requirements" and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SYSTEM DESCRIPTION

A. Temporary Construction Fence:

1. Fence Height: 8 feet.
2. Mesh Size: 2 inches.
3. Mesh Gauge: 12
4. Gates: Height of gates shall match that of fence. Width of gates shall be as shown on the Drawings.
5. Anchored post or driven posts where indicated. No top or bottom rails required.
6. Panelized/modular units where indicated. Two stabilizers per panel.

B. Chain Link Fence:

1. Fence Height: Varies, refer to the Drawings.
2. Mesh Size: 2 inches.
3. Mesh Gauge: 9, measured prior to application of any coating.
4. Gates: Height of gates shall match that of fence. Type and size of gates shall be as shown on the Drawings.
5. Top and bottom rails between posts unless otherwise indicated.

1.6 SUBMITTALS

A. Shop drawings showing the plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates and a schedule of components.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.

1. Fence and gate posts, rails, and fittings.
2. Chain-link fabric, fabric coatings, reinforcements, and attachments.
3. Accessories: Privacy slats.
4. Gates, locking mechanisms and hardware.
5. Gate operators, including operating instructions.
6. Motors (if applicable): Show nameplate data, ratings, characteristics, and mounting arrangements.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

1. Gate Operator (if applicable): Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
2. Wiring Diagrams (if applicable): For power, signal, and control wiring.

D. Samples for Initial Selection: For components with factory-applied color finishes.

E. Samples for Verification: Prepared on Samples of size indicated below:

1. Polymer-Coated Components: In 6-inch lengths for components and on full-sized units for accessories.

F. Delegated-Design Submittal: For chain-link fences and gate framework indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified factory-authorized service representative.

B. Product Certificates: For each type of chain-link fence system and gate, from manufacturer.

C. Product Test Reports: For framing strength, ASTM F1043.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:

1. Polymer finishes.
2. Gate hardware.
3. Gate operator.

1.9 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Supply material in accordance with Chain Link Fence Manufacturer's Institute Product Manual and this Specification.

C. Perform installation in accordance with ASTM F567.

D. Maintain all facilities installed under this Section in proper and safe condition throughout the progress of the work.

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to existing improvements and/or proposed construction. Verify dimensions by field measurements. Notify Engineer of any dimensional discrepancies prior to proceeding with the work. Coordinate with Engineer regarding any adjustment or modification.

1.11 DELIVERY, STORAGE AND HANDLING

A. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.

B. Packages shall be labeled with the manufacturer's name.

C. Store fence fabric and accessories in a secure and dry place.

1.12 WARRANTY

B. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of gate operators and controls.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
c. Deterioration of coatings beyond normal weathering.

B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL

A. All posts and rails shall be straight, true to section and of sufficient length for proper installation.

B. Unless otherwise specified, hardware and accessories shall conform to the requirements of ASTM F626 and ASTM A123 or ASTM A153 as applicable for zinc-coating.

2.2 POSTS AND RAILS

A. Extruded steel tube, ASTM F1083 or rolled/welded tube, ASTM F1043, minimal yield strength 50,000 pounds per square inch (psi), hot dipped galvanized.

1. Extruded steel tube: Average zinc coating of 2.0 ounces per square foot (oz/ft^2) interior/exterior, ASTM F1083.
2. Rolled/welded tube: External zinc coating 1.0 oz/ft^2 with a clear polymeric overcoat, Type D interior 90% zinc-rich coating having a minimum thickness of 0.30 mils.

B. Post size per Table 1.

Table 1 – Post and Rail Sizes

Item	Fence Height	Outside Diameter, Inches	F1083 Schedule 40 weight lb/ft	F1043-IC WT-40 weight lb/ft
Line Posts	up to 8 ft.	2.375	3.65	3.12
	8 to 12 ft.	2.875	5.79	4.64
Terminal Posts	up to 8 ft.	2.875	5.79	4.64
	8 to 12 ft.	4.000	9.11	6.56
Rails		1.660	2.27	1.84

C. Truss rod shall be ⅜-inch zinc-coated steel with adjustable turnbuckles or truss tightener.

2.3 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Mesh Size: 2 inches.
3. Selvage: Knuckled at both selvages (KK).
4. Wire Fabric

a. Zinc-Coated Steel Fabric, 9-gauge, ASTM A819, hot-dip galvanized, ASTM A392 Class 2 – 2.0 oz/ft², coated after weaving (GAW).

1) Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.

b. Polymer-Coated Steel Fabric: ASTM F668, 9-gauge core wire, 0.3 oz/ft^2 zinc-coated with Class 2b (thermally fused and bonded) PVC coating.

1) Color: Black, ASTM F934.

2.4 TENSION WIRE

C. Match coating type to that of the chain link fabric.

1. Metallic-coated steel wire: Marcelled (spiraled or crimped), 7 gage, (0.177 inches) diameter, ASTM A824, zinc-coated, ASTM A818 Class 5 – 2.0 oz/ft².
2. Polymer-coated steel wire: Marcelled (spiraled or crimped) 7 gage, (0.177 inches) diameter (before coating), ASTM F1664.

a. Color: Black, ASTM F934.

2.5 HARDWARE AND FITTINGS

A. Tension and Brace Bands: Galvanized pressed steel complying with ASTM F626, minimum steel thickness of 12 gauge (0.105 in.), minimum width of ¾ in. and minimum zinc coating of 1.20 oz/ft². Secure bands with $\frac{5}{16}$ in. hot-dip galvanized steel carriage bolts.

B. Terminal Post Caps, Line Post Loop Caps, Rail and Brace Ends, Boulevard Clamps, and Rail Sleeves: In compliance to ASTM F626, pressed steel galvanized after fabrication having a minimum zinc coating of 1.20 oz/ft².

1. Rail sleeves shall not be less than 6 inches long.

C. Truss Rod Assembly: In compliance with ASTM F626, ⅜ in. diameter steel truss rod with a pressed steel tightener, minimum zinc coating of 1.2 oz/ft², assembly capable of withstanding a tension of 2,000 lbs.

D. Tension Bars: In compliance with ASTM F626. Galvanized steel one-piece length 2 in. less than the fabric height, minimum cross section of $^{3}/_{16}$ in. by ¾ in. and minimum zinc coating of 1.2 oz./ft².

E. Miscellaneous hardware, including but not limited to nuts, bolts, washers, clips, bands, rail ends, brackets, and straps shall be provided as required, hot-dip galvanized steel, ASTM F626.

F. Brace bands shall be formed from flat or beveled steel and shall have a minimum thickness after galvanizing of 0.108 inches and a minimum width of ¾ inch.

G. Polymer-Coated Fittings: ASTM F626, PVC or polyolefin coating, minimum thickness 0.006 in., fused and adhered to the zinc-coated fittings. Color to match fence system.

2.6 TIE WIRE AND HOG RINGS

A. Tie Wire and Hog Rings: Galvanized minimum zinc coating 1.20 oz/ft², 9-gauge (0.148 in) steel wire, ASTM F626.

B. Polymer coated materials shall match the coating, class and color to that of the chain link fabric.

2.7 FASTENERS

A. All fasteners shall be hot-dip galvanized, ASTM F2329.

B. Bolts: Steel, ASTM A307, Grade A min, Hex.

C. Nuts: Steel, ASTM A563, Grade A min, Hex.

D. Washers: Steel, round, ASTM F844.

E. Polymer Coated Color Fittings: In compliance with ASTM F626, PVC or polyolefin coating minimum thickness 0.006 in. fused and adhered to the zinc-coated fittings. Color to match fence system.

2.8 MODULAR OR PANELIZED CHAIN LINK FENCE (TEMPORARY FENCE ONLY)

A. Free-standing fence panels, minimum ten (10) foot panels of the height specified.

B. Fabric as specified.

C. Welded tubular steel frame.

D. Stands: Four-sided welded tubular steel frame with center bar and tubular sleeves.

2.9 SWING GATES

A. Gate Construction: ASTM F900. Corners welded or assembled with special malleable or pressed-steel fittings and rivets or bolts to provide rigid connections.

B. Pipe and Tubing: Zinc-Coated Steel: Comply with ASTM F1043 and ASTM F1083; protective coating and finish to match fence framing.

C. Posts (Hing Posts): Round tubular steel.

1. Up to 4-foot fencing: 2⅞-inch OD Pipe.
2. Over 4-foot to 6-foot fencing: 4-inch OD Pipe.
3. Over 6-foot to 12-foot fencing: 6.625-inch OD Pipe.

D. Frames and Bracing: Round tubular steel.

1. Framing:

a. 2.375 inch OD Pipe
b. Gate Leaves: Configured with intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. When width of gate leaf exceeds 10 feet, install mid-distance vertical tubing of the same size and weight as frame members. When either horizontal or vertical bracing is not required, provide truss rods as cross-bracing to prevent sag or twist.
c. Horizontal bid bracing shall be used on all gates.

E. Wire Fencing Fabric: Fabric shall match that of fence, attached securely to frame at intervals not exceeding 15 inches.

F. Hardware:

1. Latches, hinges, stops, keepers and other hardware items shall be furnished as required for proper operation. These elements may not be shown on the Drawings, but shall be supplied and installed as required for a complete gate system.
2. Hinges: 360-degree inward and outward swing. Set screw shall be installed drilled into the steel post to lock each hinge to the gate post and prevent rotation. No-lift-off type. Box type hinges are not acceptable.
3. Latches: permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
4. Double gates and single gates with leaf width 4 feet and greater shall be equipped with a minimum ½″ drop bar and gate hold-backs.
5. Latches, hinges, stops, keepers and other hardware items shall be furnished as required for proper operation.

2.10 PRIVACY SLATS (IF APPLICABLE)

A. Material: PVC, UV-light stabilized, flame resistant, four ply, not less than 0.023 inch (0.58 mm) thick; sized to fit mesh specified for direction indicated.

B. Material: Redwood, $\frac{5}{16}$ inch (7.9 mm) thick, sized to fit mesh specified for direction indicated.

C. Color: As selected by Owner.

2.11 CONCRETE

A. Concrete shall conform to ASTM C94; or pre-packaged concrete mix, ASTM C387. Minimum 28-day compressive strength of 3,000 psi. No air entrainment.

2.12 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

PART 3 - EXECUTION

3.1 GENERAL

A. Install fence with properly trained crew as shown on the drawings in accordance with ASTM F567.

B. Install all nuts for tension bands and hardware bolts on the side of the fence opposite the fabric.

C. The temporary chain link fence shall be removed at the conclusion of the work.

3.2 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.4 INSTALLATION, GENERAL

D. Install chain-link fencing to comply with ASTM F567 and more stringent requirements indicated.

1. Install fencing on established boundary lines inside property line.

3.5 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
2. Concrete post footings shall have a plan diameter 12 inches greater than the post diameter. Holes shall be clean and free of loose soil and debris. Concrete shall be placed continuously in one operation and tamped or vibrated for consolidation. Tops of the concrete footings shall be crowned to shed water.
3. Gate post/footings shall be installed a minimum of 42 inches below grade.
4. All corner, end posts, and gate posts shall be braced.

    a. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
    b. Corner and terminal posts are to be braced horizontally and diagonally. The braces are to extend over one adjacent panel. Changes in line of 30 degrees or more shall be considered as corners.
    c. Braces and truss rods shall be securely fastened to posts with appropriate hardware.
    d. Pull posts with two braces shall be provided for all heights where changes in horizontal or vertical alignment of ten (10) degrees or more occur.

5. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

    a. Concealed Concrete: Top 3 inches below grade as indicated on Drawings to allow covering with surface material.
    b. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer’s written instructions, and finished sloped to drain water away from post.
    c. Posts Set into Voids in Concrete: Form or core drill holes not less than 5 inches deep and ¾ inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer’s written instructions, and finished sloped to drain water away from post.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts uniformly as indicated on the Drawings. Unless indicated otherwise, spacing shall be 8 feet on-center.

E. Post Bracing and Intermediate Rails: Install according to ASTM F567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.

1. horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches on-center. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches (152 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Intermediate and Bottom Rails: Install and secure to posts with fittings.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on-center.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F626. Bend ends of wire to minimize hazard to individuals and clothing.

1. Maximum Spacing: Tie fabric to line posts at 12 inches on-center and to braces at 24 inches on-center.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

M. Privacy Slats: Install slats in direction indicated, securely locked in place.

1. Diagonally, for privacy factor of 80 to 85.

N. Fabric:

1. Do not install fabric until concrete post footings have cured seven (7) days. Provide fabric of the height specified. Install fabric on the public side of the fence, with bottom no greater than 2 inches above the ground surface. Fabric shall be pulled taut to prevent sagging and provide a uniform smooth appearance. Fasten fabric to line posts at intervals not exceeding 15 inches with ties as specified.
2. Install tension wire in one continuous length between pull posts, weaved through fence fabric at top. Tension wire shall be applied to provide a wire without visible sag between posts. Fasten fabric to tension wire at intervals not exceeding 24 inches with ties or hog rings as specified.
3. Where it is not practicable to conform the fence to general contour of the ground, as at ditches, channels, etc., the opening beneath the fence shall be enclosed with chain link fabric and sufficiently braced to preclude access, but not to restrict the flow of water.

3.6 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

B. Provide swing gates at the locations and dimensions shown on the Drawings. Do not install gates until concrete post footings have cured seven (7) days.

C. Gates shall be installed plumb, level, and secure, with full opening without interference. Hardware shall be installed and adjusted for smooth operation and lubricated where necessary.

D. Provide concrete center drop to footing depth and suitable drop rod sleeve at center of double gate openings.

3.7 GATE OPERATOR INSTALLATION (IF APPLICABLE)

A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.

B. Excavation for Support Posts Pedestals Equipment Bases/Pads: Hand-excavate holes for bases/pads, in firm, undisturbed soil to dimensions and depths and at locations as required by gate-operator component manufacturer's written instructions and as indicated.

3.8 GROUNDING AND BONDING

E. Fence Grounding: Install at maximum intervals of 1,500 feet except as follows:

F. Fences within 100 feet of buildings, structures, walkways, and roadways: Ground at maximum intervals of 750 feet.

1. Gates and Other Fence Openings: Ground fence on each side of opening.
2. Bond metal gates to gate posts.
3. Coordinate subparagraph below with Drawings in projects where intentional discontinuities are provided in metal fencing conductivity to localize lightning effects to the vicinity of strikes. See Evaluations.
4. Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least 18 inches below finished grade.

B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 feet on each side of crossing.

C. Plans and details on Electrical Drawings and requirements in Division 26 Sections may revise or illustrate application of requirement below or may require grounding that exceeds minimum requirements in IEEE C2. Fences enclosing electrical substations are often bonded to a station grounding mat.

D. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.

E. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location, including the following:

1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
2. Make grounding connections to each barbed tape coil with connectors designed for this purpose.

F. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

G. Connections: Make connections to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

H. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.9 FIELD QUALITY CONTROL

A. Grounding-Resistance Testing: Engage a qualified testing agency to perform tests and inspections.

1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance no fewer than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
3. Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.10 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire

operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

3.11 DEMONSTRATION

G. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain chain-link fences and gates.

END OF SECTION 323113

SECTION 323300 – BOLLARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Steel pipe bollard with plastic sleeve.
2. Accessible Parking Signage bollard.
3. Eclipse Concrete Bollard

B. The Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. The Contractor is responsible for all health and safety.

1.3 RELATED SECTIONS

A. Section 05 0513 - Shop-Applied Coatings for Metal: For hot-dip galvanized with primed finish.

B. Section 09 9113 - Exterior Painting: For field painted finish.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include

documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.

6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. ASTM International (ASTM).

1. ASTM A366—Standard Specification for Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
2. ASTM A500—Standard Specification for Cold-Formed Welded and Seamless Carbon Tubing in Rounds and Shapes.
3. ASTM D1640—Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature.
4. ASTM D5893—Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

C. State of Connecticut

1. State Building Code, including all Amendments, Supplements, and Errata.

D. United States Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction.

E. United States General Services Administration, Federal Standards.

1. Federal Standard No. 595—Colors Used in Government Procurement.

1.6 PERFORMANCE REQUIREMENTS

A. Bollards are to be installed as a single unit with specified dimensions and is secured in the ground.

1.7 SUBMITTALS

A. Submit Shop Drawings, manufacturer’s literature, material certificates or other data indicating compliance with these Specifications.

B. Submit testing data for concrete as required by Section 03 3200—Site Cast-in-Place Concrete.

1.8 DELIVERY, STORAGE AND HANDLING

A. Supply: Bollard units of all types must be supplied by a single manufacturer having the resources to provide consistent quality in appearance and physical properties.

B. Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging.

C. Store units to avoid damage from moisture, abrasion, and other construction activities.

PART 2 - PRODUCTS

2.1 STEEL PIPE BOLLARDS WITH PLASTIC SLEEVE

A. Concrete filled steel pipe with plain shaft.

1. Shape: Round.
2. Pipe Diameter: As indicated on Drawings.
3. Height above Grade: As indicated on Drawings.

4. Materials:

a. Steel Pipe: ASTM A53/A53M, standard weight.
b. Factory Finish: Hot-dipped galvanized.

5. Mounting: In-ground.

6. Accessories: Plastic Cover.

a. Material: LDPE plastic injected with UV resistor fade resistant additive.
b. Wall Thickness: 1/4 inch.
c. Size: 7-inch inside diameter designed to fit over 6-inch diameter pipe.
d. Height: Cut to length as required by manufacturer.
e. Top: Domed.
f. Color: Black.
g. Manufacturer: Ideal Shield, 2525 Clark Street, Detroit, MI 48209 (866) 825-8659 or approved equal.

2.2 ACCESSIBLE PARKING SIGNAGE BOLLARD

A. Hollow steel pipe with plain shaft.

B. Shape: Square.

C. Width: As indicated on Drawings.

D. Height Above Grade: As indicated on Drawings.

E. Cap: Angled steel plate.

F. Materials:

1. Steel Tube: ASTM A513/A513M, standard weight.
2. Factory Finish: hot-dip galvanized with primed finish 05 0513 - Shop-Applied Coatings for Metal.
3. Final Finish: Field painted conforming to Section 09 9113 - Exterior Painting.
4. Color: As indicated on metal finish schedule.
5. Mounting: In-ground.

2.3 ECLIPSE CONCRETE BOLLARD

A. Pre-cast concrete bollard
1. Shape: Round
2. Diameter: 10”
3. Height above grade: 39 7/8”
4. Color: Acid Wash A20 White
5. Mounting: In-ground Embedment
6. Manufacturer: Wausau Tile, P.O. BOX 1520 Wausau, WI 54402-1520

2.4 CONCRETE

A. Concrete shall be as specified in Section 03 3200—Site-Cast-in-Place Concrete.

2.5 JOINT FILLER

A. One-part, cold-applied silicone that cures to a durable, flexible, low modulus silicone rubber joint seal, ASTM D5893.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install bollards at the locations indicated on the Drawings.

B. Install bollards level and true to the specific depths and exposures as indicated on the Drawings.

C. Provide temporary bracing as required to maintain desired installation until concrete has cured.

D. Protect newly-installed bollards from damage or movement.

E. Verify mounting location before proceeding. For bollards, verify spacing.

F. Examine conditions at the installation area for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting installation.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

H. Use manufacturer’s templates or similar guides prior to drilling for anchorage. Control dust and protect adjacent areas.

I. Comply with manufacturer's written installation instructions for installation, unless more stringent requirements are indicated. Complete field assembly where required.

END OF SECTION 323300

SECTION 329119.13 – TOPSOIL PLACEMENT AND GRADING

PART 1 - PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Testing of topsoil for use in creating amended topsoil and as an ingredient in planting soils of other sections.

B. Placing and finished grading of amended topsoil.

1.3 RELATED REQUIREMENTS

A. Section 31 1100 – Clearing and Grubbing: Clearing and protection of vegetation.

B. Section 32 9300 - Plants: Placing planting soil for plantings.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of

Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 01 2200 - Unit Prices.

1.6 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Amended Topsoil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

C. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

D. CEC: Cation exchange capacity.

E. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

F. Duff Layer: A surface layer of soil, typical of forested areas, which is composed of mostly decayed leaves, twigs, and detritus.

G. Imported Soil: Soil that is transported to Project site for use.

H. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

I. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

J. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

K. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

L. Planting Soil: Amended topsoil that has been modified as specified with soil amendments and fertilizers to produce a soil mixture for use in planting beds.

M. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

N. SSSA: Soil Science Society of America.

O. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

P. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

Q. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

R. USCC: U.S. Composting Council.

1.7 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.8 SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of imported soil before delivery to the site, according to the following:

    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1 quart (1 liter) volume of each in sealed containers labeled with content, source, and date obtained. Each sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

C. Qualification Data: For each testing agency.

D. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" article.

E. Field quality-control reports.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements, provide testing by one of the following:

a. UConn Soil Nutrient Analysis Laboratory, 6 Sherman Place U-5102, University of Connecticut, Storrs, CT 06269-5102 (860) 486-4274 email: soiltest@uconn.edu.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.

1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.11 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Owner or Contractor in presence of Architect under the direction of the testing agency.

1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Soils".
3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.12 TESTING REQUIREMENTS

C. General: Perform tests on soil samples according to requirements in this article.
1. Physical Testing:
1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":

a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
b. Hydrometer Method: Report percentages of sand, silt, and clay.

2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."

3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D698 (Standard Proctor).

B. Chemical Testing:

1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."

C. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.
6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm [and sodium absorption ratio].
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

D. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

E. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory amended topsoil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.

F. Delivery, Storage, and Handling

G. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

H. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 TOPSOILS SPECIFIED BY COMPOSITION

A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.

B. The Soil shall not contain refuse, roots larger than ¼-inch diameter, heavy, sticky, or stiff clay, stones larger than ½-inches in diameter, noxious seeds, sticks, brush, litter, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, or any substances deleterious to plant growth. The percentage of the above objects shall be controlled by source selection not by screening the soil. The Soil shall be suitable for the germination of seeds and the support of vegetative growth in line with the requirements of the project. The Soil shall not contain weed seeds in quantities that cause noticeable weed infestations in the final planting beds.

C. Amended Topsoil: Required Properties of topsoil after amendments have been added:

1. Friable and with sufficient structure to give good tilth and aeration.
2. Soil reaction of pH: 6 to 7.
3. Organic Matter Content: Minimum of 6 percent following addition of compost.
4. No stones greater than 0.5 inches (13 mm).
5. Infiltration Rate: Greater than 4 inches per hour.
6. Combined silt and clay shall not exceed 40 percent.
7. Soluble salts shall be no more than 2 mmho/cm.
8. Soil shall not be compactable to more than 200 psi.
9. Soils shall conform to the following gradations:

Percentage of Main Fraction		
Description	Size (mm)	Percent
Sand	0.05 to 2.0	59 to 70
Silt	0.002 to 0.05	15 to 25
Clay	Less than 0.002	5 to 15
Percentage of Sand Fraction		

Percentage of Main Fraction		
Description	Size (mm)	Percent
Description	Size (mm)	Percent
Very Coarse	1.0 to 2.0	12 to 14
Coarse	0.5 to 1.0	18 to 21
Medium	0.25 to 0.5	18 to 21
Fine	0.10 to 0.25	8 to 9
Very Fine	0.05 to 0.10	3 to 4

D. On-Site Topsoil: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable amended topsoil.

1. Blend existing, on-site surface soil with soil amendments and fertilizers according to the soil analysis to produce amended topsoil:

a. Inorganic soil amendments as recommended by testing laboratory.
b. Organic soil amendments as recommended by testing laboratory.
c. Fertilizer as recommended by testing laboratory.

E. Imported Topsoil: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable amended topsoil.

1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.

2. Blend imported topsoil with soil amendments and fertilizers according to the soil analysis to produce amended topsoil:

a. Inorganic soil amendments as recommended by testing laboratory.
b. Organic soil amendments as recommended by testing laboratory.
c. Fertilizer as recommended by testing laboratory.

2.2 INORGANIC SOIL AMENDMENTS

A. The following inorganic soil amendments shall be added to topsoil when recommended by soil analysis and as indicated on drawings to produce amended topsoil.

B. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through a No. 60 (0.25-mm) sieve.
2. Class: O, with a minimum of 95 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through a No. 60 (0.25-mm) sieve.
3. Form: Provide lime in form of ground dolomitic limestone.

C. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.

D. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

E. Perlite: Horticultural perlite, soil amendment grade.

F. Agricultural or Recycled Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve.

G. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

2.3 ORGANIC SOIL AMENDMENTS

A. The following organic soil amendments shall be added to topsoil when recommended by soil analysis and as indicated on drawings to produce amended topsoil.

B. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

C. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.

D. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.

E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

A. The following fertilizers shall be added to topsoil when recommended by soil analysis and as indicated on drawings to produce amended topsoil.

B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb./1000 sq. ft. (0.5 kg/100 sq. m of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

E. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

PART 3 - PART 3 EXECUTION

3.1 GENERAL

A. Place amended topsoil and fertilizers according to requirements in other specification sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches (150 mm) and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

D. Screening: Pass unamended soil through a 2-inch (50-mm) sieve to remove large materials.

3.3 PLACING AND MIXING UNAMENDED TOPSOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required amended topsoil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply, add soil amendments, and mix approximately half the thickness of unamended topsoil over prepared, loosened subgrade according to "Mixing" paragraph below. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.

C. Mixing: Spread unamended topsoil to total depth of 6 inches (150 mm), but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if topsoil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended topsoil to produce amended topsoil.

a. Mix lime with dry soil before mixing fertilizer.
b. Mix fertilizer with planting soil no more than seven days before planting.

2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of amended topsoil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 and tested in-place except where a different compaction value is indicated on Drawings.

E. Finish Grading: Grade amended topsoil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D698. Space tests at no less than one for each 1000 sq. ft. (100 sq. m) of in-place soil or part thereof.

C. Soil will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5 PROTECTION

A. Protection Zone: Identify protection zones according to Section 01 5639 - Temporary Tree and Plant Protection

B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.

4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

C. If amended topsoil or subgrade is over compacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.6 CLEANING

A. Protect areas adjacent to amended topsoil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
2. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329119.13

SECTION 329219 – SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Hydroseeding, mulching and fertilizer.

B. Maintenance.

1.3 RELATED REQUIREMENTS

A. Section 32 9119.13 - Topsoil Placement and Grading: Topsoil testing, planting soil placement and finish grading.

B. Section 32 9223 – Sodding: Providing and installing sod within turf surfaced roadways.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of

Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.6 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

C. Maintenance Contract.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 - PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. Grass seed mixture shall be as indicated on the Drawings.

2.2 SOIL MATERIALS

A. Amended Topsoil: As specified in Section 32 9119.13 - Topsoil Placement and Grading.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of grass.

2.4 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb./sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

2.5 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.6 TESTS

A. Provide analysis of topsoil fill under provisions of Section 01 4000 and according to Section 32 9119.13 - Topsoil Placement and Grading.

2.7 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 15th to June 15th.
2. Fall Planting: August 15th to October 15th.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.2 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. Place amended topsoil in accordance with Section 32 9119.13 - Topsoil Placement and Grading.

C. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

D. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.3 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions and per recommendations per Section 32 9119.13 - Topsoil Placement and Grading.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.4 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 3 to 4 lbs. per 1000 sq ft (1.4 to 1.8 Kg per 1000 sq m) evenly in two intersecting directions unless indicated to apply at a heavier rate on the Drawings.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).

3.5 TURF RENOVATION

A. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

C. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

D. Mow, dethatch, core aerate, and rake existing turf.

E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

H. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

1. Soil Amendment(s): according to requirements of Section 32 9119.13 - Topsoil Placement and Grading. Apply as recommended by topsoil analysis.
2. Initial Fertilizer: Commercial fertilizer or Slow-release fertilizer applied according to manufacturer's recommendations.

I. Apply seed and protect with straw mulch as required for new turf.

J. Water newly planted areas and keep moist until new turf is established.

3.6 PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 24 inches (600 mm).

B. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil

C. Cover seeded slopes where grade is 4 inches per foot (100 mm per m) or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

D. Lay fabric smoothly on surface, bury top end of each section in 6 inch (150 mm) deep excavated topsoil trench. Provide 12 inch (300 mm) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

1. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
2. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

C. Secure outside edges and overlaps at 36-inch (900 mm) intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches (150 mm).

3.7 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 7000 - Execution Requirements, for additional requirements relating to maintenance service.

C. Provide a separate maintenance contract for specified maintenance service.

D. Provide maintenance of seeded areas for a minimum of three months from Date of Substantial Completion or until grass is well established and exhibits a vigorous growing condition. Continue maintenance until turf is satisfactory.

E. Turf installations shall meet the following criteria as determined by Landscape Architect

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).

F. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.

G. Neatly trim edges and hand clip where necessary.

H. Immediately remove clippings after mowing and trimming.

I. Water to prevent grass and soil from drying out.

J. Roll surface to remove minor depressions or irregularities.

K. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

1. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
2. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

L. Immediately reseed areas that show bare spots.

M. Protect seeded areas with warning signs during maintenance period.

3.8 RESTORATION OF SETTLED GRADES

A. At the end, twelve months after the date of substantial completion of the soil installation work, inspect the site and restore any areas where the grades have settled beyond the elevations shown on the drawings.

1. Lawn areas: Remove the sod using mechanical sod cutter from the settled area and add the specified top soil or planting mix. Re sod the area using the sod cut from the lawn. In the event that the sod cannot be reused, install new sod that matches the seed mix on the lawn.
2. Planting Areas: Where the settlement is 3-inches or less, remove the mulch, top dress the area with the specified topsoil or planting mix and re mulch.
3. Planting Areas: Where the settlement is greater than 3-inches remove the mulch and plants, add the specified topsoil or planting mix and re mulch.

3.9 CLEANUP

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329219

SECTION 329223 – SODDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SECTION INCLUDES

A. Fertilizing.

B. Sod installation.

C. Maintenance.

1.3 RELATED REQUIREMENTS

A. Section 32 1125 – Turf Surfaced Roadways: Materials and installation of turf surfaced roadways.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.6 REFERENCE STANDARDS

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding 2006.

1.7 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Certificate: Certify grass species and location of sod source.

C. Certificate: Certify fertilizer and herbicide mixture approval by authority having jurisdiction.

D. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer; and herbicides.

E. Maintenance Contract.

1.8 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years' experience and certified by the State of Connecticut.

B. Installer Qualifications: Company approved by the sod producer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours.

1.10 MAINTENANCE

A. Provide a separate maintenance contract for specified maintenance service.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of fertilizer and herbicide mixture.

2.2 MATERIALS

A. Sod: TPI (SPEC), Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft (100 sq m). Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.

B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:

1. Mix of three to six new varieties of turf-type fescues which require reduced frequency of watering, fertilization, and mowing as recommended by the sod producer.

2.3 FERTILIZERS

A. Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent from natural organic sources of urea formaldehyde, phosphorous, and potassium with nitrogen, phosphorous and potassium in amounts recommended in the soil analysis per Section 32 9119.13 - Topsoil Placement and Grading.

B. Fertilizer: Slow-release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorous and potassium in amounts recommended the soil analysis per Section 32 9119.13 - Topsoil Placement and Grading.

C. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of grass.

2.4 HERBICIDES

A. Herbicides: Herbicide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

1. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
2. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size, and length to ensure anchorage of sod on slope.

2.6 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

B. CONNECTICUT:

1. Spring Planting: March 15th to June 15th.
2. Fall Planting: August 15th to October 15th.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.2 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

3.3 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.4 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches (300 mm) minimum. Do not stretch or overlap sod pieces.

D. Where new sod adjoins existing grass areas, align top surfaces.

E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch (13 mm) below top of hard surface.

F. On slopes 6 inches per foot (500 mm per m) and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet (600 mm) on center. Drive pegs flush with soil portion of sod.

G. Water sodded areas immediately after installation. Saturate sod to 4 inches (100 mm) of soil.

H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 2000 lbs. (Roll sodded areas with roller not exceeding 900 kg.)

3.5 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will not pay for water.

B. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

C. Provide a separate maintenance contract for specified maintenance service.

D. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

E. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches (65 mm). Do not cut more than 1/3 of grass blade at any one mowing.

F. Neatly trim edges and hand clip where necessary.

G. Immediately remove clippings after mowing and trimming.

H. Water to prevent grass and soil from drying out.

I. Roll surface to remove irregularities.

J. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

K. Immediately replace sod to areas that show deterioration or bare spots.

L. Protect sodded areas with warning signs during maintenance period.

3.6 SATISFACTORY TURF

A. Turf installations shall be, at the end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities as determined by Landscape Architect.

B. Use specified materials to reestablish turfgrass that does not comply with requirements and continue maintenance until turf is satisfactory.

3.7 CLEAN UP

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329223

SECTION 329300 – PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Planting Soil.

B. Related Sections:

1. Division 01 Section "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Division 31 Section "Clearing and Grubbing" for topsoil stripping and stockpiling, and site clearing.
3. Division 31 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
4. Division 32 Section “Topsoil and Grading” for planting medium.
5. Division 32 Section "Turf and Grasses" for turf (lawn), hydroseeding and sod.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

D. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

E. Finish Grade: Elevation of finished surface of planting soil.

F. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

G. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

H. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

I. Planting Area: Areas to be planted.

J. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

K. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

L. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

M. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

O. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

P. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in [digital] [3- by 5-inch (76- by 127-mm) print] format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than [20] <Insert number> plants are required, include a minimum of [three] <Insert number> photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples for Verification: For each of the following:

1. Organic and Compost Mulch: 1-quart (1-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
2. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator: State licensed, commercial.

B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.

1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three one gallon representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
3. Report suitability of tested soil for plant growth.

a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd. (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

E. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

F. Plant Material Observation: Landscape Architect shall be given the opportunity to observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Provide transportation and accompany Landscape Architect to this location. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

G. Preinstallation Conference: Conduct conference at Project site.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

C. Deliver bare-root stock plants freshly dug. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.12 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting of Deciduous Plants: March 1st to May 15th
2. Spring Planting of Evergreen Plants: March 1st to June 1st.
3. Fall Planting of both Deciduous and Evergreen Plants: October 1st until soil becomes frozen.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.13 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
b. Structural failures including plantings falling or blowing over.
c. Faulty performance of edgings.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Substantial Completion:

a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

2.2 SOIL MATERIALS

A. Amended Topsoil: As specified in Section 32 9119.13 – Topsoil Placement and Grading.

2.3 PLANTING SOILS

~~A.~~ Planting Soil: Blend amended topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
1. Compost: 1:3 ratio by volume of loose compost to amended topsoil.
2. Fertilizer tablets: Quantity per tree or shrub pit as recommended by tablet manufacturer.

2.4 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Type: 100 percent shredded bark.
2. Size Range: 3 inches (76 mm) maximum, 1/2-inch (13 mm) minimum.
3. Color: Natural.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch (25-mm) sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.5 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.6 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.7 MISCELLANEOUS PRODUCTS

A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

C. Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

D. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 5-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.1 CARE OF PLANTS PRIOR TO PLANTING

A. When plants are taken from storage to the planting site, roots of plants shall be immersed in water immediately upon opening the bundle and kept in water until planted. The Contractor shall have sufficient tanks and pails to keep roots of plants from opened bundles in water until planted. Rootball and container plants shall be immersed for a minimum of 10 minutes prior to planting. Do not remove containers or wire baskets until plant is at planting pit.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

3.3 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 12 inches (300 mm). Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply approved fertilizer tablets directly to subgrade before loosening.
2. Thoroughly blend planting soil off-site before spreading.

    a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
    b. Mix lime with dry soil before mixing fertilizer.

3. Spread planting soil to a minimum depth of 18 inches (450 mm) as indicated on the Drawings, but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches (100 mm) of subgrade. Spread remainder of planting soil.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at rate recommended by the manufacturer.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.

1. Excavate approximately three times as wide as ball diameter for balled and burlapped or container-grown stock.
2. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
6. Maintain supervision of excavations during working hours.
7. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch- (150-mm-) diameter holes, 24 inches (600 mm) apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Only plants which have had their roots immersed in water for at least 10 minutes immediately prior to planting shall be installed. The Contractor shall have sufficient tanks and pails for immersing rootball and container plants prior to planting. Containers and wire baskets are to be removed only after plant has been immersed at the planting pit.

B. Before planting, fill excavations with water and allow to percolate away before positioning trees and shrubs.

C. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

D. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

E. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Use planting soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. Set container-grown stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Use planting soil for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

B. Do not apply pruning paint to wounds.

3.7 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

A. Application: Apply compost 3 inches (76 mm) of compost to surface of in-place planting soil in planting beds prior to installation of weed control fabric and mulch. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet. Rake compost into top 3 inches (76 mm) of planting soil.

3.9 PLANTING AREA MULCHING

A. Prior to installing weed-control barriers, incorporate a 3 to 4 inches depth of composted mulch into the top 6 inches of the planting bed.

B. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm) and secure seams with galvanized pins.

C. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 3-inch (75-mm) average thickness, with radius around trunks or stems as indicated on the Drawings. Do not place mulch within 3 inches (75 mm) of trunks or stems.

2. Organic Mulch in Planting Areas: Apply 3-inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems.

3.10 BED EDGING

A. Shovel-Cut Edging: Separate mulched areas from turf areas with a 45-degree, 4- to 6-inch-(100- to 150-mm-) deep, shovel-cut edge as shown on Drawings.

3.11 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated past management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.12 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.13 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches (150 mm) or smaller in caliper size.
2. Species of Replacement Trees: Same species being replaced.

3.14 RESTORATION OF SETTLED GRADES

A. At the end, twelve months after the date of substantial completion of the soil installation work, inspect the site and restore any areas where the grades have settled beyond the elevations shown on the Drawings.

1. Lawn areas: Remove the sod using mechanical sod cutter from the settled area and add the specified top soil or planting mix. Re sod the area using the sod cut from the lawn. In the event that the sod cannot be reused, install new sod that matches the seed mix on the lawn.
2. Planting Areas: Where the settlement is 3-inches or less, remove the mulch, top dress the area with the specified topsoil or planting mix and re mulch.
3. Planting Areas: Where the settlement is greater than 3-inches remove the mulch and plants, add the specified topsoil or planting mix and re mulch.

3.15 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.16 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

3.17 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 12 months from date of Substantial Completion.

B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 12 months from date of Substantial Completion.

END OF SECTION 329300

SECTION 329705 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backed Bench with Arms.
2. Trash Receptacles.

B. Related Requirements:

1. Division 03 Section "Cast-in-Place Concrete" for installing site furnishings cast in concrete footings.
2. Division 05 Section “Unit Masonry” for installation of anchorage hardware for seatwall mounted bench.
3. Division 31 Section "Earth Moving" for excavation for installing concrete footings.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For site furnishings to include in maintenance manuals.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include

statement indicating cost for each regional material and the fraction by weight that is considered regional.

5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5

PART 2 - PRODUCTS

2.1 BACKED BENCH WITH ARMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Model “Gretchen” Backed Bench as manufactured by Landscape Forms, 431 Lawndale Avenue, Kalamazoo MI 49048 (800) 430-6209 or equal product by the following:

1. Forms + Surfaces
2. Maglin Site Furniture
3. Thomas Steele

B. Frame Material: 713 tenz-alloy Cast Aluminum.

C. Seat Material: Ipe, Solid stock, select South American hardwood.

1. Seat Height: 17 inches.
2. Length: 72 and 96 inches - where indicated on Drawings.
3. Seat Surface Shape: Straight.
4. Arms: Loop.
5. Back: Wood and metal.
6. Mounting: Surface mounted with concrete anchor bolts.

D. Metal Finish: Polyester powder-coated.
1. Color: Matte Black, and as approved by Landscape Architect.

E. Wood Finish: None.

2.2 TRASH RECEPTACLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide “Collect” Litter and Recycling Receptacle as manufactured by Landscape Forms, 431 Lawndale Avenue, Kalamazoo, MI 49048 (800) 430-6209 or the comparable product by the following:

1. Forms + Surface.
2. Maglin Site Furniture.
3. Thomas Steele.

B. Description:

1. Receptacle Shape and Form: Round.
2. Style: Side Opening 25-gallon capacity.
3. Size: 23-inch diameter by 35-inches tall.
4. Inner Container: Black polyethylene or rigid plastic container with drain holes lift-out handles; designed to be removable and reusable.
5. Service Access: Swing-out door; inner container and disposable liner lift out for emptying; side-access latch.
6. Mount: Surface mount.

C. Lid Material: 14 gauge-spun metal, attached to the unit with a pop-up mechanism.

D. Wood Body Material: Ipe: solid stock, select South American hardwood.

1. Constructed of 1-1/4” x 1-1/2” solid stock boards.
2. Boards have eased edges and ends and all sides are finished prior to assembly.

E. Base Material:1-1/2” steel flat bar, hot rolled ASTM A36.

F. Metal Finish: Polyester powder-coated.
1. Color: Matte Black, and as approved by Landscape Architect.

2.3 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Preservative-Treated Wood Components: Complete fabrication of treated items before treatment if possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.4 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUNINUM FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch (19 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled site furnishing surfaces according to manufacturer's written instructions. Protect from damage until acceptance by Owner.

END OF SECTION 329705

SECTION 331900 – WATER SUPPLY SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:

1. Water distribution and fire protection piping.
2. Pipe fittings, valves, and valve boxes.
3. Hydrants.
4. Anchors and thrust blocks.
5. Miscellaneous water system appurtenances.
6. Connections to existing water systems.
7. Disinfection and testing of new systems and appurtenances.

B. Contractor shall coordinate work between all Subcontractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 COORDINATION WITH JURISDICTIONAL AUTHORITY

A. Contractor shall notify and coordinate the work of this Section with the local authority having jurisdiction over water supply, whether public or private system owner/operator.

B. Obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied.

C. Contractor shall obtain all required approvals for connection to, or extension of, any portion of the domestic or fire protection water systems.

D. The closing of valves necessary for making connections with the existing water systems will be done by Contractor with the assistance of Engineer. Sufficient notice shall be given the jurisdictional authority for a planned connection. No allowance will be made for any delay in the closing of valves. A 48-hour notice shall be given to adjacent buildings/residences affected by the shutdown, and shall be done by Contractor to the satisfaction of jurisdictional authority and Engineer. Jurisdictional authority or Engineer may require the work be completed outside of normal working hours during low use time periods.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. State of Connecticut.

1. Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 819 and any supplements.

D. ASTM International (ASTM)

1. ASTM B88—Standard Specification for Seamless Copper Water Tube.
2. ASTM F477—Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
3. ASTM D3139—Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
4. ASTM A536—Ductile Iron Castings.

5. ASTM D1557—Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

E. American National Standards Institute (ANSI)

1. ANSI A21.50—Thickness Design of Ductile-Iron Pipe
2. ANSI A21.51—Ductile-Iron Pipe, Centrifugally Cast, for Water
3. ANSI A21.4—Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
4. ANSI A21.10—Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids

5. ANSI 61—Drinking Water System Components—Health Effects

F. American Water Works Association (AWWA)

1. AWWA C104—Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C110—Standard for Ductile-Iron and Gray-Iron Fittings.
3. AWWA C111—Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. AWWA C150—Standard for Thickness Design of Ductile-Iron Pipe.
5. AWWA C151—Standard for Ductile-Iron Pipe, Centrifugally Cast.
6. AWWA C207—Standards for Steel Pipe Flanges for Waterworks Service—Sizes 4 In. through 144 In. (100 mm Through 3,600 mm).
7. AWWA C502—Standard for Dry-Barrel Fire Hydrants.
8. AWWA C504—Standard for Rubber-Seated Butterfly Valves.
9. AWWA C509—Standard for Resilient-Seated Gate Valves for Water Supply Service.
10. AWWA C550—Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
11. AWWA C651—Disinfecting Water Mains.
12. AWWA C900—Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In.–12 In. (100 mm–300 mm), for Water Transmission and Distribution.
13. AWWA C800—Standard for Underground Service Line Valves and Fittings.

G. State of Connecticut

1. State Building Code, including all Amendments, Supplements, and Errata.

H. Local Jurisdictional Authority

1. Comply with standards of the Local Jurisdictional Authority. Should this Specification differ from those standards, the standards of the Local Jurisdictional Authority will govern.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section.

B. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

C. Maintain all temporary facilities and controls in proper and safe condition throughout the progress of the work.

1.7 COORDINATION WITH JURISDICTIONAL AUTHORITY

A. Contractor shall notify and coordinate the work of this Section with the local authority having jurisdiction over water supply, whether public or private system owner/operator.

B. Contractor shall obtain all required approvals for connection to, or extension of, any portion of the domestic or fire protection water systems.

C. Service Interruption: Provide Jurisdictional Authority five (5) days advanced notice for any planned interruption associated with the work. Comply with customer notification requirements of the Jurisdictional Authority.

D. Jurisdictional Authority may require the work be completed outside of normal working hours during low use time periods.

1.8 SAFETY

A. Contractor shall conduct all excavation activities in conformance with applicable regulations, including those relating to warning signs, excavation safety, sheeting, shoring, and stabilization.

B. Contractor shall provide and maintain barricades, signs, lights, etc., required for the protection of personnel, materials and property. Temporary barricades, etc. shall conform all applicable codes and regulations, and shall be lighted at night with lanterns, flares and reflectorized paint as required for safety. Adapt barricades, signs, lights, etc. to evolving site conditions throughout the progress of the work.

C. Provide other safety devices as required, including adaptation of such safety devices to changing site conditions, to prevent unauthorized entry to construction areas and open excavations. Provide warning signs and other temporary construction safety devices necessary for proper completion of the work in compliance with applicable safety regulations.

D. Contractor shall properly design and furnish all labor, materials, equipment, and tools necessary to completely construct the excavation support system, permanent or temporary, including sheet piling, trench shields, trench boxes, timber trench shoring, pneumatic/hydraulic shoring, steel sheeting or sheeting using other materials, sloping and benching. All of the proper materials and all equipment necessary to protect employees in excavations against cave-ins shall be furnished and installed.

E. Any time an excavation is to remain open, at a minimum, provide full enclosure with safety barriers and fencing, warning signs, and additional safety control measures as appropriate.

1.9 SUBMITTALS

A. Copies of all permits and/or approvals from Jurisdictional Authority.

B. Shop Drawings:

1. Submit shop drawings, descriptive literature, or both, showing pipe materials and appurtenances to be furnished. Shop Drawings shall be submitted to Engineer for approval prior to ordering materials.
2. Shop drawings showing the configuration, dimensions, layout, and spacing of major and minor components such as pipe, joints, restraints, valves, and other proposed details of assembly. Show in large-scale details any unique assembly, and/or installation requirements.

C. Copies of manufacturer-provided installation instructions, operation instructions, and maintenance material for all equipment furnished under this Section.

D. Manufacturer's warranties and associated warranty registration data in Owner's name. Submit two (2) copies of each warranty to Engineer in the manufacture's/supplier's standard form or if there is no standard form available, in a form specified by Engineer.

E. As-Built Drawings.

1.10 DELIVERY, STORAGE AND HANDLING

A. Storage of pipe, fittings, valves, hydrants and other water line appurtenances on the site shall be in accordance with the manufacturer's recommendations, subject to the approval of Engineer.

B. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe, fittings, valves, hydrants, and other water line appurtenances. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to pipe and fitting coatings shall be repaired as directed by Engineer.

C. Pipe, fittings, valves, hydrants and other water system appurtenances which are defective from any cause, including damage caused by handling, and determined by Engineer as non-repairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner.

D. Pipe, and all water system appurtenances that are damaged or disturbed through any cause prior to acceptance of the work shall be repaired, realigned or replaced as required by Engineer at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. The drawings are diagrammatic only and are intended to indicate the extent, but not all details, of the system, which shall be constructed. All materials and fittings are not shown; but Contractor shall furnish and install all materials and fittings required for the complete system.

2.2 DUCTILE IRON PIPE

A. Centrifugally-cast ductile iron pipe, AWWA C151/A21.51, thickness Class 52, AWWA C150/A21.50. Pipe shall be furnished in 18-foot or 20-foot nominal lengths, unless otherwise required by Jurisdictional Authority standards.

B. Pipes shall be cement-mortar lined in accordance with ANSI A21.4-03/AWWA C104, except that the cement lining shall be double thickness.

C. The exterior of all pipe shall be factory coated, with a double coat of asphaltic material conforming to ANSI A21.51-02/AWWA C151. The interior of all pipe shall have a seal coat of bituminous material applied over the cement lining in accordance with ANSI A21.4-03/AWWA C104.

2.3 DUCTILE IRON PIPE FITTINGS

A. Ductile iron pipe fittings shall have a pressure rating of 350 psi and shall conform to AWWA C110/ANSI A21.10-03. All fitting shall be compatible with pipe.

B. The type of fittings for pipe and valve connections shall be determined by Contractor in accordance with the requirements shown on the Drawings prior to ordering the fittings.

C. Fittings shall be cement-mortar lined and coated as specified for pipe.

2.4 DUCTILE IRON PIPE COUPLINGS

A. Couplings and accessories shall be pressure rated at least equal to that of the pipe. Couplings shall be Dresser Style 153, Smith Blair 441 style, Rapidfit by Cascade Waterworks, or approved equal. Couplings shall be provided with corrosion resistant nuts and bolts. The interior of the coupling shall be epoxy-coated. Epoxy coating shall conform to AWWA C550-01.

B. Transition couplings for joining pipe of different diameters shall be provided with corrosion resistant nuts and bolts.

C. After assembly, all exterior surfaces including the bolts and nuts shall be completely coated with two coats of a heavy-duty protective asphaltic coating.

2.5 JOINTS FOR DUCTILE IRON PIPE

A. Joints shall be mechanical joints, ANSI A21.11-00/AWWA C111-80. Mechanical joints shall be provided with required gaskets, lubricants and accessories conforming to ANSI A21.11-00/AWWA C111-80.

B. Restrainers shall be MEGALUG by EBBA Iron, MJ Field Lok Gasket by U.S. Pipe & Foundry, Allgrip 3600 by Star Pipe Products, or approved equal.

2.6 GATE VALVES

A. Gate valves shall be resilient seated conforming to the requirements of AWWA C509-01 and

the requirements of the local water authority.

B. Gate valves shall be cast iron body, bronze mounted, double disk, non-rising stem, O-ring type stuffing box.

C. Gate valves shall open to the left (counter clockwise) and shall be mechanical joint type.

D. Bolts, studs and nuts shall be made from a corrosion-resistant material such as low-zinc bronze, nickel copper alloy, or stainless steel.

E. The operating nut shall be 2 inches square at the base, tapering to $1\frac{15}{16}$ inches square at the top.

2.7 BUTTERFLY VALVES

A. Butterfly valves are generally used on pipe 16 inches and greater in diameter, and shall be installed in accordance with the standard practices of the Jurisdictional Authority.

B. Butterfly valves shall be pressure Class 150B mechanical joint end with ductile iron body conforming to ASTM A536-84, Grade 65-45-R and stainless steel body seat, all in accordance with ANSI F1433-97/AWWA C504-00 Rubber-Seated Butterfly Valves.

2.8 VALVE BOXES

A. Each gate valve shall be provided with a valve box and cover.

B. Valve boxes shall be of the adjustable, telescoping, heavy-pattern type designed and constructed to prevent the direct transmission of traffic loads to the pipe or valve.

C. Valve boxes shall be cast iron, asphalt coated with cast iron covers. The smallest inside diameter of the shaft shall not be less than 5¼ inches. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve. Provisions shall be made for adjustment through at least 6-inches vertically while retaining a lap of at least 4 inches between sections.

D. Covers shall be close fitting and substantially dirt-tight. The top of the cover shall be flush with the top of the box rim. Unless otherwise required by the Jurisdictional Authority, the word “WATER” shall be cast in the top surface of the cover.

2.9 HYDRANTS

A. Hydrants: A.P. Smith or equal, conforming to AWWA C502.

1. Hydrants shall be designed to break free upon vehicle impact without water loss.
2. Diameter of the main valve opening shall be no less than 5-1/4”.

3. Inlet connection shall be no less than 6” diameter.
4. Direction and operation for opening hydrant shall be counterclockwise.
5. The maximum permissible head loss shall not exceed 7 PSI discharging 1,500 GPM.
6. Hydrants shall have following connections:

a. Two (2) 2-1/2” NST.
b. One (1) 4-1/2” South Central CT Regional Water Authority thread.
c. Caps are to be provided for the above connections.

B. Coatings: Two coats of primer; final finish color as required by the Jurisdictional Authority.

2.10 TAPPING SLEEVE AND VALVE

A. Tapping sleeves: AWWA C223, bolted-sleeve type with mechanical joint connection to the existing water pipe and flanged end outlets for connecting the tapping valves. Tapping sleeves shall be suitable for a working water pressure of 200 psi and outlet flanges shall conform to the 125-pound American Standard with Cor-Ten or cadmium plated cast iron nuts and bolts.

2.11 THRUST BLOCKS

A. Thrust blocks shall be installed in accordance with the details shown on the Drawings and/or as required by the Jurisdictional Authority.

B. Concrete: Minimum 28-day compressive strength of 3,000 psi.

C. In certain areas, thrust blocks cannot be used because of the density of other utilities and inability to construct thrust blocks bearing against “undisturbed soil”. In such case, restrained joints shall be used at that location.

2.12 CORPORATION STOPS AND CURB STOPS

A. Corporation stops: ball type corporation valves threaded to a receive compression-type fitting as manufactured by Mueller Co., Ford Meter Box Co., Grand Junction Pipe & Supply, or approved equal.

B. Curb stops: ball valve threaded to receive compression-type fittings by Mueller Co., Ford Meter Box Co., Grand Junction Pipe & Supply, or approved equal.

C. Stops shall be sized to receive the service tubing without the use of enlargement/reduction fittings.

2.13 SERVICE BOXES

A. Service boxes shall be cast iron improved extension type with arch pattern base. Covers shall be held in place with bronze bolts and the word “WATER” shall be cast into the top surface of the cover. Service box shafts shall have a minimum inside diameter of 2½ inches. Service boxes
shall be as manufactured by Mueller Co., Ford Meter Box Co., Grand Junction Pipe & Supply, or approved equivalent.

2.14 WATER SERVICE

A. Services, two inches or smaller: Copper water tubing, Type K, ASTM B88 and ANSI Standard 61 for underground water service.

1. Joints: Three part compression couplings or an approved equal.

B. Water Service Fittings: Fittings, couplings, adapters, check valves and service saddles shall be in conformance with AWWA C800.

C. Services, 3 inches and greater: Ductile iron pipe or as otherwise required by the Jurisdictional Authority.

2.15 METER PITS/VAULTS

A. As required by Jurisdictional Authority.

2.16 BACKFLOW PREVENTERS

A. As required by Jurisdictional Authority.

2.17 PRESSURE REDUCING VALVES

A. As required by Jurisdictional Authority.

2.18 METERS

A. As required by Jurisdictional Authority.

2.19 BEDDING

A. Unless otherwise indicated, bedding shall consist of screened gravel, maximum size ¾ inches and minimum size ⅜ inches.

B. When clay, wet, soft or silty soil conditions prevail, ¾-inch crushed stone shall be used for bedding.

2.20 PIPE AND APPURTENANCE ENCASEMENT

A. Encasement shall be polyethylene in accordance with AWWA ANSI-AWWA C105/A21.5-99(10). Polyethylene encasement shall be v-bio enhanced polyethylene encasement style only and consist of three co-extruded layers of linear low-density polyethylene (LLDPE) film that are fused into one.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify site conditions before proceeding with demolition work. Field check the accuracy of the Drawings and inspect structures, utilities, and other site features prior to start of work and

notify Engineer in writing, of any hazardous conditions and/or discrepancies.

B. All water pipes, fittings, valves, hydrants and other appurtenances shall be installed at the locations as shown on the Drawings and/or directed by Engineer.

C. The proposed location and vertical alignment may be altered to avoid conflicts with existing and proposed utilities, as approved by Engineer.

3.2 LAYING DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe and fittings shall be installed in accordance with the requirements of AWWA C600.

B. Each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with Section 31 2310—Earthwork.

C. All pipe shall be clean before laying. When installation is stopped for any reason, the open ends of the pipe shall be closed by watertight plugs or other approved means. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been dewatered and all danger of water entering the pipe has been eliminated.

D. Fittings, in addition to those shown on the Drawings, shall be provided if required to avoid utility conflicts.

E. When cutting of pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.

F. Maximum allowable deflection for pipe laid without fittings shall not exceed the allowable amount established by the pipe manufacturer and shall not exceed those shown in AWWA C600.

G. The pipe shall be laid with a minimum cover of 4½ feet (4.5 ft) below finished grade, unless otherwise required by the Municipality or directed by Engineer.

3.3 JOINTING DUCTILE IRON PIPE, PUSH-ON TYPE

A. Push-on joints shall be made in strict accordance with the manufacturer’s instructions. A rubber gasket shall be inserted in the groove of the bell end of the pipe and the joint surface cleaned and lubricated using the pipe manufacturer’s suggested methods and materials. The plain end of the pipe to be laid shall be inserted in alignment with the bell of the pipe to which it is to be jointed and pushed home with a jack or by other means. After joining the pipe, a metal feeler gauge shall be used to make certain that the rubber gasket is correctly located and has not been twisted or otherwise displaced.

3.4 JOINTING MECHANICAL JOINT PIPE AND FITTINGS

A. Mechanical joints shall be made in strict accordance with the manufacturer’s instructions. Mechanical joints shall be made by first cleaning the surfaces against which the gaskets will come in contact with a wire brush. The gasket, bell and spigot shall be lubricated by washing with soapy water just prior to assembling the joint. After the nuts have been made up finger tight, the bottom nut, then top and then diametrically opposite nuts shall be progressively

tightened. Bolts shall be tightened to the torques listed:

Bolt Size (Inches)	Range of Torque (Foot-Pounds)
⅝	45–60
¾	75–90
1	85–100

B. After installation, a heavy bitumastic coating shall be applied to all bolts and nuts.

C. Restraining device shall be ductile iron and shall have dimensions such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI A21.53-00/AWWA C153 latest revision.

3.5 CONCRETE THRUST BLOCKS

A. Where pipes change horizontal and vertical direction, at hydrants, tees and other fittings, and wherever abnormal thrust forces may be developed, the Contractor shall construct thrust and anchor blocks as detailed on the Drawings. They shall be concrete, of minimum dimensions as detailed on the drawings or of adequate additional size to suit actual conditions to withstand pressures anticipated, and shall be founded in undisturbed soil.

B. Concrete for thrust blocks shall have a minimum 28-day compressive strength of 3,000 psi.

C. Fittings, which do not use thrust blocks resting against natural occurring material with passive resistance pressure of 1,500 psf, shall be installed with a restrained joint system as specified in Article 3.7.

3.6 RESTRAINED JOINTS

A. Restrained joints shall be installed at bends, reducers, tees, valves, dead ends, and hydrants. The minimum length of pipe to be restrained on either side of the joint shall be as shown on the table below. The fittings of the new piping shall be for restrained joints, as marked on the Drawings.

Number of Joints to Restrain on Either Side of Fitting

Fitting Type	Number of Joints to Restrain on either Side of Fitting (Based on 18-foot pipe length)
90 Degree bend	3
45 Degree bend	2
22 ½ degree bend	2
Tee, Branch	3
Tee, Run	2

B. No restraining is required in the direction of the existing pipe if only a short length of it is exposed in the trench for making a connection.

C. Restrained joint assemblies for push-on pipe and fittings shall be made in strict accordance with the manufacturer's recommended installation procedures.

D. Restrained joint assemblies for mechanical joint pipe shall be EBAA Iron MEGALUG, Cascade Waterworks Rapidfit, U.S Pipe Co. MJ Field Lok, or approved equivalent.

3.7 WATER / SANITARY SEWER SEPARATION

A. When a sewer pipe crosses above or below a water pipe, Contractor shall comply with these following procedures:

1. Relation to Water Mains

a. Horizontal Separation: Whenever possible, sewers shall be laid below, and at a minimum at least 10 feet, horizontally, from any existing or proposed water main. Should local conditions prevent a lateral separation of 10 feet, a sewer may be laid closer than 10 feet, but no closer than 2 feet, to a water main if:

1) It is laid in a separate trench, or
2) It is laid in the same trench with the water main located at one side on a bench of undistributed earth, and
3) In either case, the elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.

b. Vertical Separation: Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

c. When it is impossible to obtain horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement lined ductile iron pipe, or other equivalent based on watertightness and

structural soundness. Both pipes shall be pressure tested by an approved method to assure watertightness, or both pipes shall be encased in concrete.

3.8 GATE VALVES AND BOXES

A. Valves shall be set in firmly compacted and shaped soil. Where the soil in the trench subgrade is found to be soft, loose, freshly filled earth, unstable or unsuitable as a base, the unsuitable material shall be excavated to such additional depth and width as required. The excavated area shall be backfilled with gravel or crushed stone, compacted and shaped.

B. Valve boxes shall be set centered and plumb over the operating nuts of all valves. The top of each valve box shall be set to finished grade with at least 10 inches of overlap remaining between the upper sections for vertical adjustment. Minimum overlap for lower, extension pieces shall be 4 inches.

C. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

3.9 TAPPING SLEEVES AND GATE VALVES

A. Installation shall be made under pressure and the flow of water through the existing pipe shall be maintained at all times. The diameter of the tap shall be a minimum of ¼ inch less than the inside diameter of the branch line.

B. The entire operation shall be conducted by workmen thoroughly experienced in the installation of tapping sleeves and valves, and under supervision of qualified personnel furnished by the manufacturer. The tapping machine shall be furnished by the Contractor.

C. Contractor shall determine the location of the existing pipe to be tapped to confirm that interference will not be encountered from existing utilities or a joint or a fitting. No tap shall be made closer than 3 feet from a pipe joint.

D. Pipe upon which tapping sleeve is to be installed shall be thoroughly cleaned of all foreign matter with scraping tools and wire brushes to a minimum of six inches beyond each side of the sleeve. The cleaned area shall be washed with a hypochlorite solution. The interior of tapping valve shall also be washed with hypochlorite solution.

E. Tapping sleeves and valves with boxes shall be set vertically and squarely centered on the pipe to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping

operation. Thrust blocks shall be provided behind all tapping sleeves. the supporting earth around and under the valve and sleeve shall be compacted. After completing the tap, the valve shall be flushed to ensure that the valve set is clean.

F. Before backfilling, all exposed portions of any bolts used to hold the two halves of the sleeve together shall be heavily coated with two coats of bituminous paint.

3.10 HYDRANTS

A. Hydrants shall be installed at the locations and in conformance with the details shown on the drawings.

B. Hydrants shall be located no more than five (5) feet, nor less than three (3) feet, from the curb line or edge of the paved surface of the driveway.

C. All hydrants shall be located so they are readily accessible for the attachment of hoses, and to facilitate connection to mobile fire apparatus. No obstructions such as walls, fences, hedges, bushes, screen plantings, embankments or barriers shall be within five (5) feet of any fire hydrant or fire department connection.

D. All hydrants shall be positioned so that the 4-1/2” outlet is vacin in the direction of, or perpendicular to, the paved surface of the driveway.

E. All hydrants shall be installed so that the distance from the center line of the 4-1/2”outlet to final grade is no more than 36” and no less than 30”.

F. Each hydrant shall be set vertically and be properly braced. Hydrants shall be installed with thrust blocks or restrained joints as specified in Articles 3.6 and 3.7. Care shall be taken to ensure that thrust block concrete does not plug the drain ports.

3.11 WATER SERVICES

A. Service Pipe: Care shall be exercised in placing and laying of services to prevent kinks or sharp bends and contact with sharp stones or ledge which would damage to the pipe. At least 6 inches of sand shall be placed adjacent to, under, and above the pipe, and no stone larger than 2 inches shall be placed over the pipe until the depth of backfill above the pipe is in excess of 1 foot.

B. Corporation Stop: Taps to the pipe shall be threaded and shall be made at the horizontal diameter of the main. The tap shall be made by means of a tapping machine manufactured for this purpose and supplied by the Contractor. The tap and drill shall be kept sharp and shall have threads matching those of the stop. Corporation stop threads shall be coated with sealing compound and the stop screwed firmly into the water with the key upward and the inlet end projecting at least ⅛- inch beyond the inside face of the pipe. The corporation stop shall be left in the on (open) position after installation of the service pipe.

C. Curb Stop and Curb Boxes shall be of a size equal to the size of the service pipe and shall be installed in the locations shown on the drawings, or as ordered by Engineer. The boxes shall be set in a vertical position and flush with the proposed finish grade.

D. Ductile Iron Service Pipe: ductile iron service pipe connections to the water main shall be made with tee fittings or tapping sleeves.

3.12 POLYETHYLENE ENCASEMENT

A. Installation of polyethylene encasement shall be in accordance with the recommended procedures contained in ANSI A21.5-99/AWWA C105 and when directed by Engineer Water Department or Engineer.

B. Care shall be taken during backfilling to prevent damage to polyethylene wrap. backfilling shall be in accordance with AWWA C600-99.

3.13 PRESSURE TESTING

A. Hydrostatic and leakage test shall be conducted in accordance with AWWA Standard C600-99 and C900-97, and as directed by Engineer. Testing shall be conducted by a certified Independent Water Testing Company.

B. Conduct pipe tests after concrete thrust blocks have cured to the required 3000-psi strength. Fill pipe 24 hours prior to testing, and apply test pressure to stabilize system. Use only potable water.

C. Prior to pressure testing, the entire pipe section shall be flushed to remove any rocks or debris, which may have inadvertently entered the pipe during construction.

D. Once the pipe section has been filled at normal pressure and all entrapped air removed, the Contractor shall raise the pressure to 150 psi or two times the operating pressure (whichever is greater) by a special pressure pump, taking water from a small tank of proper dimensions for satisfactorily measuring the rate of pumping into the pipe. This pressure shall be maintained for a minimum of 2 hours, during which time the line shall be checked for leaks. Measured rate of water leakage shall not exceed the allowable leakage listed below.

Maximum Allowable Leakage

Test Pressure (psi)	Nominal Pipe Diameter (inches)	Allowable Leakage (gallons per hour per 1,000 feet of pipeline)
PART 1 150	PART 2 4	PART 3 0.36
PART 4 150	PART 5 6	PART 6 0.55
PART 7 150	PART 8 8	PART 9 0.74
PART 10 150	PART 11 10	PART 12 0.92
PART 13 150	PART 14 12	PART 15 1.10
PART 16 150	PART 17 16	PART 18 1.47

E. Interior piping in vaults, buildings, etc. shall have zero leakage.

F. Should leakage exceed this rate, the Contractor shall immediately locate the leak or leaks and repair them. Pipe will be accepted only when leakage is zero, or less than the allowable amount.

Approval does not absolve the Contractor from responsibility if leaks develop later within the period of warranty.

3.14 DISINFECTION

A. Before being placed in service, all new water pipe shall be chlorinated in accordance with AWWA C651-99 Standard for Disinfecting Water Mains or Engineer requirements/regulations, whichever is the more stringent.

B. The location of the chlorination and sampling points will be determined by the jurisdictional authority in the field. Taps for chlorination and sampling shall be installed by Contractor. Contractor shall uncover and backfill the taps as required.

C. The pipe section being disinfected shall be flushed to remove discolored water and sediment

from the pipe. a 25-mg/l chlorine solution in approved dosages shall be inserted through a tap at one end while water is being withdrawn at the other end of the pipe section. The chlorine concentration in the water in the pipe shall be maintained at a minimum 25-mg/l available chlorine during filling. To assure that this concentration is maintained, the chlorine residual shall be measured at regular intervals in accordance with procedures described in Standard Methods and AWWA M12, Simplified Procedure for Water Examination [Section K].

D. During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the pipe supplying the water. Chlorine application shall not cease until the entire pipe section is filled with chlorine solution. The chlorinated water shall be retained in the pipe for at least a twenty-four hour period. the treated water shall contain chlorine residual throughout the length of the pipe section as indicated in AWWA C651-99.

E. Following the chlorination period, all treated water shall be flushed from the pipe section and replaced with water from the distribution system. Prior to disposal of treated water the Contractor shall check with local authorities to determine if the discharge will cause damage to the receiving body or sewer and, if required, the Contractor shall neutralize the chlorinated water in accordance with AWWA recommendations. Bacteriological sampling and analysis of the replacement water may then be made by the Contractor in full accordance with AWWA C651-99. A minimum of three samples shall be taken by the Contractor at locations directed by Engineer along the length of water pipe being chlorinated and sent to a State approved private laboratory for analyses. The Contractor shall rechlorinate if the samples show presence of coliform, and the pipe section shall not be placed in service until all of the repeat samples show no presence of coliform.

F. Furnish two copies of a Certificate of Disinfection Report to Engineer and one copy to Engineer.

G. Contractor shall pay all costs for all testing, flushing, chlorinating, laboratory analyses, sampling, water supply and municipal charges.

3.15 AS-BUILT DRAWINGS

A. Contractor shall be solely responsible for complying with the requirements of local permitting authorities for preparation and submittal of as-built drawings. The requirements for the preparation of as-built drawings as defined herein shall be considered the minimum requirements

of Engineer, but shall in no way relieve Contractor from satisfying the requirements of local permitting authorities.

B. As work progresses, record the following on two (2) sets of Drawings:

C. All changes and deviations from the design in location, grade, size, material, or other feature as appropriate.

D. Any uncharted locations of utilities or other subsurface feature encountered during installation, including the characteristics of such uncharted utility or subsurface feature such as utility type, size, depth, material of construction, etc.

E. Recording of changes shall be clearly and neatly marked in red pen or pencil. All changes shall be noted on the appropriate Drawing sheets.

F. Make measurements from fixed, permanent points on the Project Site to accurately locate

the work completed. Such measurements shall consist of at least three (3) ties showing the distance of each item relative to each of the fixed, permanent points.

G. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall also contain any additional information required by Engineer.

3.16 CLEAN UP

A. Contractor shall remove all debris, residuals, and materials at the conclusion of the work.

END OF SECTION 331900

SECTION 333100 – SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. Installation of sanitary sewage pipe and fittings.

2. Installation of sanitary specials, connection chimneys, laterals, outlets, and joint materials.

3. Installation of sanitary sewer manholes.

B. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

D. Contractor is solely responsible for obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied. Notify and obtain such permits or approvals from all agencies having jurisdiction prior to starting work.

1.3 COORDINATION WITH JURISDICTIONAL AUTHORITY

A. Contractor shall notify and coordinate the work of this Section with the local authority having jurisdiction over water supply, whether public or private system owner/operator.

B. Obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied.

C. Contractor shall obtain all required approvals for connection to, or extension of, any portion of the domestic or fire protection water systems.

D. The closing of valves necessary for making connections with the existing water systems will be done by Contractor with the assistance of Engineer. Sufficient notice shall be given the jurisdictional authority for a planned connection. No allowance will be made for any delay in the closing of valves. A 48-hour notice shall be given to adjacent buildings/residences affected by the shutdown, and shall be done by Contractor to the satisfaction of jurisdictional authority and Engineer. Jurisdictional authority or Engineer may require the work be completed outside of normal working hours during low use time periods.

1.4 REFERENCE STANDARDS

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. ASTM International (ASTM).

1. ASTM A47/A47M—Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process.
2. ASTM A48—Standard Specification for Gray Iron Castings.
3. ASTM A123/A123M—Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A307—Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
5. ASTM A536—Standard Specification for Ductile Iron Castings.
6. ASTM A563—Standard Specification for Carbon and Alloy Steel Nuts.
7. ASTM A615—Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
8. ASTM A74—Standard Specification for Cast Iron Soil Pipe and Fittings.
9. ASTM A746—Standard Specification for Ductile Iron Gravity Sewer Pipe.
10. ASTM C12—Standard Practice for Installing Vitrified Clay Pipe Lines.
11. ASTM C14—Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
12. ASTM C55—Standard Specification for Concrete Building Brick.
13. ASTM C76—Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
14. ASTM C94—Standard Specification for Ready-Mixed Concrete.
15. ASTM C139—Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
16. ASTM C150—Standard Specification for Portland Cement.
17. ASTM C207—Standard Specification for Hydrated Lime for Masonry Purposes.
18. ASTM C270—Standard Specification for Mortar for Unit Masonry.
19. ASTM C387—Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
20. ASTM C425—Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
21. ASTM C443—Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
22. ASTM C443—Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
23. ASTM C478—Standard Specification for Precast Reinforced Concrete Manhole Sections.
24. ASTM C507—Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
25. ASTM C564—Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
26. ASTM C700—Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
27. ASTM C1628—Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets.
28. ASTM C828—Low-Pressure Air Test of Vitrified Clay Pipe Lines.

29. ASTM C877—Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
30. ASTM C478—Standard Specification for Precast Reinforced Concrete Manhole Sections.
31. ASTM C923—Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
32. ASTM C924—Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
33. ASTM C969—Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
34. ASTM C972—Compression-Recovery of Tape Sealant.
35. ASTM C990—Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.
36. ASTM D412—Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
37. ASTM D624—Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
38. ASTM D1784—Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
39. ASTM D1785—Standard Specification for Poly (Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120.
40. ASTM D2235—Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
41. ASTM D2241—Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
42. ASTM D2321—Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
43. ASTM D2412—Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
44. ASTM D2464—Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
45. ASTM D2466—Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
46. ASTM D2467—Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
47. ASTM D2680—Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
48. AASTM D2751—Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
49. ASTM D2996—Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
50. ASTM D2997—Centrifugally Cast “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
51. ASTM D3034—Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
52. ASTM D3139—Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
53. ASTM D3212—Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
54. ASTM D3262—“Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.
55. ASTM D3350—Polyethylene Plastics Pipe and Fittings Materials.
56. ASTM D3753—Glass-Fiber-Reinforced Polyester Manholes and Wetwells.
57. ASTM D3840—“Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Fittings for Nonpressure Applications.
58. ASTM D4101—Standard Specification for Polypropylene Injection and Extrusion Materials.
59. ASTM D4161—“Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

60. ASTM D4396—Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Nonpressure Applications.
61. ASTM F402—Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
62. ASTM F405—Corrugated Polyethylene (PE) Tubing and Fittings.
63. ASTM F477—Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
64. ASTM F679—Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
65. ASTM F714—Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
66. ASTM F758—Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.
67. ASTM F794—Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
68. ASTM F894—Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.
69. ASTM F949—Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings.
70. ASTM F1336—Standard Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
71. ASTM F1803—Standard Specification for Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter.

D. American Water Works Association (AWWA).

1. “PVC Pipe—Design and Installation,” M23 (latest edition. and applicable supplements thereto).
2. “Concrete Pressure Pipe,” M9 (latest edition and applicable supplements thereto).
3. ANSI/AWWA C104/A21.4—Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
4. ANSI/AWWA C105/A21.5—Polyethylene Encasement for Ductile-Iron Pipe Systems.
5. ANSI/AWWA C110/A21.10—Ductile-Iron and Gray-Iron Fittings for Water.
6. ANSI/AWWA C111/A21.11—Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
7. ANSI/AWWA C150/A21.50—Thickness Design of Ductile-Iron Pipe.
8. ANSI/AWWA C151/A21.51—Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
9. ANSI/AWWA C153/A21.53—Ductile-Iron Compact Fittings for Water Service.
10. ANSI/AWWA C600—Installation of Ductile-Iron Water Mains and Their Appurtenances.

E. American Concrete Pipe Association (ACPA).

1. ACPA 01-103—Concrete Pipe and Box Culvert Installation (latest revision and applicable supplements thereto).

F. UNI-BELL PVC PIPE ASSOCIATION (UBPPA).

1. UBPPA UNI-B-6 (1998) Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

G. American Association of State High and Transportation Officials (AASHTO).

1. Standard Specifications for HS-20, Highway Loading (AASHTO H-20).

1.5 SUBMITTALS

A. Submit to Engineer for his approval manufacturer's name with details of the pipe, fittings, and joint offered before ordering. Engineer reserves the right to have the manufacturer submit to them a printed certified set of material specifications certifying to the manufacturer's conformity with this Section.

B. Product data for all materials provided under this Section.

C. Prior to ordering material, submit shop drawings and descriptive literature showing dimensions, joint and other details of all materials to be furnished under this Section. Such shop drawings shall include, but not necessarily be limited to, joint and other details for precast manholes, manhole frames and covers, and flexible joint sealant for manholes.

D. Samples of each size and type of pipe to be utilized. No pipe shall be ordered or delivered until Engineer has approved the pipe material.

E. As-Built Drawings

1. Submit two (2) copies of As-Built Drawings upon completion and acceptance of work.
2. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall include a minimum of three (3) ties showing the distance to each catch basin and manhole, and the location of service connections measured from fixed permanent objects. As-Built drawings shall also contain any additional information required by Engineer.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

B. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

C. Sample pipe for testing, when requested by Engineer, shall be furnished by Contractor in sufficient numbers. The Contractor and/or the pipe manufacturer shall make the facilities and services for making the load tests available.

D. All costs for field tests shall be included in Contractor's cost of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage

1. Manufacturer shall package the pipe in a manner designed to deliver the pipe to the Project Site neatly, intact, and without physical damage. Transportation carrier shall use an appropriate method to ensure the pipe is properly supported, stacked, and restrained during transport. Inspect materials delivered to site for damage; store with minimum of handling.

2. Unloading of the pipe should be controlled so as not to collide with the other pipe sections or fittings, and care should be taken to avoid chipping or spalling, especially to the spigots and bells. For manhole sections, cone sections, bases, fittings and other precast appurtenances, utilize lifting holes or lifting eyes provided.
3. In cold weather conditions, use caution to prevent impact damage. Handling methods considered acceptable for warm weather may be unacceptable during cold weather.
4. Storage:

    a. Store materials on site in enclosures or under protective coverings. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
    b. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging.
    c. Store solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials under cover out of direct sunlight. Provide additional storage measures in accordance with the manufacturer's recommendations. Discard materials if storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.
    d. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
    e. Cement, Aggregate, and Reinforcement: As specified in Section 033200—Site Cast-in-Place Concrete.
    f. Store manhole units in an upright position.

PART 2 - PRODUCTS

2.1 GENERAL

A. Products furnished under this Section which are damaged or found defective in any way prior to being set in place and final acceptance, may be rejected. Engineer may reject an entire lot of pipe should the sample pipe from such lot fail to meet requirements.

2.2 POLYVINYL CHLORIDE (PVC) GRAVITY PIPE

A. Pipe, 4-inch to 15-inch diameter: ASTM D3034, SDR-35. Integral bell gasket joints with factory-installed retained integral gaskets. Minimum pipe stiffness of 46 psi, ASTM D3412.

B. Pipe, 18-inch to 36-inch diameter: ASTM F679. Integral bell gasket joints with factory-installed retained integral gaskets. Minimum pipe stiffness of 46 psi, ASTM D3412.

C. PVC Cell classification: 12454 or 12364, ASTM D1784.

D. Markings

1. Manufacturer's name or trademark.
2. The standard to which it conforms/ASTM Designation.
3. Pipe size.
4. Material designation code/PVC cell classification.
5. SDR number or schedule number.

E. Joints

1. Joints: ASTM D3212, gasketed, bell-and-spigot, push-on type.
2. Gaskets: ASTM F477. Gaskets shall be part of a complete pipe section, factory-installed or field-installed per pipe manufacturer's requirements. Lubricant shall be as recommended by the pipe manufacturer.

F. Fittings: SDR-35, ASTM D3034 and ASTM F1336, specifications to match pipe.

G. Waterstops: Elastomeric PVC, sized for outside diameter of pipe.

H. No single piece of pipe shall be laid on any project covered by these specifications unless it is found to be generally straight. Such pipe shall have a maximum ordinate as measured from the concave side of the pipe not to exceed 1/16 inch per foot of length. If the deviation from straightness exceeds this requirement, then the particular piece of pipe shall be rejected.

2.3 PVC FORCE MAIN PIPE

A. Polyvinyl Chloride (PVC) Sanitary Sewer Force Main pipe shall be manufactured from a Type I, Grade I Polyvinyl Chloride (PVC) compound with a Cell Classification of 12454-A or 12454-B per ASTM D1784.

B. All pipes shall be suitable for use as a pressure conduit for sanitary sewage.

C. Pipe shall be either SDR-14 (200 psi) meeting the requirements of AWWA C900 or Schedule 80 meeting the requirements of ASTM D1785.

D. Fittings shall be gasketed joint meeting the requirements of ASTM D3139, and the joint gasket shall conform to ASTM F477.

E. Force main pipe shall be a minimum of 3-inch diameter.

2.4 JOINT LUBRICANT

A. As specified by pipe manufacturer, ANSI/AWWA C111/A21.11.

2.5 CONCRETE MANHOLE

A. Reinforced precast concrete base, riser, and top: ASTM C478. Sections shall consist of smooth circular sections in standard nominal inside diameters, type and dimensions as indicated on the Drawings. All components shall be free from cracks, damaged joints, exposed reinforcing, aggregate pockets, spalls, and dimensional distortions or other irregularities.

1. Diameter: 48 inches unless otherwise indicated.
2. Concrete: 4,000 psi minimum.
3. Top Section: Concentric-cone type, unless eccentric-cone or flat-slab-top type is indicated. Cones shall have the same wall thickness and reinforcement as riser sections. If required or called-for, flat slab shall be a minimum of 8 inches thick designed to carry AASHTO H-20 loading with one foot cover and conform to ASTM C478.
4. Bottom: Bottoms shall be integrally cast unless specialty bases ("Dog-House") at points of connection to existing sewer mains are indicated on the Drawings or otherwise proposed for use. Unless indicated on the Drawings, any special bases or riser used must be detailed in shop drawings and submitted for approval.

5. External damp-proofing: Asphalt, ASTM D449, Type A.
6. Openings or “knockouts” in precast units shall be located as shown on the Drawings and to accommodate the inflow and outflow pipe orientation required. Openings shall sized sufficiently to permit passage of the largest outside dimension of pipe or fittings. Prior to ordering precast manhole bases, all angles between incoming pipes are to be field checked to incorporate possible line changes required in the field layout.

B. Gaskets for joints between manhole sections: Butyl rubber, ASTM C443.

C. Grade Rings: ASTM C478, precast reinforced concrete, 1-inch to 4-inch thickness, diameter to match manhole and frame.

D. Frame and Cover: Ductile Cast Iron, ASTM A536, Grade 60-40-18.

E. Frame and Cover: Grey Cast Iron, ASTM A48, Class 35B.

1. Cover: 26 inch diameter, non-vented with non-penetrating pickholes. Unless otherwise detailed or indicated, covers shall be cast with 1½ inch wide, raised letters, indicating “SANITARY SEWER”.

2. Frame and cover shall be supplied as a pair from the same manufacturer. Castings shall be of tough, even-grained iron, free from scale, lumps, blisters, sand-holes and other injurious defects, and of the size and type shown on the drawings. Frames and covers shall have machined bearing surfaces to seat firmly and prevent rocking and rattling under traffic loads. Before leaving the foundry, castings shall be thoroughly cleaned, subjected to hammer tests for soundness and given two coats of coal tar pitch varnish.

F. Resilient connectors for joints between manhole and pipes entering manhole: Continuous boot of ⅜ inch minimum thickness neoprene, ASTM C923 or ASTM C990. Boots shall be either cast into the manhole wall or installed into a cored opening using internal compression rings. Installed boot shall result in a water-tight connection meeting the performance requirements of ASTM C443.

G. Steps: ASTM C478 and OSHA 29 CFR 1910.27, drop front or equivalent. Steps shall be nine inches in depth and at least twelve inches in width with an abrasive step surface.

1. Cast Aluminum Alloy: Aluminum alloy, 6061-T6, tensile 38,000 psi, yield 35,000 psi. Drop front design with upturned embedded ends. All parts of aluminum steps to be embedded in concrete or masonry shall be coated with bituminous paint or zinc chromate primer.
2. Composite Plastic-Steel: One-half (½) inch deformed steel reinforcing rod, ASTM A615, Grade 60, encapsulated in a co-polymer polypropylene plastic, ASTM D2146, Type II, Grade 16906.
3. Steps shall be placed in vertical alignment as indicated on the Drawings. Steps shall be uniformly spaced not more than sixteen inches (16″) on center, including the spacing between the top step and the manhole cover. Steps shall be embedded in the wall a minimum distance of 4 inches in either cast or drilled holes. Steps shall not be driven or vibrated into fresh concrete and shall withstand a pullout resistance of 2,000 lbs when tested in accordance with ASTM C497. Each step shall project a minimum of 5 inches from the wall measured from the point of embedment.

2.6 DROP MANHOLE

A. Provide Concrete Manhole as specified herein.

B. Drop inlet shall be constructed with ductile iron gravity sewer pipe laid in undisturbed soil in conformance with ASTM A746-82. Adapt to PVC with Fernco coupling or approved equivalent.

C. Vertical drop pipe shall be 8″, 10″, or 12″ maximum SDR 35 PVC with 90-degree short bend radius shall conform to ASTM D3034.

D. Vertical drop pipe shall be anchored a minimum of every 4 feet with ⅛″ x 1½″ type 304 stainless steel pipe straps set as ordered with lag bolts and shields.

2.7 MORTAR

A. Mortar: ASTM C270/ASTM C387.

1. Portland Cement: ASTM C150, Type I.
2. Sand: ASTM C144.
3. Hydrated Lime: ASTM C207.
4. Water: Potable.
5. Mix proportions for manhole rims and covers: 1 part portland cement, 2 parts sand, and 1/4 part hydrated lime by dry volume. Hydrated lime shall not exceed 10 percent by weight of the total dry mix. Quantity of water in mixture shall be sufficient to produce a stiff, workable mortar, but in no case shall exceed 5 1/2 gallons of water per sack of cement.
6. Mix Proportions for invert construction: 1 part portland cement and 2 parts sand by volume. Quantity of water in mixture shall be sufficient to produce a stiff, workable mortar, but in no case shall exceed 5 1/2 gallons of water per sack of cement.

2.8 GREASE TRAP

A. Precast concrete or fiberglass of the configuration and dimensions shown on the Drawings.

B. Units shall be as manufactured by United Concrete Products, Inc. (Yalesville, CT); Rotondo Precast (Rehoboth, MA); Sparkling Clear Industries (Houston, TX), or approved equal.

C. Concrete units
1. All components shall be free from cracks, damaged joints, exposed reinforcing, aggregate pockets, spalls, and dimensional distortions or other irregularities.
2. H-20 loading with one foot of cover, manhole riser with frame and cones, plus the weight of the soil above.
3. Anchorage system for high groundwater/buoyancy.
4. Joints: Butyl rubber gasket joints, ASTM C990.

D. Unit manufacturer shall provide cleanout, sample and ventilation ports and a grease level monitoring and alarm system.

2.9 BEDDING

A. Pipes: Unless otherwise indicated or directed by Engineer, screened gravel, maximum size ¾ inches and minimum size 3/8 inches consisting of clean, hard, and durable fragments. No limestone shall be permitted.

B. Manholes: Screened Gravel or Crushed Stone, well graded in size from 3/4 inch to 3/8 inch consisting of clean, hard, and durable fragments. No limestone shall be permitted.

PART 3 - EXECUTION

3.1 GENERAL

A. Depending upon pipe type, comply with ASTM C1479, ASTM D2321, and pipe manufacturer's requirements for installation.

B. Inspect each pipe, fitting or other material before and after installation; replace those found defective and remove from Project Site.

C. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry or hoist, do not drag, pipe to trench. Provide proper facilities for lowering sections of pipe, manholes or other appurtenances into trenches and excavations without damage.

D. Wyes, tees and bends and adapters may not be explicitly indicated on the drawings but shall be installed as required to route pipe as indicated. Plans for such fittings showing cross sectional views with dimensions shall be provided by Contractor to Engineer for approval prior to use.

E. Dry conditions shall be maintained at all times and under no circumstances shall pipe be laid or appurtenances installed in water.

3.2 EARTHWORK

A. Excavation, the type of materials to be used in bedding and backfilling, and the method of placement shall conform to the requirements of Section 31 2310—Earthwork and the details shown on the Drawings.

B. Excavation for cover:

1. Under Roads and similar areas: Unless shown on the Drawings or otherwise specified, three (3) feet six (6) inches.
2. Landscape and grass areas: Unless shown on the Drawings or otherwise specified, four (4) feet.

C. Trenches should be excavated to the dimensions and grade specified on the Drawings or as ordered by engineer. The width of the trenches should be kept to the minimum required for installation of pipe sections.

1. Maximum trench width in soil: 1.25 times outside pipe diameter, in inches, plus one (1) foot measured at the springline of the pipe.
2. Maximum trench width in rock: Four (4) feet plus outside pipe diameter measured at the springline of the pipe.

D. The bottom of trenches shall be sufficiently graded to ensure uniform bearing for the full length of all pipes.

E. Backfill, with approved materials, and properly compact the following:

1. Over excavated areas
2. Soft, unstable, or unsuitable material.

F. Trenches shall be maintained in a safe condition at all times. Contractor shall furnish and employ such stay braces, sheeting, shoring, pumps, etc., as may be necessary for the proper completion of work, the protection of property and the safety of the public, employees of Contractor, Local Public Agencies, the Engineer, or the State; all in accordance with the current regulations of the Applicable Safety Code and pertinent local ordinances and regulations.

G. Contractor shall be entirely and solely responsible for the adequacy and sufficiency of all supports and of all sheeting, bracing shoring, underpinning, cofferdamming, etc. The Contractor shall assume the entire and sole liability for damages on account of injury to persons or damage to adjacent pavements and public and private property (including but not limited to, the Work under construction, existing buildings, facilities, etc.) which injury or damage results directly from Contractor's failure to install or to leave in place adequate and sufficient supports, sheeting, bracing, underpinning, cofferdamming, etc.

H. When blasting is required for the rock excavation, adequate provisions for safety shall be provided and such work shall be performed in compliance with applicable local requirements.

I. Backfill: Trenches shall be backfilled only after pipe has been inspected and approved and locations of pipes and appurtenances have been recorded.

3.3 COORDINATION WITH OTHER UTILITIES

A. Verify clearances for other utilities as required prior to proceeding with the work.

B. Crossing Water and Sewer Lines

1. Crossings shall be as close to perpendicular as possible.
2. Separation: Minimum 18-inch vertical separation.
3. Sewer line crossing below water line

    a. Unless approved by Engineer, sewer lines shall cross beneath water lines.
    b. Ensure adequate support for water line to avoid deflection or damage.
    c. Lay sewer pipe so that no joint in the sewer line will be closer than three (3) feet, horizontal distance, to the water line.
    d. Provide screened gravel or crushed stone at the crossing as indicated on the Drawings.
    e. Pressure Sewer Lines

        1) Separation: minimum two (2) feet separation.
        2) All portions of the pressure line within 10-feet of the water line shall be concrete-encased or enclosed in a continuous sleeve.

4. Sewer line above water line

    a. Pressure lines shall not be installed above water lines.
    b. Provide adequate support for the sewer pipe to maintain line and grade and prevent loading of the water line.
    c. Lay sewer pipe so that no joint in the sewer line will be closer than three (3) feet, horizontal distance, to the water line.
    d. For a distance of 10-feet on each side of the crossing, provide either gasketed PVC pressure pipe or a minimum of six (6) inches of concrete encasement.

5. Unusual conditions: When conditions prevent the minimum vertical separation indicated above for any type of crossing, obtain Engineer's approval prior to proceeding.

a. Comply with the following minimum requirements:

1) Provide sewer pipe meeting AWWA standards for potable water conveyance for a distance of 10-feet on each side of the crossing. Pressure test this segment in-place per AWWA standards without leakage prior to backfilling; or
2) Encase the lower pipe in a minimum of six (6) inches of concrete for a distance of 10-feet on each side of the crossing.

C. Parallel Water and Sewer Lines

1. Normal conditions: Sanitary piping or manholes shall be laid at least ten 10-feet horizontally from a water line whenever possible. The distance shall be measured edge-to-edge.
2. Unusual conditions: When conditions prevent a horizontal separation of ten 10-feet, the sanitary piping or manhole may be laid closer to a water line provided that:

a. The top (crown) of the sanitary piping shall be at least 18 inches below the bottom (invert) of the water main.
b. Where this separation cannot be obtained, provide sanitary pipe meeting AWWA standards for potable water conveyance pressure tested in place without leakage prior to backfilling.
c. Sewer manholes shall be of watertight construction and tested in place.

3. Sanitary sewer manholes: No water piping shall pass through or come in contact with any part of a sanitary sewer manhole.

3.4 PIPE INSTALLATION

A. All pipe shall be installed per the recommendations of the pipe manufacturer, unless otherwise specified.

B. Clean and dry surfaces receiving lubricants, cements, or adhesives. Affix gaskets to pipe not more than 24 hours prior to the installation of the pipe. Protect gaskets from sun, blowing dust, and other deleterious agents at all times. Before installation of the pipe, inspect gaskets and remove and replace loose or improperly affixed gaskets. Align each pipe section with the previously installed pipe section, and pull the joint together.

C. Commencing at the lowest point in the system, the pipe and fittings shall be carefully laid true to line and grade with the bell or groove-end upgrade.

D. A stopper shall be kept in the pipe mouth when the pipe laying is not in progress.

E. The ends of pipe, which enter masonry, shall be neatly cut to fit the inner face of the masonry.

1. The upper surface of the screened gravel shall be shaped as necessary to provide proper grade for the pipe to be laid thereon, bell holes shall be made in the screened gravel so the pipe shall be supported on its barrel portion only, and the pipe laid thereon to line and grade in the manner described in these Specifications.

F. When the pipe is properly positioned, screened gravel, unless otherwise required by the drawings or Engineer, shall be pulled or scraped up against the pipe and rammed into place along the barrel of the pipe only, to firmly hold the pipe in position. Care shall be taken during these operations to assure that the pipe is not disturbed.

G. Screened Gravel Haunching and Sand Stop:

1. All pipe and laterals connected thereto, shall be haunched with bedding from the foundation to a point at least to the top of the pipe and to this same elevation out to the trench wall. Care shall be taken when placing bedding in haunching, to assure that the pipe is not disturbed.
2. Contractor shall use any means necessary to assure firm compaction of haunching and adequate side support for the pipe.
3. Contractor shall provide and install a filter fabric sand stop per Section 02290 for the full trench width for all sanitary sewer mains and laterals. Filter fabric shall be placed on top of the screened gravel prior to placement of 12″ gravel/sand cushion. All costs for furnishing and placing of the filter fabric shall be included in the price bid per foot of pipe of all sizes.

H. Backfill trenches from the top of the screened gravel haunching and sand stop to 12″ above the top of pipe with firmly compacted sand or fine gravel or other suitable material exercising care so as not to damage or disturb the pipe.

I. Backfill from 12″ above the top of pipe to top of trench with bank run gravel, sand, or other approved material in roadway areas, otherwise suitable existing material may be used if approved by Engineer.

J. Fill on both sides of pipe and up to a depth of 12 inches over top of pipe shall be placed carefully by hand in layers, 6 inches thick, and each layer will be tamped and compacted before the next layer is placed. Care must be taken that the fill is compact and tight under the lower half of the pipe. Remaining backfill shall be placed in layers of not more than 12 inches in depth after compaction and shall be thoroughly compacted by means of mechanical rammers or vibrators or by pneumatic tampers. Hand tampers shall be used only around the pipe as approved by Engineer. All voids along sides of trench, behind sheeting, under bracing or other objects, shall be completely and carefully filled, using such fine materials, hand labor and tools as may be necessary. All backfill materials shall be compacted to a minimum of 95% of the maximum dry density as determined by AASHTO T-180 Method D or as directed by Engineer.

K. At Engineer’s discretion, the Contractor may compact the backfill from 12 inches over the pipe to finish grade by means of a Ho-Pac. Engineer shall also have the right to approve or disapprove the compaction equipment to be used and also the height of backfill to be compacted in one lift.

L. Backfill, screened gravel foundation and haunching shall be provided and installed as shown on the typical trench cross-section shown on the Drawings.

3.5 SPECIAL REQUIREMENTS

A. The following subarticles supplement execution requirements set forth in Article 3.4.

B. Installation of PVC Plastic Piping

1. Install pipe and fittings in accordance with Article 3.4 and ASTM D2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

C. Installation of PVC Plastic Pressure Pipe and Fittings

1. Install pipe and fittings in accordance with Article 3.4 and AWWA C605 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23.

    a. Pipe Less Than 4-Inch Diameter:

        1) Threaded joints shall be made by wrapping the male threads with joint tape or by applying an approved thread lubricant, then threading the joining members together. The joints shall be tightened with strap wrenches which will not damage the pipe and fittings. The joint shall be tightened no more than 2 threads past hand-tight.
        2) Push-On Joints: The ends of pipe for push-on joints shall be beveled to facilitate assembly. Pipe shall be marked to indicate when the pipe is fully seated. The gasket shall be lubricated to prevent displacement. Care shall be exercised to ensure that the gasket remains in proper position in the bell or coupling while making the joint.
        3) Solvent-weld joints shall comply with the manufacturer's instructions.

    b. Pipe greater than 4-Inch Diameter: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to fittings, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of AWWA C605 for laying the pipe and the recommendations in AWWA M23 for pipe joint assembly. Assemble push-on joints for connection to fittings in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly. Make compression-type joints/mechanical-joints with the gaskets, glands, bolts, nuts, and internal stiffeners specified for this type joint and assemble in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.

2. Pipe anchorage: Provide concrete thrust blocks for pipe anchorage. Size and position thrust blocks as indicated on the Drawings or as otherwise required.

3.6 MANHOLE INSTALLATION

A. Furnish complete manhole assemblies conforming to the Drawings and as specified herein.

B. Precast reinforced concrete manhole sections shall be set so as to be vertical and with section in true alignment. Joints of the base and precast section shall be formed and sealed with "O" ring type rubber gaskets. Joints shall be painted with mortar and exterior joints thoroughly tooled so as to be slightly concave with a hard polished surface free from drying cracks. Interior joints shall be tooled flush in a similar manner. Mortar shall be as specified herein for brick masonry.

C. All holes in sections, used for their handling, shall be thoroughly plugged with mortar. Finish smooth and flush with adjoining surfaces.

D. The manufacturer shall provide waterstops acceptable to Engineer, which shall be applied to the outside of the plastic pipe where the pipe is to be enclosed in any structure where concrete or mortar is used to prevent leakage along the outer wall of the barrel of the pipe.

E. Manhole frames shall be set with the tops conforming accurately to the grade of or finished ground surface or as indicated on the plans or directed. Adjust to grade with clay bricks and mortar, not to exceed five brick courses. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring or mortar extending to the outer edge of the masonry shall be placed all around the bottom flange and have a slight slope to shed water away from the frame.

F. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

3.7 GREASE TRAP

A. Grease traps shall be installed in accordance with the manufacturer’s recommendations.

B. The unit shall be placed on a minimum of 12 inches of compacted gravel on compacted subgrade.

C. The joints of field-assembled sections shall be waterproof.

D. Manhole riser sections, frames and covers shall be installed as required and detailed.

3.8 FIELD PERFORMANCE TESTS

A. Joints shall sustain a maximum limit of 50 gallons per inch of diameter per foot per day per mile when field tested by actual infiltration conditions. All sanitary sewers which lie between 25 feet and 75 feet of a water supply well shall not exceed a leakage of 25 gallons per day per inch diameter of pipe per mile of sewer.

B. These requirements will be met for every section (between manholes) of pipe; it is not a cumulative average over several sections of pipe. The low pressure air test as described in these specifications will be required for all sanitary sewer installations.

3.9 LEAKAGE TESTS FOR SEWER MANHOLES

A. General: Leakage tests shall be made and observed by Engineer on each manhole. The test shall be an exfiltration test or vacuum test, made as described below.

B. Preparation for Test: After the manhole has been assembled in place, all lifting holes and those exterior joints within 6 feet of the ground surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the self and invert and before filling and pointing the horizontal joints below the 6-foot depth line. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

C. Test Procedure: The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observations indicate no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test as described above is satisfactory, as determined by Engineer, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by Engineer to bring the leakage within the allowable rate of 1 gallon per vertical foot per day. Leakage due to a defective section of joint, or exceeding the 3 gallon per vertical foot per day, shall be cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

D. Backfilling: The test may be conducted either before or after backfilling around the manhole. However, if the Contractor elects to backfill prior to testing, for any reason, it shall be at their own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the concrete. Furthermore, the Contractor shall take any steps necessary to assure Engineer that the water table is below the bottom of the manhole throughout the test.

E. Infiltration Test: If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by Engineer, such a test can be used to evaluate the water-tightness of the manhole. However, if Engineer is not satisfied, the Contractor shall lower the water table and carry out the test as described herein before.

F. Vacuum Testing

1. The vacuum testing system shall be a unit as supplied by P.A. Glazier, Inc.—Worcester, MA 01613 (508) 755-3849, Cherne Industries, Inc.—Minneapolis, MN 55436 (800-843-7584); IEQ industries—Ada, MI 49307 (800-544-9053), or approved equivalent.
2. The testing shall be done immediately after assembly of the manhole and before backfilling. A 60 lb-in torque wrench shall be used to tighten the external clamps that secure the test cover to the top of the manhole. All lift holes shall be plugged with an approved non-shrink grout. No grout will be placed in the horizontal joints before testing. All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.
3. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass the test if the time is greater than 60 seconds for a 48″-diameter manhole, 75 seconds for a 60″ manhole, and 90 seconds for a 72″ manhole.
4. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn or the test shall be stopped, repairs made and all steps of the test repeated. Re-testing shall proceed until a satisfactory test is obtained.

3.10 SEWER PIPE JOINT TESTING

A. The main sewer line and laterals shall be tested for leakage by the use of low-pressure air as approved by Engineer. The test length shall not exceed one length of pipe between two structures. Air test procedures may be dangerous and the Contractor shall take all necessary precautions to prevent blowouts.

B. Pneumatic Plugs

1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.
2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
3. All air used shall pass through a single control panel.
4. Three individual hoses shall be used for the following connections:

    a. From control panel to pneumatic plugs for inflation;
    b. From control panel to sealed line for introducing the low pressure air;
    c. From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

C. The following testing procedures shall be explicitly followed:

1. All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 5 psig. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.
2. After the pipe has been backfilled and cleaned, pneumatic plugs shall be placed in the line at each manhole and inflated to 25 psi. Low-pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psi greater than the average back pressure of any ground water that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.
3. After the stabilization period (3.5 psi minimum pressure in the pipe), the portion of pipe tested shall be acceptable if the time required in minutes for the pressure to decrease from 3.5 to 3.0 psi (greater than the average back pressure of any ground water that may be over the pipe) is not less than the time indicated in the following table:

Minimum Pressure Drop Time

Pipe Size (in.)	Time (sec)
4	0.190L
6	0.427L
8	0.760L
10	1.187L
12	1.709L
15	2.671L

D. Correction of Defective Work: If leakage exceeds the specified amount, the Contractor shall make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit, and the tests shall be repeated until the leakage requirement is met.

E. Compliance with Agency Requirements: In the event of conflict between the leakage test requirements specified herein with the leakage test requirements of agencies having jurisdiction over all or any portion of the sewer system installed under this Contract, the more restrictive requirements shall govern.

3.11 CLEANING AND REPAIR

A. The Contractor shall clean the entire sewer system of all debris and obstructions. This cleaning shall include, the removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sewers, storm drains and or streams.

B. All work of cleaning and repair shall be performed at no additional cost to Owner.

3.12 FINAL INSPECTION

A. Upon completion of the work, and before final acceptance by Engineer, the entire sewer system shall be subjected to a final inspection in the presence of Engineer. The work shall not be considered as complete until all requirements for line, grade, cleanliness, leakage tests and other requirements have been met.

3.13 AS-BUILT DRAWINGS

A. As work progresses, record on one set of plans all changes and deviations from the Contract Drawings in size, line, and grade. Make sufficient measurements to accurately locate the completed work. Record the locations of any uncharted locations of utilities encountered during installation of the sewer. Deliver the final As-Built drawings to Engineer.

B. Contractor shall be solely responsible for complying with the requirements of local permitting authorities for preparation and submittal of as-built drawings. The requirements for the

preparation of as-built drawings as defined herein shall be considered the minimum requirements of Engineer, but shall in no way relive Contractor from satisfying the requirements of local permitting authorities.

C. As work progresses, record the following on two (2) sets of Drawings:

1. All changes and deviations from the design in location, grade, size, material, or other feature as appropriate.
2. Any uncharted locations of utilities or other subsurface feature encountered during installation, including the characteristics of such uncharted utility or subsurface feature such as utility type, size, depth, material of construction, etc.

D. Recording of changes shall be clearly and neatly marked in red pen or pencil. All changes shall be noted on the appropriate Drawing sheets.

E. Make measurements from fixed, permanent points on the Project Site to accurately locate the work completed. Such measurements shall consist of at least three (3) ties showing the distance of each item relative to each of the fixed, permanent points.

F. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall also contain any additional information required by Engineer.

END OF SECTION 333100

SECTION 334000 – STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section Includes:

1. Installation of new storm drain pipe, manholes and catch basins.
2. Connection of exterior building roof drains and perimeter drains.
3. Installation of under-drains.
4. Installation of stormwater treatment units.

B. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

D. Contractor is solely responsible for obtaining permits or approvals which may be required to perform the work of this section, including all costs, fees and taxes required or levied. Notify and obtain such permits or approvals from all agencies having jurisdiction prior to starting work.

1.3 REFERENCE STANDARDS

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR)

1. 29 CFR 1926, Safety and Health Regulations for Construction.

B. ASTM International (ASTM)

1. ASTM A36—Standard Specification for Carbon Structural Steel.
2. ASTM A48—Standard Specification for Gray Iron Castings.
3. ASTM A123—Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A307—Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
5. ASTM A536—Standard Specification for Ductile Iron Castings.
6. ASTM A615—Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
7. ASTM C12—Standard Practice for Installing Vitrified Clay Pipe Lines.

8. ASTM C14—Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
9. ASTM C55—Standard Specification for Concrete Building Brick.
10. ASTM C76—Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
11. ASTM C94—Standard Specification for Ready-Mixed Concrete.
12. ASTM C139—Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
13. ASTM C150—Standard Specification for Portland Cement.
14. ASTM C207—Standard Specification for Hydrated Lime for Masonry Purposes.
15. ASTM C270—Standard Specification for Mortar for Unit Masonry.
16. ASTM C387—Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
17. ASTM C425—Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
18. ASTM C443—Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
19. ASTM C443—Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
20. ASTM C478—Standard Specification for Precast Reinforced Concrete Manhole Sections.
21. ASTM F493—Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
22. ASTM C507—Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
23. ASTM C564—Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
24. ASTM F656—Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
25. ASTM C700—Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
26. ASTM C877—Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
27. ASTM C890—Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
28. ASTM C913—Standard Specification for Precast Concrete Water and Wastewater Structures.
29. ASTM C923—Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
30. ASTM C990—Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.
31. ASTM C1479—Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
32. ASTM C 1628—Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets.
33. ASTM D1784—Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
34. ASTM D1785—Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120.
35. ASTM D2235—Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
36. ASTM D2241—Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
37. ASTM D2321—Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
38. ASTM D2412—Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

39. ASTM D2466—Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
40. ASTM D2467—Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
41. ASTM D2564—Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
42. ASTM D2855—Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
43. ASTM D2665—Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
44. ASTM D2729—Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
45. ASTM D2855—Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
46. ASTM D3212—Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
47. ASTM D3350—Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
48. ASTM D4396—Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Nonpressure Applications.
49. ASTM F402—Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
50. ASTM F405—Corrugated Polyethylene (PE) Tubing and Fittings.
51. ASTM F477—Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
52. ASTM F656—Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
53. ASTM F679—Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
54. ASTM F714—Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
55. ASTM F758—Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.
56. ASTM F894—Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.
57. ASTM F1803—Standard Specification for Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter.
58. ASTM F2306—Standard Specification for 12 to 60 inch [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
59. ASTM F2648—Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

C. American Concrete Pipe Association (ACPA).

1. ACPA 01-103—Concrete Pipe and Box Culvert Installation (latest revision and applicable supplements thereto).

D. American Association of State High and Transportation Officials (AASHTO).

1. AASHTO H20—Standard Specifications for HS-20, Highway Loading.
2. AASHTO M105—Standard Specification for Gray Iron Castings.
3. AASHTO M198—Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.

4. AASHTO M252—Standard Specification for Corrugated Polyethylene Drainage Pipe.
5. AASHTO M294—Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter.

E. Corrugated Polyethylene Pipe Association (CPPA), division of the Plastics Pipe Institute (PPI).

1. Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings (latest revision and applicable supplements thereto).

F. State of Connecticut Department of Transportation (ConnDOT)
1. Standard Specifications for Roads, Bridges, Facilities, and Incidental Construction, Form 819 and any supplements.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings, descriptive literature, or both, showing pipe materials and appurtenances to be furnished. Shop drawings shall be submitted to Engineer for approval prior to ordering materials.
2. Shop drawings showing the configuration, dimensions, layout, and spacing of major and minor components such as pipe, joints, couplings, restraints, and other proposed details of assembly. Show in large-scale details any unique assembly, pipe/pipe transitions, pipe/structure transitions, and/or installation requirements.

B. Copies of manufacturer-provided installation instructions, operation instructions, and maintenance material for all equipment furnished under this Section.

C. Manufacturer's warranties and associated warranty registration data in Owner's name. Submit two (2) copies of each warranty to Engineer in the manufacture/supplier standard form or if there is no standard form available, in a form specified by Engineer.

D. As-Built Drawings.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods required for proper performance of the work in this Section. Use equipment of adequate size, capacity and quantity to accomplish the work of this Section in a timely manner.

B. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.

C. Sample pipe for testing, when requested by Engineer, shall be furnished by Contractor in sufficient numbers. The Contractor and/or the pipe manufacturer shall make the facilities and services for making the load tests available.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage

1. Manufacturer shall package the pipe and other drainage materials in a manner designed to deliver the pipe to the Project Site neatly, intact, and without physical damage. Transportation carrier shall use an appropriate method to ensure the pipe is properly supported, stacked, and restrained during transport. Inspect materials delivered to site for damage; store with minimum of handling.
2. Unloading of the pipe and other drainage materials should be controlled so as not to collide with the other pipe sections or fittings, and care should be taken to avoid chipping or spalling, especially to the spigots and bells. For manhole sections, cone sections, bases, fittings and other precast appurtenances, utilize lifting holes or lifting eyes provided.
3. In cold weather conditions, use caution to prevent impact damage. Handling methods considered acceptable for warm weather may be unacceptable during cold weather.
4. Storage:

    a. Store materials on site in enclosures or under protective coverings. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
    b. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging.
    c. Store solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials under cover out of direct sunlight. Provide additional storage measures in accordance with the manufacturer's recommendations. Discard materials if storage period exceeds the recommended shelf life. Solvents in use shall be discarded when the recommended pot life is exceeded.
    d. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

e. Cement, Aggregate, and Reinforcement: As specified in Section 033200—Site Cast-in-Place Concrete.
f. Store manhole units in an upright position.

PART 2 - MATERIALS

2.1 GENERAL

A. Products furnished under this Section which are damaged or found defective in any way prior to being set in place and final acceptance, may be rejected. Engineer may reject an entire lot of pipe should the sample pipe from such lot fail to meet requirements.

2.2 CONCRETE GRAVITY PIPE

A. Reinforced concrete pipe:
1. Pipe less than 12 inches in diameter: ASTM C14, Class 3.
2. Pipe greater than 12 inches in diameter: ASTM C76, Class 3.
3. Class 4 pipe shall be required when cover is less than 12 inches.

C. Fittings and specials: conform to the applicable requirements specified for the pipe.

D. Gaskets and pipe ends for rubber gasket joint: ASTM C443.

2.3 CORRUGATED POLYETHYLENE PIPE

A. Pipe: High density polyethylene, corrugated, smooth interior, ASTM D3350, Cell Classification 424420C.

1. Four (4) inch through 10 inch diameter pipe: AASHTO M252, Type S.
2. 12 inch through 60 inch diameter pipe: AASHTO M294, Type S or ASTM F2306.

B. Joints: Bell-and-spigot joint, AASHTO M252, AASHTO M294, or ASTM F2306. Bell shall be an integral part of the pipe and provide a minimum pull-apart strength of 400 pounds. Bell-and-spigot joint shall incorporate a gasket making it silt-tight. Gaskets shall be installed in the bell, or on the pipe by the pipe manufacturer.

1. Four-inch (4″) through 60-inch (60″) diameter pipe joint, watertight, ASTM D3212. Gaskets: polyisoprene, ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.
2. 12-inch (12″) through 60-inch (60″) diameter pipe shall have a reinforced bell with a bell tolerance device. The bell tolerance device shall be installed by the manufacturer.
3. Coupling bands shall conform to the manufacturer’s specifications. Couplers shall cover not less than one corrugation on each section of pipe.

C. Fittings: AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.

D. Saddle Tee

1. Saddle tees shall be manufactured saddle tees designed to connect to the corrugated polyethylene pipe.
2. Fittings shall conform to AASHTO M 294. Fabricated fittings shall be welded on the interior and exterior of all junctions.
3. A soil-tight seal shall be obtained with the coupling at the saddle tee stub to the storm service pipe.

2.4 POLYVINYL CHLORIDE (PVC) GRAVITY PIPE

A. Polyvinyl Chloride Pipe formulated for drainage application:

1. Pipe 4-inch to 15-inch diameter: ASTM D3034, SDR-35. Elastomeric gasket joints, retained gaskets, part of a complete pipe section and supplied as such.
2. Pipe 18 inch to 36 inch diameter: ASTM F679. Elastomeric gasket joints, retained gaskets, part of a complete pipe section and supplied as such.

B. PVC Cell classification: 12454 or 12364, ASTM D1784.

C. Pipe shall have a minimum pipe stiffness that equals or exceeds 46 psi (lbs/in.^{2}).

D. Pipe shall be marked along the outside of the barrel with the following:

1. The manufacturer's name or trademark.
2. The standard to which it conforms/ASTM Designation.
3. Pipe size.
4. Material designation code/PVC cell classification.
5. SDR number or schedule number.

E. Standard length of pipe: maximum of 20 feet with the following exceptions.

1. Length of 6-inch pipe shall be a maximum of 13 feet unless otherwise approved by Engineer.
2. Pipe used in house connections and/or laterals shall not exceed 6.5 feet in length unless otherwise approved by Engineer.

F. PVC Plastic Gravity Joints and Jointing Material.

1. Joints: ASTM D3213, gasketed, bell-and-spigot, push-on type.
2. Gaskets: ASTM F477. Since each pipe manufacturer has a different design for push-on joints, gaskets shall be part of a complete pipe section and provided as such. Gaskets may be factory installed or field installed as recommended by the pipe manufacturer. Lubricant shall be as recommended by the pipe manufacturer.

G. Fittings: SDR-35, ASTM D3034 and ASTM F1336, specifications as pipe.

H. The manufacturer shall provide waterstops acceptable to Engineer, which shall be applied to the outside of the plastic pipe where the pipe is to be enclosed in any structure where concrete or mortar is used to prevent leakage along the outer wall of the barrel of the pipe.

I. No single piece of pipe shall be laid on any project covered by these specifications unless it is found to be generally straight. Such pipe shall have a maximum ordinate as measured from the concave side of the pipe not to exceed $1/16$ inch per foot of length. If the deviation from straightness exceeds this requirement, then the particular piece of pipe shall be rejected.

2.5 UNDERDRAIN

A. Pipe: Perforated Polyvinyl Chloride (PVC) Gravity Pipe or Corrugated Polyethylene Pipe as indicated on the Drawings.

1. Perforated Polyvinyl Chloride (PVC) Gravity Pipe: ASTM F758.

a. Perforations shall be uniformly spaced along the length and circumference of the pipe.
b. Joints: Solvent weld with primer (ASTM F656) and solvent cement (ASTM F493) per ASTM D2855 or integrally-formed bell and spigot gasketed connections with elastomeric seals (gaskets) meeting the requirements of ASTM F477.

2. Corrugated Polyethylene Pipe: AASHTO M252 Type SP (Double Wall).

a. Perforations: Class 2 slotted perforations per AASHTO M252. Perforations shall be uniformly spaced along the length and circumference of the pipe.
b. Joints: Joint: Silt-tight, ASTM D3212.

2.6 JOINT LUBRICANT

A. As specified by pipe manufacturer, ANSI/AWWA C111/A21.11.

2.7 CATCH BASINS

A. Reinforced precast concrete base, sump, transition, riser, corbel, and top: ASTM C913 for precast rectangular catch basins, ASTM C478 for precast circular catch basins. Type, construction, and dimensions as indicated on the Drawings.

1. Concrete: 4,000 psi minimum, 4%–7% entrained air.
2. Reinforcement: ASTM C890. Steel bars, ASTM A615. Welded-wire fabric, ASTM A185. Additional reinforcing at openings.
3. Precast sections shall consist of smooth sections in standard nominal inside diameters. All precast concrete sections shall be free from cracks, damaged joints, exposed reinforcing, aggregate pockets, spalls, and dimensional distortions or other irregularities. Lifting holes shall be filled with mortar, or other approved material.
4. Openings or “knockouts” in precast units shall be located as shown on the Drawings and to accommodate the inflow and outflow pipe orientation required. Openings shall be sized sufficiently to permit passage of the largest outside dimension of pipe or fittings. Prior to ordering precast manhole bases, all angles between incoming pipes are to be field checked to incorporate possible line changes required in the field layout.

B. Gaskets for joints between sections: Butyl rubber, ASTM C443.

C. Grade Rings: ASTM C478, precast reinforced concrete, 1-inch to 4-inch thickness, dimensions to match basin and top section.

D. Frame and Grate.

1. Cast iron: AASHTO M 105, Class 25 for frames and Class 30 for grates.
2. Cast steel: ASTM A27, Grade optional, thoroughly annealed.

3. Structural Steel: ASTM A36, or A283, Grade B or better, as to quality and details of fabrication, except that in the chemical composition of the steel, the 2/10 of 1% of copper may be omitted.
4. Grate type: ConnDOT “Type A” unless otherwise specified.
5. Covers and gratings shall bear uniformly on their supports.
6. Frame and grate shall be galvanized, ConnDOT Form 819 M.06.03. Cast Iron frames and grates shall not be galvanized.

2.8 YARD DRAIN/AREA DRAIN

A. Configured as indicated on the Drawings. Precast concrete.

B. Frame and Grate: Ductile iron as an integral part of the surface drainage inlet and furnished by the same manufacturer of the drain, frame and grate set manufactured for use on PVC pipe, or insert-type grate manufactured for use on PVC pipe.

1. Grates for drain basins shall be capable of supporting H-20 wheel loading for traffic areas or H-10 loading for pedestrian areas.
2. 12″ and 15″ square grates will be hinged to the frame using pins. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron.
3. Grates shall be provided painted black.

2.9 CONCRETE MANHOLE

A. Precast concrete manhole risers, base sections, and tops: ASTM C478. Precast manhole sections shall consist of smooth circular sections in standard nominal inside diameters. All precast concrete manhole sections shall be free from cracks, damaged joints, exposed reinforcing, aggregate pockets, spalls, and dimensional distortions or other irregularities. Lifting holes, when provided, shall be filled with mortar, or other approved material.

1. Concrete: 4,000 psi minimum, 4%–7% entrained air.
2. Diameter: 48 inches unless otherwise indicated.
3. Base and first riser: Monolithic and built to the dimensions and requirements indicated on the Drawings.

    a. Bottoms shall be integrally cast unless specialty bases at points of connection to existing piping (“Dog-House”) is indicated on the Drawings or otherwise proposed for use. Unless indicated on the Drawings, any special bases or riser used must be detailed in shop drawings and submitted for approval.

4. Riser sections: As required to provide depths indicated.
5. Top Section: Concentric-cone type, unless eccentric-cone or flat-slab-top type is indicated. Cones shall have the same wall thickness and reinforcement as riser sections. If required or called-for, flat slab shall be a minimum of 8 inches thick designed to carry AASHTO H-20 loading with one foot cover and conform to ASTM C478.
6. External damp-proofing: Asphalt, ASTM D449, Type A.
7. Openings or “knockouts” in precast units shall be located as shown on the Drawings and to accommodate the inflow and outflow pipe orientation required. Openings shall be sized sufficiently to permit passage of the largest outside dimension of pipe or fittings. Prior to ordering precast manhole bases, all angles between incoming pipes are to be field checked to incorporate possible line changes required in the field layout.

B. Gaskets for joints between manhole sections: Butyl rubber, ASTM C443.

C. Grade Rings: ASTM C478, precast reinforced concrete, 1 inch to 4 inch thickness, diameter to match manhole and frame.

D. Mortar: Packaged, ASTM C387 or as Specified in Section 033200—Site Cast-in-Place Concrete.

E. Frame and Cover: Ductile Cast Iron, ASTM A536, Grade 60-40-18.

F. Frame and Cover: Grey Cast Iron, ASTM A48, Class 25B (Frame) and Class 30B (Covers), uncoated.

1. Cover: 26 inch diameter, non-vented with non-penetrating pickholes. Unless otherwise detailed or indicated, covers shall be cast with 1½ inch wide, raised letters, indicating “STORM SEWER” unless other lettering is called-for.
2. Frame and cover shall be supplied as a pair from the same manufacturer. Castings shall be of tough, even-grained iron, free from scale, lumps, blisters, sand-holes and other injurious defects, and of the size and type shown on the Drawings. Frames and covers shall have machined bearing surfaces to seat firmly and prevent rocking and rattling under traffic loads. Before leaving the foundry, castings shall be thoroughly cleaned, subjected to hammer tests for soundness and given two coats of coal tar pitch varnish.

G. Resilient connectors for joints between manhole and pipes entering manhole: Continuous boot of ⅜ inch minimum thickness neoprene, ASTM C923 or ASTM C990. Boots shall be either cast into the manhole wall or installed into a cored opening using internal compression rings. Installed boot shall result in a water-tight connection meeting the performance requirements of ASTM C443.

H. Manhole Steps: ASTM C478 and OSHA 29 CFR 1910.27, drop front or equivalent. Steps shall be nine inches in depth and at least twelve inches in width with an abrasive step surface.

1. [Cast Aluminum Alloy: Aluminum alloy, 6061-T6, tensile 38,000 psi, yield 35,000 psi. Drop front design with upturned embedded ends. All parts of aluminum steps to be embedded in concrete or masonry shall be coated with bituminous paint or zinc chromate primer.]
2. [Composite Plastic-Steel: One-half (½) inch deformed steel reinforcing rod, ASTM A615, Grade 60, encapsulated in a co-polymer polypropylene plastic, ASTM D2146, Type II, Grade 16906.]
3. Steps shall be placed in vertical alignment as indicated on the Drawings. Steps shall be uniformly spaced not more than sixteen inches (16″) on center, including the spacing between the top step and the manhole cover. Steps shall be embedded in the wall a minimum distance of 4 inches in either cast or drilled holes. Steps shall not be driven or vibrated into fresh concrete and shall withstand a pullout resistance of 2000 lbs when tested in accordance with ASTM C497. Each step shall project a minimum of 5 inches from the wall measured from the point of embedment.

2.10 DROP MANHOLE

A. Drop inlet shall be constructed with ductile iron gravity pipe laid in undisturbed soil in conformance with ASTM A746-82. Adapt to PVC with Fernco coupling or approved equivalent.

B. Vertical drop pipe shall be 8″, 10″, or 12″ maximum SDR 35 PVC with 90 degree short bend radius shall conform to ASTM D3034.

C. Vertical drop pipe shall be anchored a minimum of every 4 feet with ⅛″ x 1½″ type 304 stainless steel pipe straps set as ordered with lag bolts and shields.

2.11 MASONRY UNITS

A. Brick: ASTM C32 Grade MS or ASTM C62 Grade SW.

B. Concrete block: Solid block, ASTM C139.

2.12 MORTAR

A. Mortar: ASTM C387.

1. Portland Cement: ASTM C150, Type I.
2. Sand: ASTM C144.
3. Hydrated Lime: ASTM C207.
4. Water: Potable.
5. Mix proportions for manhole rims and covers: 1 part portland cement, 2 parts sand, and ¼ part hydrated lime by dry volume. Hydrated lime shall not exceed 10 percent by weight of the total dry mix. Quantity of water in mixture shall be sufficient to produce a stiff, workable mortar, but in no case shall exceed 5½ gallons of water per sack of cement.
6. Mix Proportions for invert construction: 1 part portland cement and 2 parts sand by volume. Quantity of water in mixture shall be sufficient to produce a stiff, workable mortar, but in no case shall exceed 5½ gallons of water per sack of cement.

2.13 STORMWATER TREATMENT UNIT

A. Stormwater Treatment Units shall be hydrodynamic separators made of precast concrete sections and shall have the capacity and dimensions indicated on the Drawings. Treatment units shall be HydroStorm, as manufactured by Hydroworks (888-290-7900); Vortechs®, as manufactured by CONTECH Stormwater Solutions, Scarborough, Maine (877-907-8676); Stormceptor® by CSR—Farmington, CT (860-677-1374); or approved equivalent.

B. Units shown on the Drawings have been sized to meet specific criteria as indicated. Contractor shall submit only those units that are sized and manufactured to meet such criteria as shown with the details and/or listed below:

1. WQU HDS 1 – HS-5

a. Conveyed flow = 8.74 c.f.s. (total flow to the treatment system)
b. Treated flow = 5.59 c.f.s. (total flow actually subjected to treatment)
c. Removal efficiency particle size = maximum of 100 microns
d. Evidence of Independent Third Party field testing
e. Evidence of full scale laboratory testing
f. Minimum removal of 80% Total Suspended Solids (TSS) for 1 inch of rainfall on the impervious surfaces within its drainage area

2. WQU HDS 5 – HS-3i

a. Conveyed flow = 0.87 c.f.s. (total flow to the treatment system)
b. Treated flow = 0.87 c.f.s. (total flow actually subjected to treatment)

c. Removal efficiency particle size = maximum of 100 microns
d. Evidence of Independent Third Party field testing
e. Evidence of full scale laboratory testing
f. Minimum removal of 80% Total Suspended Solids (TSS) for 1 inch of rainfall on the impervious surfaces within its drainage area.

3. WQU HDS 7 – HS-5

a. Conveyed flow = 9.4 c.f.s. (total flow to the treatment system)
b. Treated flow = 6.46 c.f.s. (total flow actually subjected to treatment)
c. Removal efficiency particle size = maximum of 100 microns
d. Evidence of Independent Third Party field testing
e. Evidence of full scale laboratory testing
f. Minimum removal of 80% Total Suspended Solids (TSS) for 1 inch of rainfall on the impervious surfaces within its drainage area.

4. WQU HDS 9 – HS-4i

a. Conveyed flow = 6.26 c.f.s. (total flow to the treatment system)
b. Treated flow = 6.26 c.f.s. (total flow actually subjected to treatment)
c. Removal efficiency particle size = maximum of 100 microns
d. Evidence of Independent Third Party field testing
e. Evidence of full scale laboratory testing
f. Minimum removal of 80% Total Suspended Solids (TSS) for 1 inch of rainfall on the impervious surfaces within its drainage area.

C. Precast Sections: Portland cement shall be Type II, ASTM C150, 4,000 psi minimum.

D. Loading requirements:

1. H-20 loading, manhole riser with frame and cones, plus the weight of soil above.
2. Weight of precast concrete structure.
3. Initial handling and erection loadings.

E. Construction joints shall be sealed with a butyl rubber based sealant.

F. Manhole riser sections, manhole steps, frames and covers shall be as detailed on the Drawings.

2.14 BEDDING

A. Bedding for concrete and PVC pipes: Bedding, Haunching and Initial Backfill shall consist of screened gravel, maximum size ¾ inches and minimum size ⅜ inches.

B. Bedding for HDPE pipes: Bedding, Haunching and Initial Backfill shall consist of ConnDOT No. 6, No. 67, or No. 8 aggregate, or other materials meeting the requirements of ASTM D2321 for Class IA, Class IB, Class II, or Class III unless otherwise specified by the pipe manufacturer.

C. Bedding for Catch Basins: Screened Gravel or Crushed Stone, well graded in size from ¾ inch to ⅜ inch consisting of clean, hard, and durable fragments. No limestone shall be permitted.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

A. As soon as the excavation is completed to the normal grade of the bottom of the trench, the Contractor shall immediately place the bedding material in the trench. Then the pipe shall be firmly bedded in the compacted bedding material to conform accurately to the lines and grade indicated on the Drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions.

1. Concrete pipe shall be installed per ASTM C1479, as may be modified by the pipe manufacturer's instructions.
2. HDPE pipe shall be installed per ASTM D2321, as may be modified by the pipe manufacturer's instructions.

C. Notch under pipe bells and joints, where applicable to provide for uniform bearing under entire length of pipe.

D. Excavation, backfilling and compaction shall be as specified in Section 312310—Earthwork of these Specifications.

E. Maintain optimum moisture content of bedding material to attain required compaction density.

3.2 MANHOLES AND CATCH BASINS

A. Manholes and Catch Basins shall be constructed at the locations and to the lines, grades and dimensions noted on the Drawings, or as required.

B. Precast concrete construction shall be done in a manner to insure watertight construction and all leaks in precast concrete shall be sealed. If required, precast concrete shall be repaired or replaced to obtain watertight construction.

C. Concrete barrels and cones shall be precast concrete sections.

1. Bases shall be either precast with a barrel integrally cast with the base, or poured concrete suitably shaped by means of accurate bell-rung forms to receive the barrel sections. Manhole invert channels in manholes shall be formed in concrete.
2. Precast manholes shall have an adjustment ring at the top of the cone to permit the frame and cover to meet the finished surface. This shall consist of courses of brick or reinforced grading rings not to exceed 11 inches.

D. Stubs shall be short pieces cut from the bell ends of the appropriate size and class of pipe. Concrete stubs shall be plugged with brick masonry unless otherwise directed.

E. Manhole inverts shall conform accurately to the size of the adjoining pipes.

1. Manhole inverts shall be constructed of concrete developing 3,500 psi with the concrete being placed to the spring line of the pipe form.
2. Smooth plastic pipe, matching the dimension of the outlet pipe, shall be used to form the invert.

3. Side inverts and main inverts, where the direction changes, shall be laid out in smooth curves of the longest possible radius, which is tangent, within the manhole, to the centerline of adjoining pipelines.
4. Invert shelves shall be graded to provide a 1-inch per 1-foot wash from the manhole walls.

F. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.

G. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs, made specifically for this purpose, or with mortar. The mortar shall be one part cement to 1½ parts sand, mixed slightly damp to the touch (just short of “balling”), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

H. The Contractor may, as an alternate to suitable nonshrink mortar joints, use premolded elastomeric-sealed joints for pipe into precast manhole bases.

1. All materials, accessories and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint.

I. Openings for pipe and materials to be embedded in the walls of the base for these joints shall be cast in the base at the required locations during the manufacturer of the base. Incorrectly cast and patched pipe openings will be rejected.

J. Manhole risers and tops shall be installed using approved “o-ring” type, neoprene gaskets for sealing joints. Units shall be installed level and plumb. Water shall not be permitted to rise over newly made joints nor until after inspection as to their acceptability. All jointing shall be done in a manner to insure water tightness.

K. Openings shall be provided in the risers to receive entering pipes. These openings may be made at the place of manufacture. The openings shall be sized to provide a uniform 1 inch maximum annular space between the outside of the pipe wall and the opening in the riser. After the pipe is in position, the annular space shall be solidly filled with nonshrink mortar. Care shall be taken to assure that the openings are located to permit setting of the entering pipe at its correct elevation as indicated.

L. Openings, which are cut in the risers in the field, shall be carefully made by coring so as not to damage the riser. Damaged risers will be rejected and shall be replaced at no additional expense to the Owner.

M. Where required by the Drawings, a slot and opening shall be cast in the catch basin wall suitable for mounting the cast iron hood and discharge pipe. The hood hinge may be furnished to the precast supplier by the Contractor for incorporation into the casting during manufacture.

3.3 BRICK MASONRY

A. Brick Masonry Construction shall be done in a manner to insure watertight construction and all leaks in brick masonry shall be sealed. All workmanship shall conform to the best standard practice and all brick masonry shall be laid by skilled workmen.

B. All beds on which masonry is to be laid shall be cleaned and wetted properly. Brick shall be wetted as required and shall be damp but free of any surface water when placed in the Work. Bed joints

shall be formed of a thick layer of mortar, which shall be smoothed or furrowed slightly. Head joints shall be formed by applying to the brick to be laid a full coast of mortar on the entire end, or on the entire side as the case requires, and then shoving the mortar covered end or side of the brick tightly against the bricks laid previously. The practice of buttering at the corners of the brick and then throwing the mortar or scrapings in the empty joints will not be permitted. Dry or butt joints will not be permitted. Joints shall be uniform in thickness and shall be approximately 1¼ inch thick.

C. Brickwork shall be constructed accurately to dimensions and brickwork at top of manholes shall be to the dimensions of the flanges of the cast-iron frames.

D. Joints on the inside face of walls shall be tooled slightly concave with an approved jointer when the mortar is thumbprint hard. The mortar shall be compressed with complete contact along the edges to seal the surface of the joints.

E. All castings to be embedded in the brickwork shall be accurately set and built-in as the Work progresses. Cast-iron frames and manhole covers shall be well bedded in mortar and accurately set to finished graded indicated or as directed.

F. Water shall not be allowed to flow against brickwork or to rise on the masonry for 60 hours after it has been laid, and any brick masonry damaged in this manner shall be replaced as directed at no additional expense to the Owner. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by frost.

3.4 CONCRETE MASONRY UNITS

A. Concrete Masonry unit construction shall be soaked in water before laying. As circular concrete block walls are laid-up, the horizontal joints and keyways shall be flushed full with mortar. As rectangular blocks are laid-up, all horizontal and vertical joints shall be flushed full with mortar. Plastering of the outside of block structures will not be required. The joints in precast units shall be wetted and completely mortared immediately prior to setting a section. No structure shall be backfilled until all mortar has completely set.

3.5 MANHOLE STEPS

A. Placement of steps into the precast walls shall be by a proven method as recommended by the supplier of the precast manhole sections. Details of the steps and method of placement shall be submitted for approval.

B. Plastic steps shall be placed into the wet concrete wall during manufacture or if designed for press fit installation shall be driven into a wall opening according to the manufacturer’s specifications. Steps shall not be mortared into place after the concrete has set.

C. All manholes, catch basins, lawn inlets, etc., which are in excess of five feet in depth, shall be constructed with standard aluminum steps, spaced at 12-inch on center.

3.6 DROP INLETS

A. Drop inlets shall be constructed to the lines, grades, dimensions and design at the locations indicated on the Drawings or as required.

B. Construction shall conform to requirements outlined in Section 033013—Site Cast-in-Place Concrete.

C. Engineer may permit brick or concrete masonry construction. If this alternate is being employed, construction shall be done in accordance with paragraphs 3.04 or 3.05 in this Section.

3.7 CASTINGS

A. Cast-iron frames for grates and covers shall be well bedded in cement mortar and accurately set to the grades indicated or as directed. The frames shall be encased with a thick cement-mortar collar around the entire perimeter of the frames.

B. All voids between the bottom flange shall be completely filled to make a watertight fit. A ring of mortar, at least one inch thick and pitched to shed water away from the frame shall be placed over and around the outside of the bottom flange. The mortar shall extend to the outer edge of the masonry all around its circumference and shall be finished smooth. No visible leakage will be permitted.

C. Structures within the limits of bituminous concrete pavement shall be temporarily set at the elevation of the bottom of the binder course or as ordered. After the binder course has been compacted, these structures shall be set at their final grade. Backfill necessary around such structures after the binder course has been completed shall be made with Class A concrete unless otherwise ordered.

3.8 TRENCH DRAINS/SLOTTED DRAINS

A. Precast, pre-sloped trench drain metals, accessories, and installation methods shall be in accordance with the manufacturer’s recommendations and the details shown on the Drawings.

B. Slotted drains shall be installed in accordance with the manufacturer’s recommendations and the details shown on the Drawings.

C. Contractor shall furnish to Engineer the manufacturer’s written instructions for installation prior to such installation.

3.9 STORMWATER TREATMENT UNIT

A. Stormwater Treatment Units shall be installed in accordance with the manufacturer’s instructions.

B. Vaults shall be placed on a minimum foundation of 12 inches of gravel material. If groundwater is encountered, the foundation base shall be a minimum of 12 inches of crushed stone.

C. If precast sections are to be field assembled, adequate waterproofing shall be used at the joints.

D. Stormwater Treatment Units installed on interior floor drain discharges from parking garages shall have gasoline trapping capabilities in accordance with local and state regulations.

3.10 CLEANING

A. At the completion of the Work, clean all piping, structures and open drainage courses, through and to which water from this construction is directed, to the satisfaction of Engineer.

3.11 AS-BUILT DRAWINGS

A. Contractor shall be solely responsible for complying with the requirements of local permitting authorities for preparation and submittal of as-built drawings. The requirements for the preparation of as-built drawings as defined herein shall be considered the minimum requirements of Engineer, but shall in no way relive Contractor from satisfying the requirements of local permitting authorities.

B. As work progresses, record the following on two (2) sets of Drawings:

1. All changes and deviations from the design in location, grade, size, material, or other feature as appropriate.
2. Any uncharted locations of utilities or other subsurface feature encountered during installation, including the characteristics of such uncharted utility or subsurface feature such as utility type, size, depth, material of construction, etc.

C. Recording of changes shall be clearly and neatly marked in red pen or pencil. All changes shall be noted on the appropriate Drawing sheets.

D. Make measurements from fixed, permanent points on the Project Site to accurately locate the work completed. Such measurements shall consist of at least three (3) ties showing the distance of each item relative to each of the fixed, permanent points.

E. As-Built drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall also contain any additional information required by Engineer.

END OF SECTION 334000

SECTION 347123 – MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor, Subcontractors and/or suppliers providing goods or services referenced in or related to this Section shall also be bound by the Documents identified in Division 01 Section “Summary”, Paragraph 1.1A, entitled “Related Documents.”

1.2 SUMMARY

A. Section includes:
   1. Coordination with state or local police/public safety.
   2. Development and submittal of a Traffic Management Plan.
   3. Development and submittal of a Detour Plan.
   4. Contractor shall identify safety hazards and then furnish all necessary labor, materials, testing, submittals, tools, and equipment including, but not limited, to signs, barricades, traffic drums, cones, flashers, construction fencing, flaggers, warning devices, temporary pavement markings, delineators, etc., to control vehicular and pedestrian traffic through and adjacent to the project area. These measures and actions shall safely maintain the accessibility of public and construction traffic by preventing potential construction hazards.
   5. The work shall also include all costs associated with the erecting, maintaining, moving, adjusting, cleaning, relocating, and storing the aforementioned materials as is necessary to ensure safe movement of vehicular and pedestrian traffic throughout the project area.

B. Contractor shall coordinate work between all Contractors, sections, and trades required for the proper completion of the work.

C. Contractor is responsible for all health and safety.

1.3 REFERENCES

A. Reference herein to any technical society, organization, group or regulation are made in accordance with the following abbreviations and, unless otherwise noted or specified, all work under this Section shall conform to the latest edition as applicable.

B. Code of Federal Regulations (CFR).

   1. 29 CFR 1926, Safety and Health Regulations for Construction.

C. State of Connecticut.

   1. Standard Specifications for Roads, Bridges, Facilities, and Incidental Construction, Form 819 and any supplements.

D. American Association of State High and Transportation Officials (AASHTO).

   1. Roadside Design Guide, latest edition.

2. Manual for Signing and Pavement Marking of the National System of Interstate and Defense Highways, latest edition.
3. AASHTO M 268 - Standard Specification for Retroreflective Sheeting for Traffic Control.

E. United States Department of Transportation, Federal Highway Administration (FHWA).

1. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), latest edition.
2. Standard Highway Signs Including Pavement Markings and Standard Alphabets, latest edition.

1.4 ACTION SUBMITTALS

A. CTHPB Documentation Submittals: Comply with Division 01 Section “Sustainable Design Requirements” and provide the following in addition to other action submittals:

1. Product Data for Credit 5d: For adhesives and sealants, documentation including printed statement of VOC content.
2. Product Data for Credit 5d: For paints and coatings, including printed statement of VOC content.
3. Product Data for Credit d8: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
4. Product Certificates for Credit d10: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Certificates for Credit d13: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
6. Laboratory Test Reports for Credit b4: For composite wood and agrifiber products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.5 SUBMITTALS

A. Traffic Management Plan (if necessary)

1. Contractor shall identify safety hazards and then prepare and submit a Traffic Management Plan to describe all necessary labor, materials, testing, submittals, tools, and equipment including, but not limited, to signs, barricades, traffic drums, cones, flashers, construction fencing, flaggers, warning devices, temporary pavement markings, delineators, etc., proposed for use in controlling vehicular and pedestrian traffic through and adjacent to the project area.

B. Detour Plan (if necessary)

1. Prepare and submit a Detour Plan to describe the temporary re-routing of traffic around the work zone(s) showing all proposed routing, signs, barricades, traffic drums, cones, flashers, construction fencing, flaggers, warning devices, temporary pavement markings, delineators, etc., proposed for use in conjunction with such detour.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials furnished under this Section including any warning devices, such as signs, barricades, flashers, cones, drums, vests, paddle signs, delineators, and other incidentals necessary to protect the work area and maintain vehicular and pedestrian traffic through and adjacent to the project area shall be in accordance with the Manual of Uniform Traffic Control Devices, as amended, or as approved by Engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify site conditions before proceeding with the work. Field check the accuracy of the Drawings and inspect structures, utilities, and other site features prior to start of work and notify Engineer in writing, of any hazardous conditions and/or discrepancies.

B. Contractor shall keep the roadway under construction open to vehicular and pedestrian traffic for the full length of the project. Traffic is to be maintained on one section of existing pavement, proposed pavement, or a combination thereof.

C. Alternating one way traffic may be utilized and limited to a maximum length of 500 feet during construction hours.

D. Lane width for alternating one-way traffic shall be kept to a minimum width of 10 feet, or as directed by the Engineer. A sufficient number of travel ways and pedestrian passways shall be provided to move that traffic ordinarily using the roadway. The travel lanes and pedestrian passways shall be drained and kept reasonably smooth, and in a suitable condition at all times in order to provide minimum interference to traffic consistent with the prosecution of the work. Suitable ingress and egress shall be provided at all times where required for all intersections, driveways, and for all abutting properties having legal access.

3.2 TRAFFIC CONTROL

A. Contractor shall furnish, light, and maintain such signs as may be directed, or may be necessary, for the safe regulation, and convenience of traffic. Said signs will be as specified on the Contract

Drawings or elsewhere herein, or if not specified, they shall be adequate for the regulation, safety and convenience of traffic and in conformance with the applicable requirements of the Manual on Uniform Traffic Control Devices, latest edition. Engineer reserves the right to reject any sign deemed unsuitable.

B. Contractor shall provide, erect, and maintain suitably lighted barricades, warning lights, etc. as needed, or as directed in order to keep people, animals, and vehicles from excavations, obstacles, etc. Contractor may be required to employ traffic control personnel and take other such reasonable means or precautions as Engineer or local traffic authority may direct, or as may be needed to prevent damage or injury to persons, vehicles, or other property, and to minimize the inconvenience and danger to the public by his construction operations.

C. Contractor shall arrange his operations to provide access to properties along the street, including temporary bridges to driveways, and provide access to fire hydrants, manholes, gate boxes, or other utilities. Whenever any trench obstructs traffic in, or to, any public street, private driveway, or property entrance, Contractor shall take such steps as required to maintain necessary traffic and access, including temporary bridging if required.

D. Contractor shall confine his occupancy of public or traveled ways to the smallest space compatible with the efficient and safe performance of the Work contemplated by the Contract.

E. Contractor shall observe and obey all local and state laws, ordinances, regulations and permits in relation to the obstruction of streets and highways, keeping passageways open and protecting traffic where there may be danger from blasting or other construction activities.

F. Suitable lighted barriers or barricades shall be furnished by Contractor, and erected and maintained at all times, including daylight and night time, around all open ditches, trenches, excavations, or other work potentially dangerous to traffic or pedestrians. Such barricades shall conform to the Manual on Uniform Traffic Control Devices, latest edition. Barricades shall be placed on all sides and throughout the entire length and breadth of all open ditches, trenches, excavations, or other work, which must be barred to the general public. Barricades shall be properly painted and lighted to retain a high degree of visibility to vehicular and pedestrian traffic.

G. Suitable lighted barricades shall be defined as barricades lit by flashers in accordance with this paragraph or other lighting methods required by the Uniform Traffic Control Devices, latest edition, Engineer, or the local traffic authority. Flashers shall be placed along the entire length of the barricades at an interval no greater than 8 feet, center to center. Flashers shall be power operated, lens directed, enclosed light units which shall provide intermittent light from 70 to 120 flashes per minute, with the period of light emittance occurring not less than 25 percent of each on off cycle, regardless of temperature. The emitted light shall be yellow in color and the area of light on at least one face of the unit shall be not less than 12 square inches. The discernible light shall be bright enough to be conspicuously visible during the hours of darkness at a minimum distance of 800 feet from the unit under normal atmospheric conditions. For units, which beam light in one or more directions, the foregoing specifications shall apply 10 degrees or more to the side and 5 degrees or more above and below the photometric axis.

H. Contractor shall furnish and securely fasten flashing units to signs, barricades, and other objects in such numbers and for such lengths of time as are required for the maintenance and protection of traffic, or as the Engineer and/or local traffic authority may order. The flasher shall be in operation during all hours between sunset and sunrise, and during periods of low visibility. Contractor shall maintain, relocate and operate barricades and flashers throughout the life of the Contract as required. No special payment will be made for barricades or flashers.

I. Should Contractor or his employees neglect to set out and maintain barricades or lights, as required in these Specifications, Engineer immediately, and without notice, may furnish, install and maintain barricades or lights. The cost thereof shall be borne by Contractor and may be deducted from any amount due, or to become due, to Contractor under this Contract.

J. Contractor will be held responsible for any damages that the Owner, Governmental units, or their heirs or assigns may have to pay as a consequence of Contractor's failure to protect the public from injury, and the same may be deducted from any payments that are due or may become due to Contractor under this Contract. Contractor shall allow for bridging for trenches at all street and driveway crossings in such manner as the Engineer and/or local traffic authority may direct in order that the traffic on intersecting streets may not be blocked, and in order that entrance may be made to properties along the line of work.

3.3 MAINTENANCE OF TRAVEL LANES

A. During non-construction hours, weekends and holidays, a minimum of two 12-foot wide travel lanes shall be open to traffic. Trenches shall be either temporarily paved or covered with skid resistant steel plates, unless otherwise directed by Engineer or the local traffic authority. The steel plates to be designed to withstand the normal traffic loads. Also during the above mentioned times, all public and private driveways shall be accessible to vehicular traffic.

B. During construction hours, Contractor will be allowed to close the streets to through traffic, provided alternate detour arrangements are made which are acceptable to the Police, Fire, Emergency Medical Services, Public Safety, and local traffic authority. Contractor shall notify the local Police, Fire, Emergency Medical Services, Public Safety, and local traffic authority ten (10) calendar days in advance of any/or all street closures, or partial closures.

3.4 SNOW REMOVAL

A. If Contractor's operations or occupancy of any public street or highway, or the uneven surfaces over any trenches being maintained by Contractor shall interfere with the removal or sanding of snow or ice by the public authorities or adjoining land owners, in an ordinary manner with regular highway equipment, Contractor shall be required to perform such services for the public authorities or adjoining owners without charge.

B. If the Contractor fails to perform snow removal services for the public authorities or adjoining owners, he shall reimburse the said authorities or adjoining owners for any additional cost to them for doing such work occasioned by conditions arising from Contractor's operations, occupancy, or trench surfaces, together with any damage to the equipment of said parties by those conditions, or claims of any parties for damage or injury or loss by reason of failure to remove snow or ice or to sand icy spots under these conditions.

3.5 STREET DETOURS

A. Where detours will be required, Contractor shall prepare and submit a proposed Detour Plan for all portions of the Work. Such Detour Plan will be subject to review and approval by Engineer, the local traffic authority, and other applicable town or state entities having jurisdiction. This submittal shall be made at least seven days prior to commencing construction. It shall be the sole responsibility of Contractor to keep the Local Regulatory Agencies (including, but not limited to, the Police and Fire Departments) forewarned at least 72 hours in advance of changes in traffic patterns due to reduction of pavement widths or closing of streets. Contractor shall supply, install,

maintain, replace as necessary, adjust, move, relocate, and store all signs, suitably lighted barricades, traffic cones, and traffic delineators, as necessary to carry out the traffic routing plan and maintain vehicular and pedestrian traffic. All of this work shall meet with the requirements of Engineer, local traffic authority, and other applicable town or state entities having jurisdiction.

3.6 TRAFFIC CONTROL PROCEDURES

A. The proper and adequate signing of the construction zone, and any approved detours, is considered of utmost importance. Prior to the start of construction, Contractor shall submit a Traffic Management Plan for review by Engineer, the local traffic authority, Owner, Police, and Fire Department.

B. Contractor shall provide one flagman for each work crew within signed areas for the control and direction of vehicular and pedestrian traffic on as needed, or as directed, basis and at no cost to Owner. This flagman shall be dedicated to traffic control only and shall not be utilized as part of the work crew.

C. Uniformed policemen will be provided at major intersections and at other locations where the applicable local traffic authority or local regulatory agencies may determine their need for the control and direction of vehicular traffic and pedestrians.

3.7 CLEAN UP

A. Contractor shall remove all debris, residuals, and materials at the conclusion of the work.

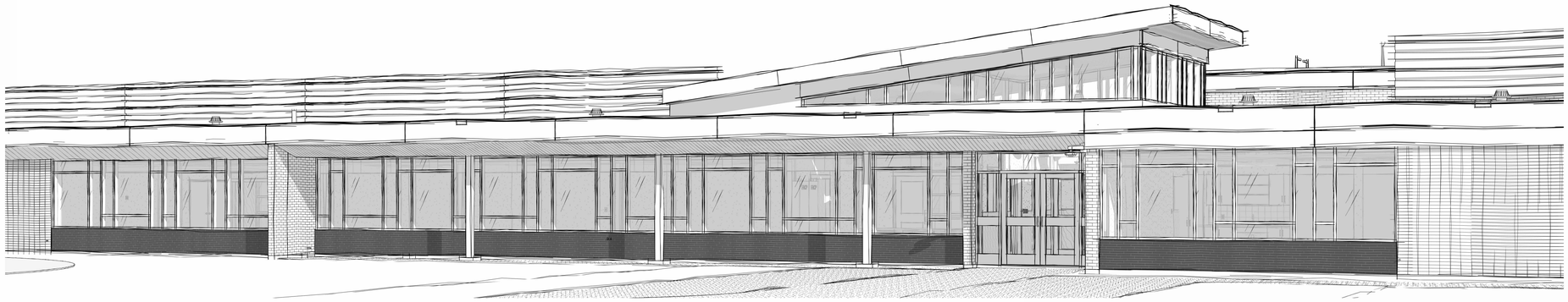
END OF SECTION 347123

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET BRISTOL, CT 06010

STATE PROJECT NUMBER: 017-0090 RNV



BUILDING OFFICIAL: (SIGNATURE) (DATE)	BUILDING COMMITTEE: (SIGNATURE) (DATE)
FIRE MARSHAL: (SIGNATURE) (DATE)	HEALTH INSPECTOR: (SIGNATURE) (DATE)
SECTION 504 OFFICIAL: (SIGNATURE) (DATE)	SUPERINTENDENT (SIGNATURE) (DATE)
BOARD OF EDUCATION: (SIGNATURE) (DATE)	(SIGNATURE) (DATE)

CONSTRUCTION DOCUMENTS

JUNE 5, 2026

PROJECT TEAM:

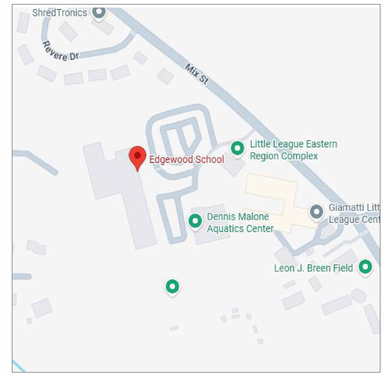
CIVIL ENGINEER:	**BENESCH** *200 GLASTONBURY BOULEVARD, SUITE 201* *GLASTONBURY, CT 06033*
LANDSCAPE ARCHITECT:	**BENESCH** *200 GLASTONBURY BOULEVARD, SUITE 201* *GLASTONBURY, CT 06033*
STRUCTURAL ENGINEER:	**RZ-DESIGN ASSOCIATES, A GM2 COMPANY** *750 OLD MAIN STREET #202* *ROCKY HILL, CT 06067*
MEP ENGINEER:	**RZ-DESIGN ASSOCIATES, A GM2 COMPANY** *750 OLD MAIN STREET #202* *ROCKY HILL, CT 06067*
TECHNOLOGY:	**D'AGOSTINO ASSOCIATES** *477 MAIN STREET, SUITE 210B* *MONROE, CT 06468*
FOOD SERVICE:	**CRABTREE McGRATH ASSOCIATES, INC.** *161 WEST MAIN STREET* *GEORGETOWN, MA 01833*

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
www.qamarch.com

LOCATION MAP:

TRUE NORTH: N

PROJECT NORTH: N



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ABBREVIATIONS

AB	Anchor Bolt	IN	Inch
AC	Air Conditioning	INCL	Included
ACT	Acoustical Ceiling Tile	INFO	Information
ADJ	Adjacent	INSUL	Insulation
AFF	Above Finish Floor	INT	Interior
AFG	Above Finish Grade	JT	Joint
AHU	Air Handling Unit	KP	Kick Plate
ALF	Aluminum Frame	LAB	Laboratory
ALT	Alternate	LAV	Lavatory
ALUM	Aluminum	LH	Left Hand
ANCH	Anchor, Anchorage	LTG	Lighting
ANOD	Anodized	LVT	Luxury Vinyl Tile
APBO	As Provided By Owner	MACH	Machine
APPR	Approved	MAINT	Maintenance
ARCH	Architect, Architectural	MAS	Masonry
ASB	Asbestos	MAT	Material
ASBO	As Selected By Owner	MAX	Maximum
ASPH	Asphalt	MECH	Mechanical
ASST	Assistant	MEZZ	Mezzanine
ASSY	Assembly	MFRG	Manufacturer
AUTO	Automatic	MIN	Minimum
BD	Board	MISC	Miscellaneous
BEV	Bevel, Beveled	MO	Masonry Opening
BIT	Bituminous	N	North
BLDG	Building	NIC	Not In Contract
BLK	Block	NTS	Not To Scale
BLKG	Blocking	OC	On Center
BM	Beam	OD	Outside Diameter
BO	Bottom Of	OFF	Office
BOT	Bottom	OH	Overhead
BRG	Bearing / Bridging	PASS	Passage
BUR	Built Up Roofing	PERP	Perpendicular
CAB	Cabinet	PL	Plate
CAP	Capacity	PLAM	Plastic Laminate
CASE	Casement	PLAS	Plaster
CEM	Cement	PLUMB	Plumbing
CJ	Control Joint	PLYWD	Plywood
CL	Centerline	PR	Pair
CLG	Ceiling	PREFAB	Prefabricated
CLOS	Closet	PT	Pressure Treated
COL	Column	PTD	Painted
CONC	Concrete	PVC	Polyvinylchloride
CONF	Conference	QT	Quarry Tile
CONT	Continuous	QTY	Quantity
CONTR	Contractor	QUAL	Quality
CORR	Corridor	R	Riser
CRS	Course, Courses	RAD	Radius
CT	Ceramic Tile	RD	Roof Drain
CTR	Center	RECV	Receiving / Receiver
CUH	Cabinet Unit Heater	REF	Reference
DBL	Double	REFR	Refrigerator
DEG	Degree	REINF	Reinforce
DEMO	Demolition	REM	Remove
DEPT	Department	REQD	Required
DET	Detail	REV	Revised, Revision
DF	Drinking Fountain	RH	Robe Hook / Right Hand
DH	Double Hung	RM	Room
DIA	Diameter	RTFS	Refer To Finish Schedule
DIM	Dimension	RWC	Rain Water Conductor
DIST	Distance	SC	Scupper
DN	Down	SCHED	Schedule
DS	Downspout	SD	Soap Dispenser
DWG	Drawing	SECT	Section
EA	Each	SF	Square Foot
EIFS	Exterior Insulation Finish System	SHT	Sheet
EJ	Expansion Joint	SIM	Similar
EL	Elevation	SJ	Seismic Joint
ELEC	Electric, Electrical	SND	Sanitary Napkin Dispenser / Disposal
ELEV	Elevator	SNR	Sanitary Napkin Receptacle
EMERG	Emergency	SPEC	Specifications
EQ	Equal	SQ	Square
EQUIP	Equipment	SS	Stainless Steel
ETR	Existing To Remain	SSTL	Structural Steel
EXIST	Existing	ST	Sound Transmission
EXP	Expansion	STC	Sound Transmission Coefficient
EXT	Exterior	STD	Standard
FD	Floor Drain	STL	Steel
FDN	Foundation	STOR	Storage
FE	Fire Extinguisher	STRUCT	Structure, Structural
FF	Finished Floor	SUSP	Suspend, Suspension
FFE	Finished Floor Elevation	T	Tread
FIN	Finish, Finished	TBD	Tack Board
FIXT	Fixture	TG	Tongue and Groove
FLR	Floor	THRU	Through
FP	Fireproofing	TME	To Match Existing
FR	Fire Retardant	TO	Top Of
FRGP	Fiber Reinforced Gypsum Panel	TPD	Toilet Paper Dispenser
FT	Feet, Foot	TYP	Typical
FTG	Footing	UH	Unit Heater
FURN	Furnish, Furnishings, Furniture	UL	Underwriter's Laboratory
FURR	Furred, Furring	UNO	Unless Noted Otherwise
GA	Gauge	UV	Unit Ventilator
GALV	Galvanized	VCT	Vinyl Composition Tile
GB	Gypsum Board	VEST	Vestibule
GC	General Contractor	W	With
HB	Hose Bibb	WBD	White Board
HC	Handicapped	WD	Wood
HGT	Height	WP	Waterproofing
HM	Hollow Metal	WRB	Weather Resistent Barrier
HORIZ	Horizontal	WWF	Welded Wire Fabric
ID	Inside Diamter		

GENERAL NOTES

1. GENERAL CONTRACTOR TO NOTIFY ARCHITECT OF ANY INCONSISTENCIES IN THE DRAWINGS, EXISTING CONDITIONS OR THE PROPOSED CONSTRUCTION IMMEDIATELY.
2. GENERAL CONTRACTOR TO TAKE AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE JOB AND SHALL BE HELD RESPONSIBLE FOR THE SAME.
3. ALL NOTES AND DIMENSIONS DESIGNATED AS "TYP." OR "TYPICAL" APPLY TO ALL SIMILAR CONDITIONS THROUGHOUT THE PROJECT.
4. THESE PLANS ARE NOT TO BE SCALED FOR CONSTRUCTION PURPOSES. DIMENSION LINES AND NOTES SUPERSEDE ALL SCALED REFERENCES.
5. ALL DIMENSIONS ARE TO FACE OF MASONRY, FACE OF STUD OR CENTERLINE OF STRUCTURAL STEEL COLUMNS UNLESS OTHERWISE NOTED.
6. ROOFING CONTRACTOR TO VERIFY QUANTITY AND LOCATION OF ROOF PENETRATIONS, AND TO FLASH ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
7. THE REQUIREMENTS FOR SEISMIC LOADS HAVE BEEN INCORPORATED INTO THE DESIGN OF THE STRUCTURAL, MECHANICAL, AND SUSPENDED CEILING SYSTEMS AS REQUIRED FOR THE NEW CONSTRUCTION.
8. SIGNAGE SHALL BE PLACED ON THE WALL ADJACENT TO THE LEVEL SIDE OF A ROOM DOOR AT A HEIGHT OF 5' A.F.F.
9. PROVIDE AN ALUMINUM DIVIDER STRIP AT ALL DOOR THRESHOLDS WHERE TWO DIFFERENT FINISHES MEET UNLESS OTHERWISE NOTED.

DEMOLITION NOTES

1. REMOVE ALL MATERIALS, ASSEMBLIES AND CONSTRUCTED ELEMENTS AS REQUIRED TO ACCOMMODATE THE NEW CONSTRUCTION.
2. PROTECT ALL EXISTING FINISHES AND SPACES NOT AFFECTED BY THE CONSTRUCTION OR DIRECTLY ADJACENT TO THE CONSTRUCTION. ALL EXISTING FINISHES AFFECTED BY THE DEMOLITION WORK ARE TO BE RETURNED TO A STATE OF FINISH EQUIVALENT TO THAT PRIOR TO COMMENCEMENT OF THE WORK.
3. PROVIDE DUST-PROOF PARTITIONS SEPARATING THE DEMOLITION AND WORK AREAS FROM AREAS UNAFFECTED BY THE CONSTRUCTION.
4. CLEAN ALL AREAS OF THE PROJECT PERIODICALLY TO MAINTAIN A SAFE AND CLEAR WORKING ENVIRONMENT. PROVIDE FINAL CLEANING OF THE ENTIRE PROJECT SITE AT THE COMPLETION OF THE PROJECT WORK.
5. PROVIDE TEMPORARY SHORING OR BRACING AS REQUIRED TO PROPERLY COMPLETE THE WORK. COORDINATE SHORING WITH ALL SUB-CONTRACTORS, AND NOTIFY THE ARCHITECT OF ANY PROBLEMS OR CONCERNS IMMEDIATELY.

ARCHITECTURAL SYMBOLS

ROOM NAME — *ROOM NAME/ ROOM NUMBER*

BUILDING SECTION

WALL SECTION

CASEWORK SECTION

ELEVATION MARKER

DOOR IDENTIFICATION

WINDOW IDENTIFICATION

STOREFRONT IDENTIFICATION

COLUMN IDENTIFICATION

ELEVATION MARKER

EXISTING DOOR

DEMOLISHED DOOR

NEW DOOR

EXISTING WALL TO REMAIN

EXISTING WALL / ITEM TO BE REMOVED

NEW STUD FRAMED WALL

CONCRETE MASONRY UNIT

FOUNDATION WALL

CONCRETE

BRICK

STONE

METALS

COMPACTED GRAVEL

EARTH/COMPACTED FILL

FINISH WOOD

CONTINUOUS WOOD BLOCKING

SHIM

PLYWOOD

BATT INSULATION

RIGID INSULATION

ACOUSTIC TILE

RESILIENT FLOORING/PLASTIC LAMINATE

AIR AND VAPOR BARRIER/DAMPPROOFING

SHEET LIST

01 - General	
CS	COVER SHEET
G1.0	GENERAL INFORMATION
G1.1	GENERAL INFORMATION
G1.2	GENERAL INFORMATION
R1.0	CODE INFORMATION
02-HAZMAT	
REM-1A	SOIL MANAGEMENT PLAN
REM-1B	SOIL MANAGEMENT PLAN
HM-1	ABATEMENT- FOUNDATION & TUNNEL PLAN
HM-2	ABATEMENT- FIRST FLOOR PLAN
HM-3	ABATEMENT- ROOF PLAN
03 - SURVEY	
SV.01	BOUNDARY SURVEY
SV.02	TOPOGRAPHIC SURVEY
SV.03	TOPOGRAPHIC SURVEY
SV.04	TOPOGRAPHIC SURVEY
SV.05	TOPOGRAPHIC SURVEY
04 - Demolition	
C1.0	DEMOLITION, EROSION & SEDIMENTATION CONTROL PLAN (WEST)
C1.1	DEMOLITION, EROSION & SEDIMENTATION CONTROL PLAN (EAST)
C1.2	DEMOLITION, EROSION & SEDIMENTATION CONTROL DETAILS
C1.3	DEMOLITION, EROSION & SEDIMENTATION CONTROL NOTES
D1.0	DEMO- OVERALL FOUNDATION PLAN
D1.1	DEMO-OVERALL FIRST FLOOR PLAN
D1.1A	DEMO-FIRST FLOOR PLAN-AREA A
D1.1B	DEMO-FIRST FLOOR PLAN-AREA B
D1.2	DEMO-OVERALL ROOF PLAN
D1.2A	DEMO ROOF PLAN-AREA A
D1.2B	DEMO ROOF PLAN- AREA B
D1.3	DEMO TYPICAL DETAILS
D2.0	DEMO-OVERALL RCP
D2.1A	DEMO RCP-AREA A
D2.1B	DEMO-RCP-AREA B
D3.0	DEMO-OVERALL EXTERIOR ELEVATIONS
D3.1	DEMO-OVERALL EXTERIOR ELEVATIONS
D4.0	DEMO WALL SECTIONS
D4.1	DEMO WALL SECTIONS
D4.2	DEMO WALL SECTIONS
D6.0	DEMO-ENLARGED GYM PLAN & DETAILS
D7.10	DEMO INTERIOR ELEVATIONS
MD1.0A	BASEMENT MECHANICAL DEMO PLAN - AREA A
MD1.0B	BASEMENT MECHANICAL DEMO PLAN - AREA B
MD1.1A	FIRST FLOOR MECHANICAL DEMO PLAN - AREA A
MD1.1B	FIRST FLOOR MECHANICAL DEMO PLAN - AREA B
MD1.2A	ROOF MECHANICAL DEMOLITION PLAN - AREA A
MD1.2B	ROOF MECHANICAL DEMOLITION PLAN - AREA B
PD1.0A	BASEMENT PLUMBING DEMO PLAN - AREA A
PD1.0B	BASEMENT PLUMBING DEMO PLAN - AREA B
PD1.1A	FIRST FLOOR PLUMBING DEMO PLAN - AREA A
PD1.1B	FIRST FLOOR PLUMBING DEMO PLAN - AREA B
PD1.2A	ROOF PLUMBING DEMOLITION PLAN - AREA A
PD1.2B	ROOF PLUMBING DEMOLITION PLAN - AREA B
ED1.1A	FIRST FLOOR LIGHTING DEMO PLAN - AREA A
ED1.1B	FIRST FLOOR LIGHTING DEMO PLAN - AREA B
ED2.1A	FIRST FLOOR POWER DEMOLITION PLAN - AREA A
ED2.1B	FIRST FLOOR POWER DEMOLITION PLAN - AREA B
ED2.2A	ROOF POWER DEMOLITION PLAN - AREA A
ED2.2B	ROOF POWER DEMOLITION PLAN - AREA B
05 - CIVIL	
C0.0	OVERALL SITE PLAN
C0.1	INLAND WETLANDS, FLOODWAY & FLOODPLAIN IMPACT PLAN
C0.2	AQUIFER PROTECTION PLAN
C2.0	LAYOUT & MATERIALS PLAN (WEST)
C2.1	LAYOUT & MATERIALS PLAN (EAST)
C2.2	TURNING MOVEMENT PLAN
C2.3	BUS & PARENT DROP OFF PLAN
C3.0	GRADING, DRAINAGE & UTILITY PLAN (WEST)
C3.1	GRADING, DRAINAGE & UTILITY PLAN (EAST)
C4.0	PLANTING PLAN (WEST)
C4.1	PLANTING PLAN (EAST)
C4.2	PLANTING DETAILS
C5.0	PHOTOMETRIC PLAN (WEST)
C5.1	PHOTOMETRIC PLAN (EAST)
C6.0	SITE DETAILS
C6.1	SITE DETAILS
C6.2	SITE DETAILS
C6.3	SITE DETAILS
C6.4	SITE DETAILS
C6.5	SITE DETAILS
C6.6	SITE DETAILS
C6.7	SITE DETAILS
06 - Architectural	
A1.1	OVERALL FIRST FLOOR PLAN
A1.1A	FIRST FLOOR PLAN-AREA A
A1.1B	FIRST FLOOR PLAN-AREA B
A1.2	OVERALL ROOF PLAN
A1.2A	ROOF PLAN-AREA A
A1.2B	ROOF PLAN-AREA B
A1.3	ROOF DETAILS
A1.4	ROOF DETAILS
A1.5	ROOF DETAILS
A2.1	OVERALL RCP
A2.1A	RCP-AREA A
A2.1B	RCP-AREA B
A2.1C	ENLARGED TREE RCPS & ELEVATIONS
A2.2	CEILING DETAILS
A3.0	EXTERIOR ELEVATIONS
A3.1	EXTERIOR ELEVATIONS
A4.0	BUILDING SECTIONS
A4.1	BUILDING SECTIONS
A5.0	WALL SECTIONS
A5.1	WALL SECTIONS
A5.2	WALL SECTIONS
A5.3	WALL SECTIONS
A5.4	WALL SECTIONS
A5.5	WALL SECTIONS-GROSS MOTOR ROOM
A5.6	WALL SECTIONS
A6.0	PLAN DETAILS
A6.1	PLAN DETAILS
A6.2	SECTION DETAILS
A6.3	SECTION DETAILS
A6.4	BASEMENT HATCH DETAIL
A6.10	ENLARGED RECEPTION PLAN
A6.11	ENLARGED SPEC. OFFICES PLAN
A6.12	ENLARGED BATHROOM PLANS AND ELEVATIONS
A6.13	ENLARGED BATHROOM PLANS AND ELEVATIONS
A7.0	MAIN CORRIDOR INTERIOR ELEVATIONS
A7.1	MAIN CORRIDOR INTERIOR ELEVATIONS
A7.2	INTERIOR ELEVATION-CORRIDOR
A7.3	INTERIOR ELEVATIONS - CLASSROOMS
A7.4	INTERIOR ELEVATIONS - CLASSROOMS
A7.5	INTERIOR ELEVATIONS - CLASSROOMS
A7.6	INTERIOR ELEVATIONS - ADMIN
A7.7	INTERIOR ELEVATIONS - ADMIN
A7.8	INTERIOR ELEVATIONS-GROSS MOTOR ROOM
A7.9	INTERIOR ELEVATIONS
A7.10	INTERIOR ELEVATIONS
A8.0	MECHANICAL ROOM STAIR PLANS
A8.1	STOREFRONT ELEVATIONS
A8.2	STOREFRONT DETAILS
A8.3	STOREFRONT DETAILS

SHEET LIST

A8.4	STOREFRONT DETAILS
A8.5	STOREFRONT & METAL PANEL DETAILS
A8.6	METAL PANEL ELEVATIONS
A8.7	ROOF SCREEN ELEVATIONS
A9.0	DOOR SCHEDULE & ELEVATIONS
A9.1	DOOR DETAILS
A9.2	DOOR JAMB DETAILS
A9.3	HOLLOW METAL TYPES AND DETAILS
A10.0	ENLARGED FINISH PLAN - AREA A
A10.1	ENLARGED FINISH PLAN - AREA B
A10.2	FINISH DETAILS
A10.3	ENLARGED FLOOR PATTERN DETAILS
A11.0	GENERAL MILLWORK ELEVATIONS
A11.1	CLASSROOM MILLWORK ELEVATIONS
A11.2	MILLWORK DETAILS
A12.0	SIGNAGE PLANS
A12.1	SIGNAGE SKETCHES
A12.2	SIGNAGE SKETCHES
A12.3	SIGNAGE SCHEDULE
07 - FOOD SERVICE	
K100	FOODSERVICE EQUIPMENT PLAN & SCHEDULE
K101	FOODSERVICE EQUIPMENT ROUGH-IN PLAN
K102	FOODSERVICE EQUIPMENT SPECIAL CONDITIONS PLAN
08 - Structural	
S0.1	GENERAL NOTES & ABBREVIATIONS
S0.2	TYPICAL DETAILS - STRUCTURAL
S0.3	TYPICAL DETAILS - STRUCTURAL STEEL
S0.4	TYPICAL DETAILS - JOIST REINFORCING
S1.1A	FOUNDATION PLAN - AREA A
S1.1B	FOUNDATION PLAN - AREA B
S1.2A	LOW ROOF FRAMING PLAN - AREA A
S1.2B	LOW ROOF FRAMING PLAN - AREA B
S1.3	HIGH ROOF FRAMING PLAN
S2.0	COLUMN SCHEDULE & PLAN DETAILS
S2.6	SHEAR WALL DETAILS
S3.0	FOUNDATION SECTIONS
S3.1	FOUNDATION SECTIONS
S4.0	WALL SECTIONS
S4.1	WALL SECTIONS
S5.0	ROOF SECTIONS
S5.1	ROOF SECTIONS
09 - Mechanical	
M0.1	MECHANICAL GENERAL INFORMATION
M1.1A	FIRST FLOOR MECHANICAL DUCT PLAN - AREA A
M1.1B	FIRST FLOOR MECHANICAL DUCT PLAN - AREA B
M1.2A	MECHANICAL ROOF PLAN - AREA A
M1.2B	MECHANICAL ROOF PLAN - AREA B
M2.1A	FIRST FLOOR MECHANICAL PIPE PLAN - AREA A
M2.1B	FIRST FLOOR MECHANICAL PIPE PLAN - AREA B
M4.0	MECHANICAL ENLARGED PLANS
M5.0	MECHANICAL DETAILS
M5.1	MECHANICAL DETAILS
M6.0	MECHANICAL SCHEDULES
M6.1	MECHANICAL SCHEDULES
M7.0	MECHANICAL PIPING DIAGRAMS
M7.1	MECHANICAL PIPING DIAGRAMS
M8.0	MECHANICAL CONTROL DIAGRAMS
M8.1	MECHANICAL CONTROL DIAGRAMS
M8.2	MECHANICAL CONTROL DIAGRAMS
M8.3	MECHANICAL CONTROL DIAGRAMS
10 - Plumbing	
P0.1	PLUMBING GENERAL INFORMATION
P1.0A	BASEMENT DRAINAGE PLAN - AREA A
P1.0B	BASEMENT DRAINAGE PLAN - AREA B
P1.1A	FIRST FLOOR DRAINAGE PLAN - AREA A
P1.1B	FIRST FLOOR DRAINAGE PLAN - AREA B
P1.2A	PLUMBING ROOF PLAN - AREA A
P1.2B	PLUMBING ROOF PLAN - AREA B
P2.1A	FIRST FLOOR PLUMBING SUPPLY PLAN - AREA A
P2.1B	FIRST FLOOR PLUMBING SUPPLY PLAN - AREA B
P3.1	PLUMBING KITCHEN PART PLANS
P4.1	PLUMBING ENLARGED PLANS
P4.2	PLUMBING ENLARGED PLANS
P4.3	PLUMBING ENLARGED PLANS
P5.1	PLUMBING DETAILS
P5.2	PLUMBING DETAILS
P5.3	PLUMBING DETAILS
P6.1	PLUMBING SCHEDULES
P7.1	PLUMBING RISERS - DRAINAGE
P7.2	PLUMBING RISERS - DRAINAGE
P7.3	PLUMBING RISERS - SUPPLY
P7.4	PLUMBING RISERS - SUPPLY
P7.5	PLUMBING RISERS - STORM
P7.6	PLUMBING RISERS - STORM
11 - Fire Protection	
FP1.1A	FIRST FLOOR FIRE PROTECTION PLAN - AREA A
FP1.1B	FIRST FLOOR FIRE PROTECTION PLAN - AREA B
FP2.0	FIRE PROTECTION DETAILS
12 - Electrical	
E0.1	ELECTRICAL GENERAL INFORMATION
E1.0	LIGHTING FIXTURE SCHEDULE
E1.1A	FIRST FLOOR LIGHTING PLAN - AREA A
E1.1B	FIRST FLOOR LIGHTING PLAN - AREA B
E2.1A	FIRST FLOOR POWER PLAN - AREA A
E2.1B	FIRST FLOOR POWER PLAN - AREA B
E2.2A	ROOF POWER PLAN - AREA A
E2.2B	ROOF POWER PLAN - AREA B
E3.1	ELECTRICAL PART PLANS
E4.0	EQUIPMENT COORDINATION SCHEDULE
E5.0	ELECTRICAL RISER DIAGRAM
E5.1	PANEL SCHEDULES
E5.2	PANEL SCHEDULES
E5.3	PANEL SCHEDULES
E6.1	ELECTRICAL DETAILS
E6.2	ELECTRICAL DETAILS
E6.3	ELECTRICAL DETAILS
ES1.1	ELECTRICAL SITE PLAN
13 - Technology	
TN0.1	TECH-AV SYMBOL LEGEND & GENERAL NOTES
TN1.1	TECH-AV OVERALL FIRST FLOOR PLAN
TN1.1A	TECH-AV FIRST FLOOR PLAN - AREA A
TN1.1B	TECH-AV FIRST FLOOR PLAN - AREA B
TN2.1	TECH-AV OVERALL RCP PLAN
TN2.1A	TECH-AV RCP PLAN - AREA A
TN2.1B	TECH-AV RCP PLAN - AREA B
TN3.1	TECH-AV DATA ROOM DETAILS
TN3.2	AV-OT / OP ROOM DETAILS
TN4.1	TECH-AV DETAILS
TN4.2	TECH-AV DETAILS
TN5.1	TECH-AV WIRING DIAGRAMS
TY0.1	SECURITY SYMBOL, LEGEND & GENERAL NOTES
TY1.1	SECURITY OVERALL FIRST FLOOR PLAN
TY1.1A	SECURITY FIRST FLOOR PLAN - AREA A
TY1.1B	SECURITY FIRST FLOOR PLAN - AREA B
TY2.1	SECURITY OVERALL RCP PLAN
TY2.1A	SECURITY RCP PLAN - AREA A
TY2.1B	SECURITY RCP PLAN - AREA B
TY3.1	SECURITY DETAILS
TY3.2	SECURITY DETAILS
TY4.1	SECURITY WIRING DIAGRAMS

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STATE OF CONNECTICUT — MICHAEL LANE MALIK — 29627 — REG. 9193 — REGISTERED ARCHITECT

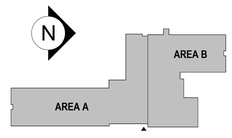
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

GENERAL INFORMATION

G1.0

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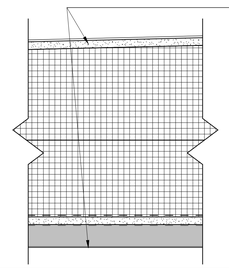
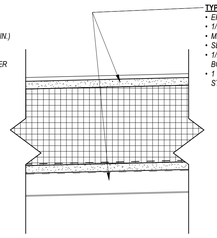
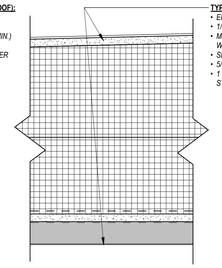
ROOF TYPES



TYPE R1 (FLAT ROOF):
- *EPDM ROOF MEMBRANE*
- *1/2" COVER BOARD*
- *MIN. 5" RIGID INSULATION (R-30 MIN.) WITH 1/4" TAPER ABOVE*
- *SELF ADHERED VAPOR BARRIER*
- *1/2" HIGH DENSITY POLYISO COVER BOARD*
- *1 1/2" METAL ROOF DECK SEE STRUCTURAL DRAWINGS*

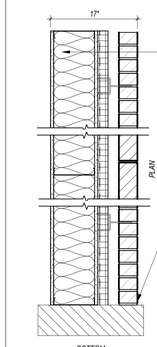


TYPE R2 (NEW ENTRY - SLOPED ROOF):
- *EPDM ROOF MEMBRANE*
- *1/2" COVER BOARD*
- *MIN. 5" RIGID INSULATION (R-30 MIN.)*
- *SELF-ADHERED VAPOR BARRIER*
- *1/2" HIGH DENSITY POLYISO COVER BOARD*
- *1 1/2" METAL ROOF DECK, SEE STRUCTURAL DRAWINGS*



TYPE R3 (FLAT ROOF):
- *EPDM ROOF MEMBRANE*
- *1/2" COVER BOARD*
- *MIN. 5" RIGID INSULATION (R-30 MIN.) WITH 1/4" TAPER ABOVE*
- *SELF ADHERED VAPOR BARRIER*
- *5/8 GLASS MAT ROOF BOARD*
- *1 1/2" METAL ROOF DECK SEE STRUCTURAL DRAWINGS*

WALL TYPES



WALL TYPE "F"	**R VALUE**
- *5/8" GWB*	*0.45*
- *METAL STUD @ 16" O.C.*	*0.46*
- *5/8" EXTERIOR SHEATHING*	*0.45*
- *MINERAL WOOL INSULATION (R-13 MIN.)*	*13.00*
- *SPRAY APPLIED WEATHER BARRIER*	*0*
- *2" RIGID INSULATION (R-10 MIN.)*	*10.00*
- *MASONRY TIES*	*0*
- *AIR CAVITY*	*0.46*
- *BRICK*	*0.39*
	25.21
OUTSIDE AIR FILM	*0.17*
INSIDE AIR FILM	*0.68*
R TOTAL	*26.06*

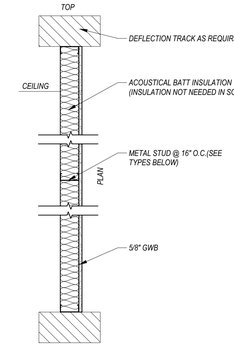
FACE BRICK MASONRY ANCHORS @ 16" O.C. HORIZ. AND VERT. TYPICAL

SEE WALL SECTIONS AND ELEVATIONS FOR LOCATIONS OF RECESSED BANDING, CAST STONE, AND WALL SPECIFIC ELEMENTS

TYPE F1: (6" STUD) *BRICK COLOR A*
TYPE F2: (8" STUD) *BRICK COLOR A*
TYPE F3: (8" STUD) *BRICK COLOR B*

TYPE F:

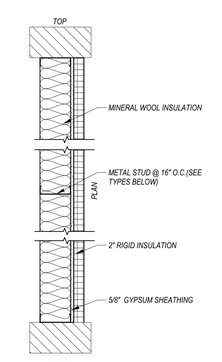
EXTERIOR



TYPE C1: (2 1/2" STUD)
TYPE C2: (3 5/8" STUD)
TYPE C3: (6" STUD)
TYPE C4: (8" STUD)
TYPE C5: (10" STUD)
TYPE C6: (12" STUD)

NOTE: *USE MOISTURE RESISTANT GYPSUM AT BATHROOMS.*

TYPE C:

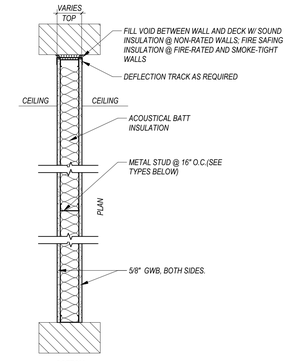


TYPE E: (6" STUD)

NOTE: SEE WALL SECTIONS AND EXTERIOR ELEVATIONS

TYPE E:

EXTERIOR

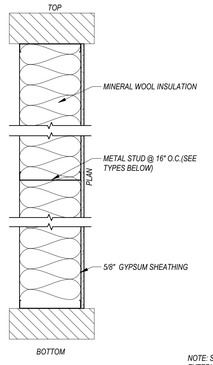


TYPE B1: (3 5/8" STUD)
TYPE B2: (6" STUD)
TYPE B3: (8" STUD)
TYPE B4: (10" STUD)
TYPE B5: (12" STUD)

NOTE: USE MOISTURE RESISTANT GYPSUM AT BATHROOMS

TYPE B:

STC-45 WALL

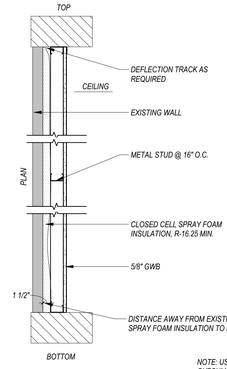


TYPE G: (12" STUD)

NOTE: SEE WALL SECTIONS AND EXTERIOR ELEVATIONS

TYPE G:

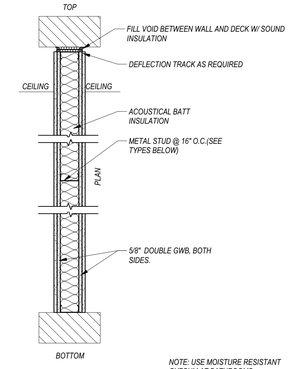
EXTERIOR



TYPE D1: (2 1/2" STUD)

NOTE: USE MOISTURE RESISTANT GYPSUM AT BATHROOMS

TYPE D:



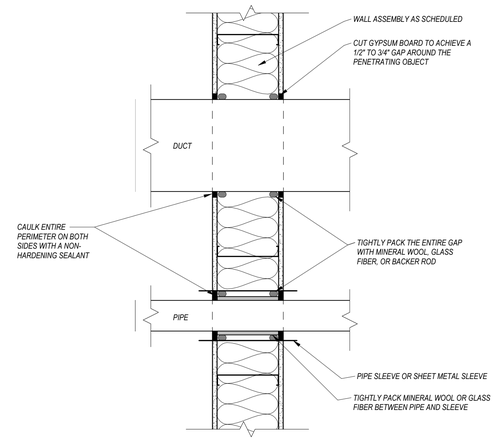
TYPE A1: (3 5/8" STUD)
TYPE A2: (6" STUD)
TYPE A3: (8" STUD)

NOTE: USE MOISTURE RESISTANT GYPSUM AT BATHROOMS

TYPE A:

STC-50 WALL

TYPICAL WALL PENETRATION DETAIL



QA+M architecture
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Farmington, CT 06032
qamarch.com

STATE OF CONNECTICUT · MICHAEL LANE MALIK · REG. 9193 · REGISTERED ARCHITECT

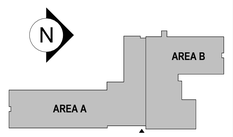
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

GENERAL INFORMATION

G1.1

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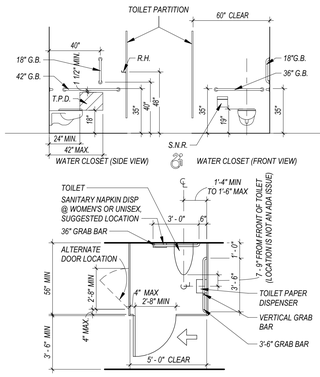
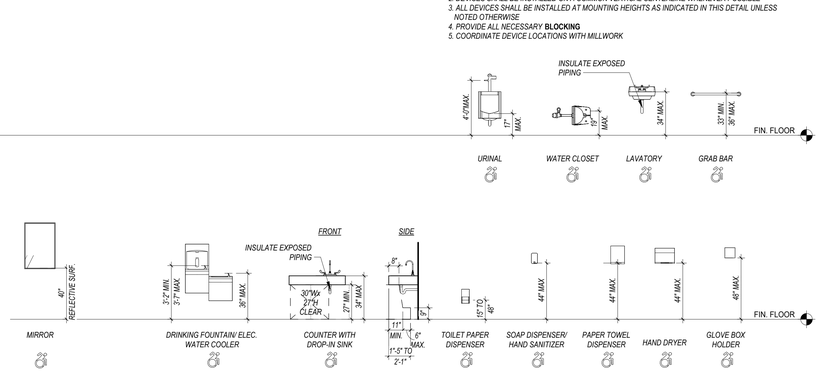
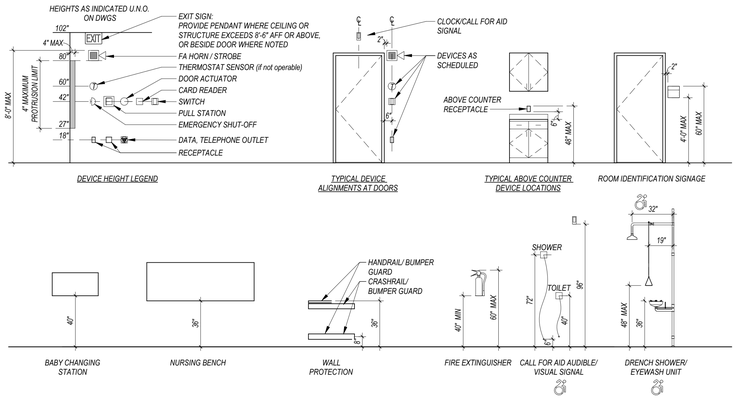
ADULT MOUNTING HEIGHTS & CLEARANCES

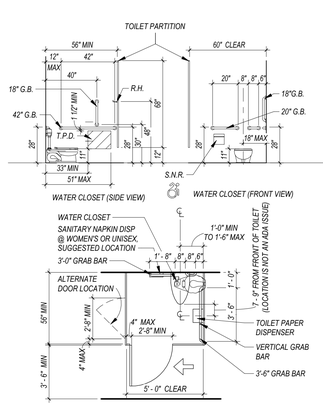


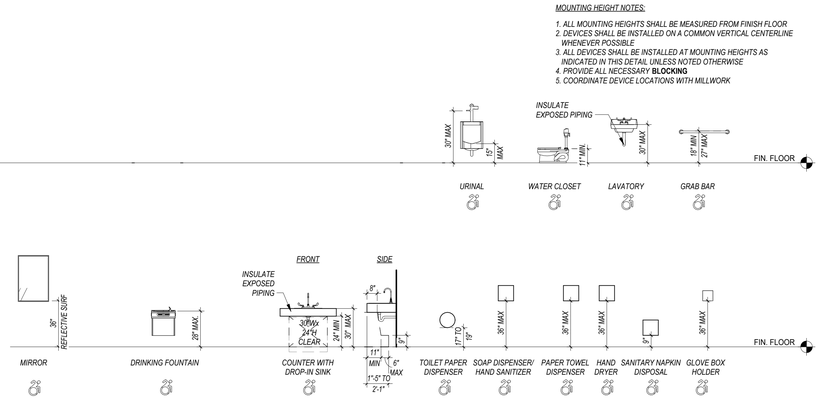


COMMON MOUNTING HEIGHTS & CLEARANCES



CHILD FIXTURE MOUNTING HEIGHTS





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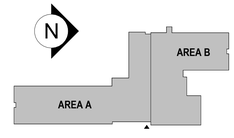
STATE OF CONNECTICUT · MARK MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

GENERAL INFORMATION

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Plumbing Code Calculations

Refer to IBC Chapter 29 and Table 29-A "Minimum Plumbing Fixtures" for specifics, exceptions, and footnotes.

OCCUPANCY: EDUCATION - E			OCCUPANTS: 956			(478 MALE 478 FEMALE)	
Educational facilities	WATER CLOSET		LAVATORIES		BATHTUBS OR SHOWERS	DRINKING FOUNTAINS	OTHER
	MALE	FEMALE	MALE	FEMALE			
REQUIRED:	10	10	10	10	–	10	1 Service Sink

CODES THIS PROJECT WAS DESIGNED TO

INTERNATIONAL BUILDING CODE	2021
IBC CONNECTICUT SUPPLEMENT	2022
INTERNATIONAL EXISTING BUILDING CODE	2021
INTERNATIONAL MECHANICAL CODE	2021
INTERNATIONAL PLUMBING CODE	2021
NFPA 70 NATIONAL ELECTRIC CODE	2020
INTERNATIONAL ENERGY CONSERVATION CODE	2021
CONNECTICUT FIRE SAFETY CODE	2022

REHABILITATION ACT 1973, SECTION 504
INCLUDING UNIFORM FEDERAL ACCESSIBILITY STANDARDS (UFAS) AND SECTION 504 REGULATIONS

ICC/ANSI A117.1 - 2017

THE AMERICANS WITH DISABILITIES ACT, TITLE II,
INCLUDING THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG) AND ADA REGULATIONS

(H) CURRENT CONNECTICUT PUBLIC HEALTH CODES
(O) CURRENT O.S.H.A. - TITLE 29/LABOR
(GS) CONNECTICUT GENERAL STATUTES

LIFE SAFETY LEGEND:

- AREA / 500 SF / 30 / 17 — EGRESS ROOM TAG; ROOM AREA; ROOM OCCUPANT LOAD FACTOR; NO. OF OCCUPANTS
- DOOR ### / 164 / 0 — STAIR / DOOR EGRESS TAG; ALLOWABLE OCCUPANT LOAD; ACTUAL OCCUPANT LOAD
- 2-HOUR SEPARATION
- 1-HOUR SEPARATION
- SMOKE SEPARATION
- Travel Distance — TRAVEL DISTANCE TAG; TRAVEL DISTANCE LINE
- START OF EGRESS TRAVEL PATH
- EXIT — EXIT POINT
- HC ACCESSIBLE ROUTE

BUILDING INFORMATION

RENOVATION FOR:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET BRISTOL, CT 06010

PROPOSED CONSTRUCTION START 2026

1. USE GROUP CLASSIFICATION (301)
PRIMARY EDUCATION (E)

2. CONSTRUCTION TYPE (602)
EXISTING/NEW CONSTRUCTION TYPE 2B

3. BUILDING HEIGHT (503) STORIES / FEET
ALLOWABLE HEIGHT [MOST RESTRICTIVE] 3 / 75 *
ACTUAL HEIGHT 1 / 16
* INCLUDES ALLOWABLE HEIGHT INCREASE AS ESTABLISHED WITH AUTOMATIC SPRINKLER SYSTEM (S)

4. BUILDING AREA (506)
[Interior face of exterior walls & Open Space Area]
USE GROUP *ACTUAL / ALLOWABLE
(E) 38,534 / 58,000 SF

ACTUAL FLOOR AREA = 38,534 SF
* INCLUDES ALLOWABLE AREA INCREASE AS ESTABLISHED WITH FRONTAGE INCREASE (506.3) AND AUTOMATIC SPRINKLER SYSTEM (S) SEE CALCULATIONS, THIS SHEET.

7. FIRE RESISTANCE RATINGS (601)
GENERAL BUILDING CONSTRUCTION 0 HOUR(S)
STAIR SHAFTS NA
ELEVATOR SHAFT NA
EXIT ACCESS CORRIDORS 0 HOURS
VERTICAL SHAFT N/A
SMOKE PARTITIONS 0 HOURS

8. OCCUPANT LOAD
DESIGN LOAD PER ROOM SEE CODE PLAN
TOTAL BUILDING OCCUPANCY 956 PEOPLE
TOTAL EXIT CAPACITY 1,695 PEOPLE

9. MODIFICATIONS N/A LOCAL APPROVAL / STATE APPROVAL
1. CODE SECTION: [Y / N] [Y / N]

10. HANDICAPPED ACCESSIBLE BUILDING [X] DESIGNATED [ ] NON-DESIGNATED

11. MINIMUM PLUMBING FIXTURE COUNT (2902.1)
TOTAL FACILITY O.L.: 956

FIXTURES		REQUIREMENTS	REQUIRED/PROVIDED
WATER CLOSETS	(E):	1/50 M - 1/50 F	20 / 22
LAVATORIES	(E):	1/50	20 / 22
DRINKING FOUNTAINS	(E):	1/50	10 / 6
SERVICE SINK		1	2

12. FIRE PROTECTION SYSTEMS
FIRE SUPPRESSION [X] FULL [ ] LIMITED [ ] NONE
FIRE DETECTION [X] FULL [ ] LIMITED [ ] NONE

13. NUMBER OF EXITS
EXITS REQUIRED 5
EXITS PROVIDED 5

14. TRAVEL DISTANCE
MAXIMUM TRAVEL DISTANCE ALLOWED (E) 250'-0"
ACTUAL TRAVEL DISTANCE SEE CODE PLAN

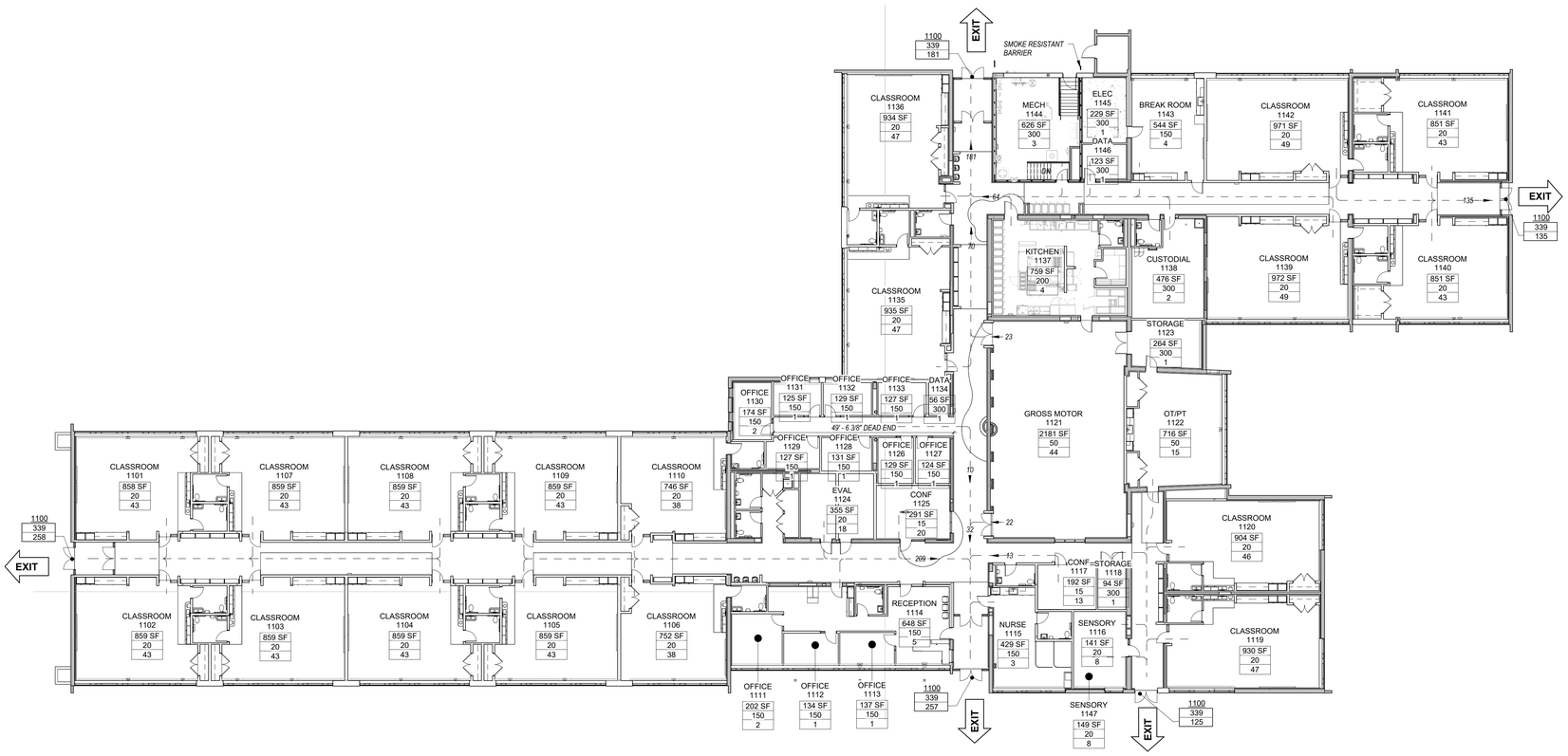
15. THRESHOLD BUILDING CONDITIONS [ ] YES [X] NO

16. BUILDING AREAS FOR GRANT CALCULATIONS (ENTIRE FACILITY)

EXISTING UNALTERED CONSTRUCTION	0 SF
EXISTING ALTERED CONSTRUCTION	38,534 SF
EXISTING BEING DEMOLISHED	0 SF
TOTAL EXISTING CONSTRUCTION	38,534 SF
TOTAL NEW CONSTRUCTION	0 SF
TOTAL FACILITY	38,534 SF

17. TOTAL CONSTRUCTED BUILDING AREA [To exterior face of Building]

BUILDING AREA, PER FLOOR	EXISTING / NEW / TOTAL
TOTAL BUILDING	39,923 / 0 / 39,923 SF



2 **LEVEL 1**
R1.0 1/16" = 1'-0"

QA+M architecture
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STATE OF CONNECTICUT — LANCE MALIK — REG. NO. 9193 — REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

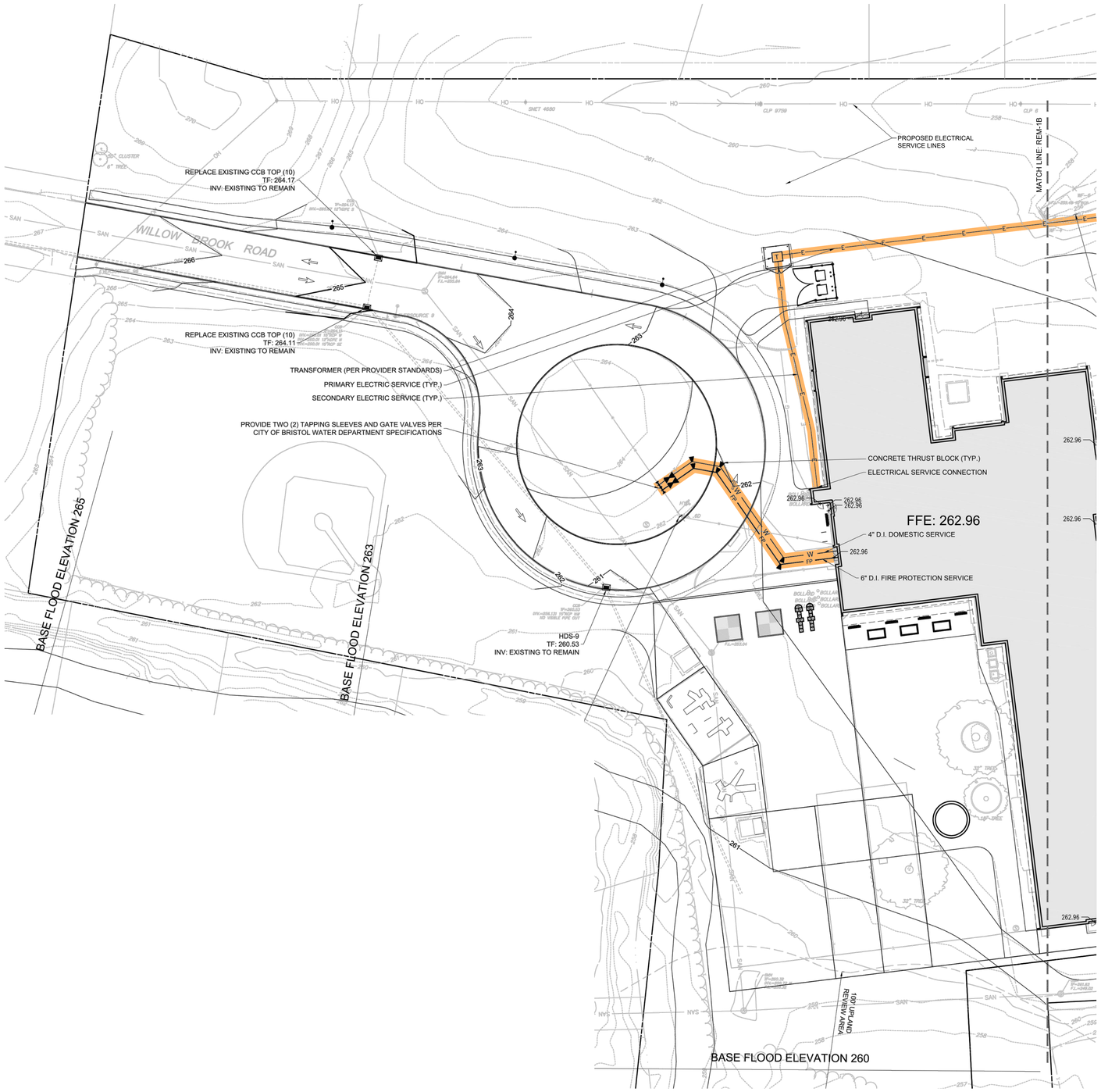
Revisions

AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

CODE INFORMATION

R1.0



1 REM-1A **SOIL MANAGEMENT SITE PLAN**
1" = 30'

SOURCE:
- SITE PLAN WAS CREATED FROM DRAWING NUMBER C3.0 TITLED "GRADING, DRAINAGE & UTILITY PLAN (WEST)" FOR EDGEWOOD PRE-K ACADEMY - CITY OF BRISTOL, QA+M OF FARMINGTON, CT DATED MARCH 20, 2026.
- DETAIL A WAS CREATED FROM DRAWING NUMBER FIGURE NO. 2 TITLED "CLOSURE SAMPLING LOCATIONS" FOR EDGEWOOD SCHOOL - CITY OF BRISTOL BY, HRP OF FARMINGTON, CT DATED 12/01/2025.

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- ROOF LEADER
- SANITARY MANHOLE
- S — SANITARY SEWER
- VENT — VENT LINE
- CLEANOUT
- W — WATER LINE / FIRE LINE
- W — WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WATER METER
- E — ELECTRIC / COMM. DUCT BANK
- G — GAS LINE
- GAS METER

GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- 123 — PROPOSED INTERMEDIATE CONTOUR
- 120 — PROPOSED INDEX CONTOUR
- 123.45 — TW 123.45 / BW 122.45 — PROPOSED SPOT ELEVATION
- 123.45 (MC) — MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- B-# — SOIL BORING LOCATION

SOIL CLASSIFICATION KEY:

- CONTAMINATED SOIL
- POLLUTED SOIL
- UNCONTAMINATED / CLEAN SOIL
- UNINVESTIGATED AREA

CONTAMINATED SOIL: SOIL EXHIBITING EXCEEDANCES OF PERTINENT CONTAMINANT CONCENTRATION LIMITS IN THE CONNECTICUT FORMER REMEDIATION STANDARD REGULATIONS (RSR'S) / RELEASE-BASED CLEAN-UP REGULATIONS (RBCR).

POLLUTED SOIL: SOIL EXHIBITING DETECTABLE CONCENTRATIONS OF CONTAMINANTS, INCLUDING METAL CONCENTRATIONS ABOVE TYPICAL BACKGROUND LEVELS, BUT AT CONCENTRATIONS BELOW PERTINENT FORMER RSR CRITERIA / RELEASE-BASED CLEAN-UP REGULATIONS (RBCR)

UNCONTAMINATED / CLEAN SOIL: SOIL EXHIBITING NO DETECTABLE CONCENTRATIONS OF CONTAMINANTS OR DETECTABLE CONCENTRATIONS OF CONTAMINANTS, INCLUDING METALS CONCENTRATIONS BELOW TYPICAL BACKGROUND RANGES.

UNINVESTIGATED AREA: SOILS WITHIN AREAS THAT HAVE NOT BEEN INVESTIGATED. THESE SOILS ARE CONSIDERED CONTAMINATED FOR BIDDING PURPOSES. CHARACTERISTIC SOIL TESTING CAN BE COMPLETED TO RECLASSIFY SOIL.

GENERAL NOTES:

1. THIS GENERAL SITE SOIL CHARACTERIZATION DRAWING IS INTENDED FOR USE BY THE CONTRACTOR IN ASSISTING WITH DEVELOPING THEIR BID RELATED TO ALL SITE WORK AS IT RELATES TO THE DISPOSITION OF SOIL GENERATED FROM THE PROPOSED WORK AREA. THIS DRAWING WAS BASED UPON EXISTING SOIL ANALYTICAL DATA COLLECTED FOR PRE-CONSTRUCTION SOIL TESTING IN 2026 AS PART OF DESIGN PROCESS.
2. EXCESS POLLUTED AND CONTAMINATED SOILS SHALL BE PROPERLY HANDLED AND DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01 57 05 AND SECTION 02 61 23 AND OTHER PROJECT SPECIFICATIONS AS APPLICABLE.
3. STRIP AND EXCAVATE POLLUTED AND CONTAMINATED SOILS AT DESIGNATED LOCATIONS AS REQUIRED BY SITE WORK ACTIVITIES. EXCESS POLLUTED AND CONTAMINATED SOILS SHALL BE PROPERLY DISPOSED OF BY THE CONTRACTOR IN ACCORDANCE WITH PROJECT SPECIFICATIONS SECTION 01 57 05 AND SECTION 02 61 23 AND OTHER PROJECT SPECIFICATIONS, AS APPLICABLE.
4. SOILS GENERATED FROM UNTESTED AREAS SHALL BE CLASSIFIED AS CONTAMINATED SOILS.
5. UNCONTAMINATED / CLEAN SOILS SHALL NOT BE COMINGLED WITH POLLUTED OR CONTAMINATED SOILS. UNCONTAMINATED SOILS MAY BE REUSED ON SITE, WHERE APPROPRIATE PER PROJECT SPECIFICATIONS. POLLUTED SOILS SHALL NOT BE COMINGLED WITH CONTAMINATED SOILS. POLLUTED SOILS MAY BE CONSIDERED FOR RE-USE WHERE APPROPRIATE PER PROJECT SPECIFICATIONS.
6. IT IS NOT THE INTENT OF THIS PROJECT TO EXCAVATE AND MANAGE OR DISPOSE OF CONTAMINATED OR POLLUTED SOILS BEYOND THE LIMITS OF THE WORK DESCRIBED IN THE ARCHITECT'S PLANS AND SPECIFICATIONS.
7. SOILS THAT WILL BE IMPACTED INCIDENTAL TO ANY WORK ON THE SITE ARE COVERED UNDER THESE PLANS AND SPECIFICATIONS AND ARE SUBJECT TO ALL SPECIFIED REQUIREMENTS.
8. IF POLLUTED AND CONTAMINATED SOILS ARE ENCOUNTERED THEY SHALL BE HANDLED IN ACCORDANCE WITH SECTION 01 57 05 AND SECTION 02 61 23.
9. MATERIAL FROM THE PAVEMENT RECLAMATION ON-SITE MAY BE CONSIDERED FOR RESUSE AS BASE MATERIAL BENEATH THE NEW PAVEMENT LAYER IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
10. DEWATERING IF NEEDED FOR UTILITY INSTALLATIONS WILL BE COMPLETED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
11. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IMPLEMENTED IN ACCORDANCE WITH PROJECT SPECIFICATIONS.
12. CALL-BEFORE-YOU-DIG (CBYD) / 811 IS REQUIRED TO BE CONTACTED PRIOR INTRUSIVE ACTIVITIES AT LEAST TWO BUSINESS DAYS BUT NOT MORE THAN 30 DAYS PRIOR TO INITIATION OF WORK.
13. EXECUTION AND HANDLING OF POLLUTED AND CONTAMINATED SOILS IS REQUIRED TO BE COMPLETED BY A GENERAL PERMIT TO ACT AS A CONTRACTOR TO CONTAIN OR REMOVE OR OTHERWISE MITIGATE THE EFFECTS OF CERTAIN RELEASES. (REGISTERED EXISTING RELEASE RESPONSE CONTRACTOR)
14. REFER TO MECHANICAL AND PLUMBING PLANS FOR BOILER ROOM AND CORRIDOR TRENCHING LOCATIONS NOT SOWN ON THIS DRAWING BUT INCLUDED IN THE CONTRACTORS BID FOR SOIL REMOVAL. SOIL REMOVED FROM WITHIN THE BOILER ROOM SHALL BE DISPOSED OF AS CONTAMINATED AND SOIL FROM THE INTERIOR TRENCHING SHALL BE DISPOSED OF AS POLLUTED.

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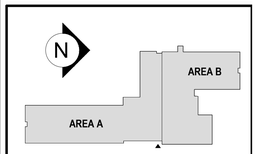
EAGLE Environmental, Inc.
150 MAIN STREET, SUITE B
BRISTOL, CONNECTICUT 06010
860-589-8257

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

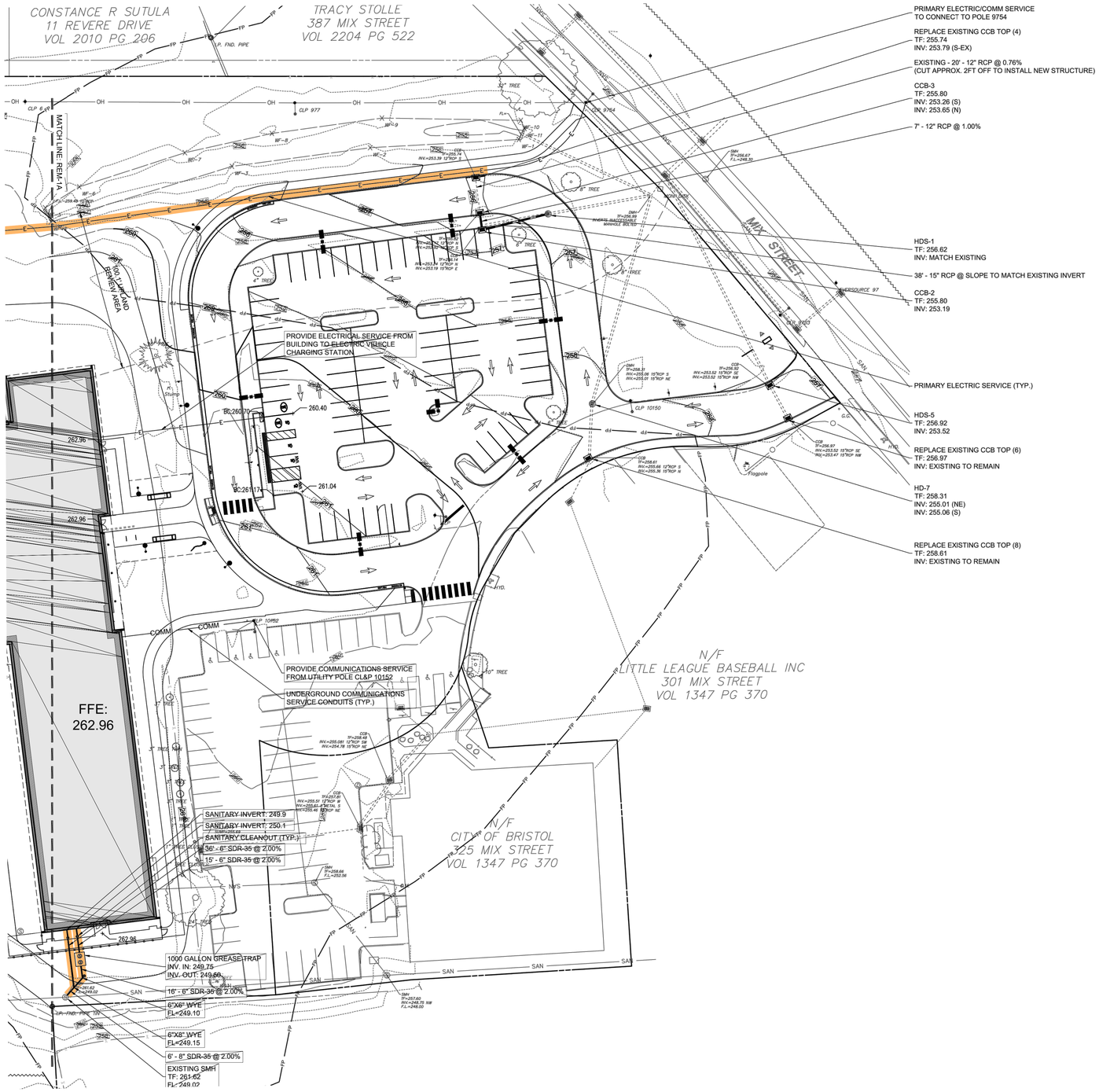
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SOIL MANAGEMENT PLAN

REM-1A


CONSTANCE R SUTULA
11 REVERE DRIVE
VOL 2010 PG 206
TRACY STOLLE
387 MIX STREET
VOL 2204 PG 522
MATCH LINE: REM-1A
MIX STREET
PROVIDE ELECTRICAL SERVICE FROM BUILDING TO ELECTRIC VEHICLE CHARGING STATION
PROVIDE COMMUNICATIONS SERVICE FROM UTILITY POLE CL&P 10152
UNDERGROUND COMMUNICATIONS SERVICE CONDUITS (TYP.)
FFE: 262.96
SANITARY INVERT: 249.9
SANITARY INVERT: 250.1
SANITARY CLEANOUT (TYP.)
36' - 6" SDR-35 @ 2.00%
15' - 6" SDR-35 @ 2.00%
1000 GALLON GREASE TRAP
INV. IN: 249.75
INV. OUT: 249.60
16' - 6" SDR-35 @ 2.00%
6"X6" WYE
FL=249.10
6"X6" WYE
FL=249.15
6' - 8" SDR-35 @ 2.00%
EXISTING SMH
TF: 261.62
FL: 249.02
PRIMARY ELECTRIC/COMM SERVICE TO CONNECT TO POLE 9754
REPLACE EXISTING CCB TOP (4)
TF: 255.74
INV: 253.79 (S-EX)
EXISTING - 20' - 12" RCP @ 0.76%
(CUT APPROX. 2FT OFF TO INSTALL NEW STRUCTURE)
CCB-3
TF: 255.80
INV: 253.26 (S)
INV: 253.65 (N)
7' - 12" RCP @ 1.00%
HDS-1
TF: 256.62
INV: MATCH EXISTING
38' - 15" RCP @ SLOPE TO MATCH EXISTING INVERT
CCB-2
TF: 255.80
INV: 253.19
PRIMARY ELECTRIC SERVICE (TYP.)
HDS-5
TF: 256.92
INV: 253.52
REPLACE EXISTING CCB TOP (6)
TF: 256.97
INV: EXISTING TO REMAIN
HD-7
TF: 258.31
INV: 255.01 (NE)
INV: 255.06 (S)
REPLACE EXISTING CCB TOP (8)
TF: 258.61
INV: EXISTING TO REMAIN
N/F
LITTLE LEAGUE BASEBALL INC
301 MIX STREET
VOL 1347 PG 370
N/F
CITY OF BRISTOL
325 MIX STREET
VOL 1347 PG 370
NO TOPSOIL AND REMOVE AREA
PROVIDE SILT SACK (TYP.)
CLP 10150
CLP 10152
CLP 977
CLP 6 x 6
P. FND. PIPE
Flagpole
HYD.
SMH
TF=256.67
FL=246.70
SMH
TF=256.99
INVERS: MANHOLE MANUAL WAS TBD
SMH
TF=258.66
FL=252.56
SMH
TF=257.60
INV=248.75 NW
FL=248.60
CCB
TF=256.99
INV=253.52 15"RCP SE
INV=253.52 15"RCP NW
CCB
TF=258.61
INV=255.66 12"RCP S
INV=255.36 15"RCP N
CCB
TF=258.97
INV=253.52 15"RCP SE
INV=253.47 15"RCP NW
CCB
TF=258.31
INV=255.06 15"RCP S
INV=255.01 15"RCP NE
CCB
TF=255.74
INV=253.74 12"RCP S
INV=253.39 12"RCP E
CCB
TF=255.80
INV=253.19 15"RCP E
INV=253.24 15"RCP S
CCB
TF=255.80
INV=255.08 12"RCP W
INV=254.78 15"RCP NE
CCB
TF=255.80
INV=255.51 12"RCP W
INV=255.41 METAL S
INV=255.46 15"RCP NE
BC=260.70
260.40
BC=261.17
261.04
262.96
262.96
262.96
SAN
STM
WTR
COMM
GAS
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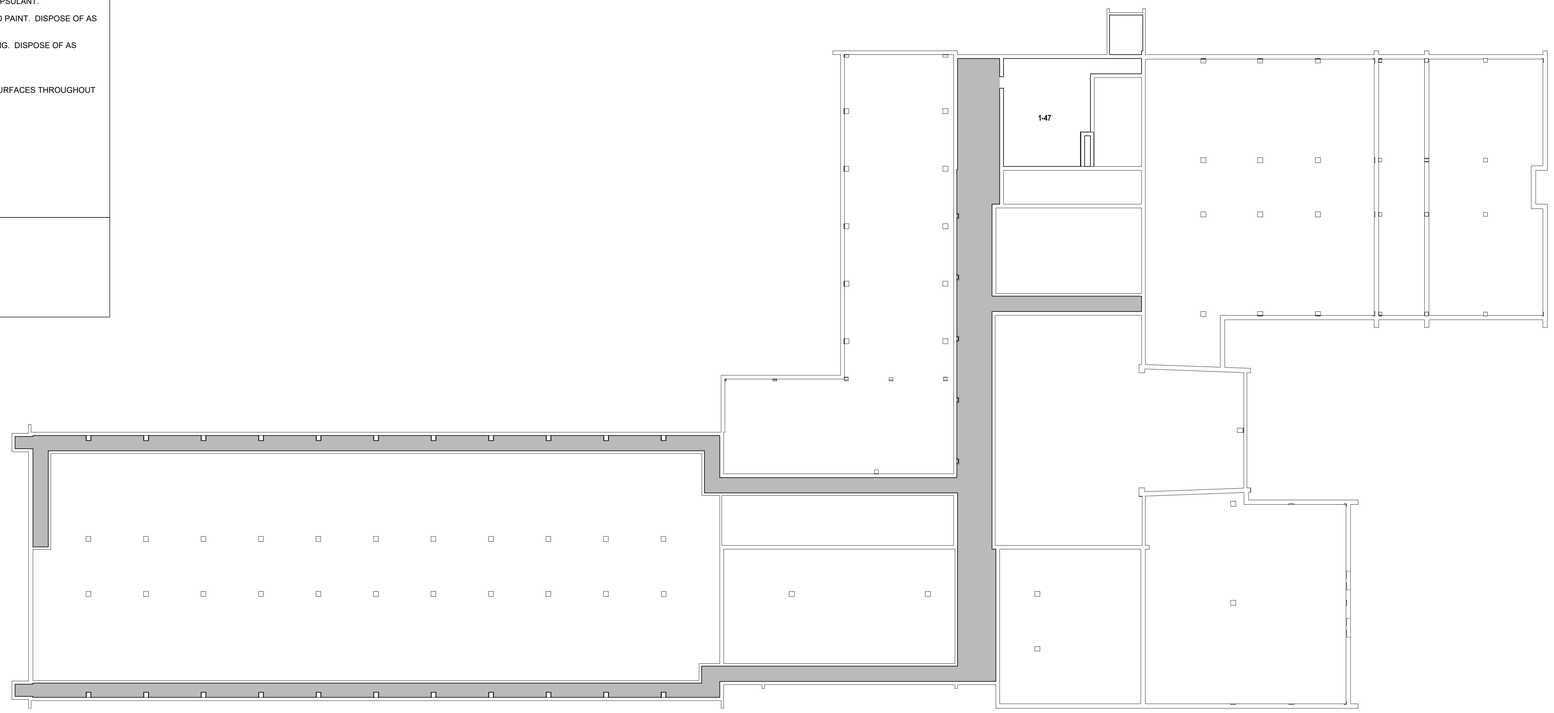

1 HM-1 **ABATEMENT-OVERALL FOUNDATION & TUNNEL PLAN**
1/16" = 1'-0"

QA+M architecture
QuinsenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

EAGLE Environmental, Inc.
150 MAIN STREET, SUITE B
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RENOVATIONS TO:
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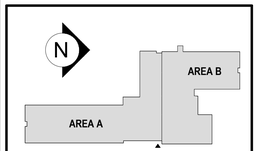

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ABATEMENT - FOUNDATION & TUNNEL PLAN

HM-1

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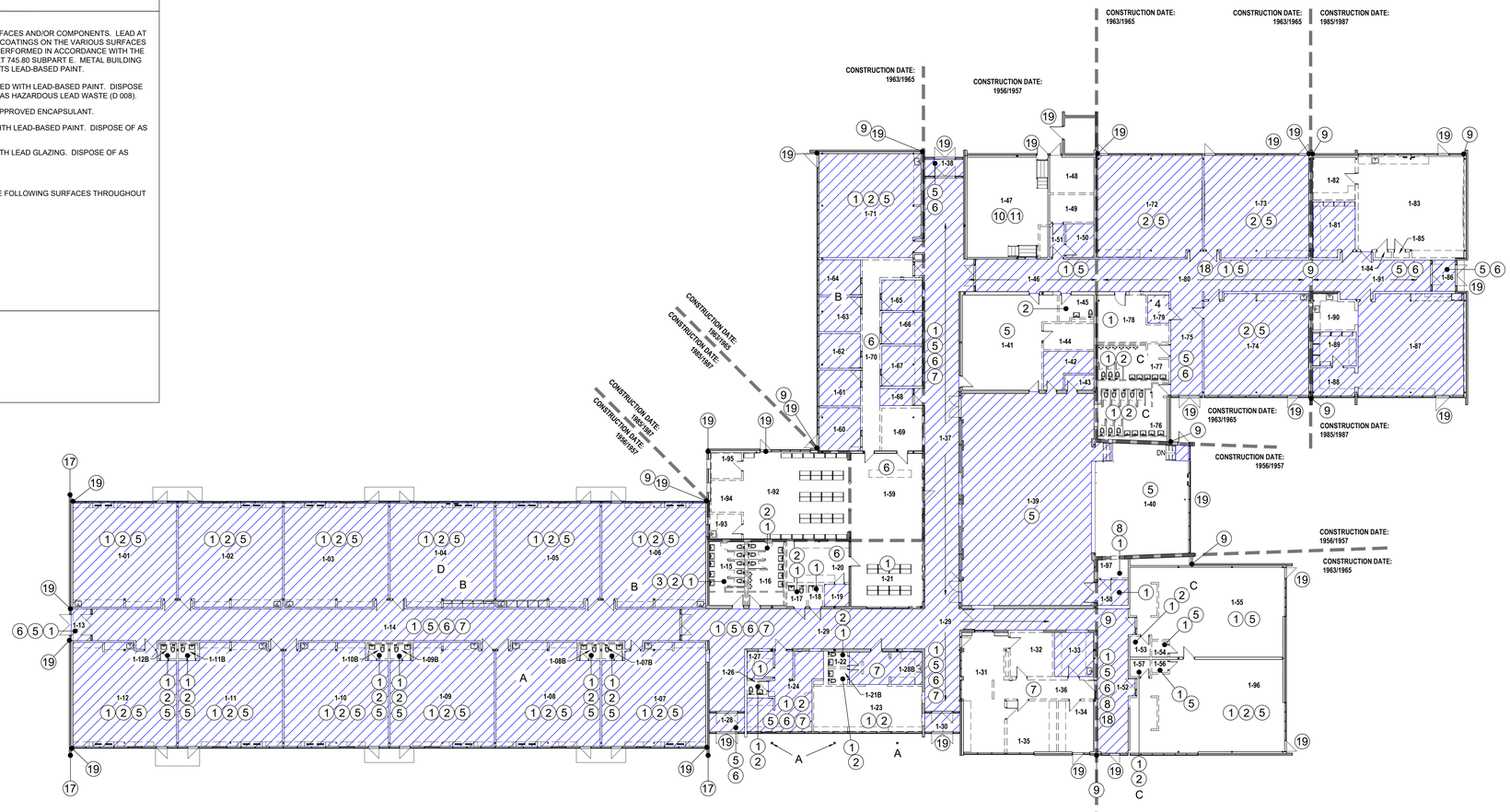

1 HM-2 **ABATEMENT-OVERALL FIRST FLOOR PLAN**
1/16" = 1'-0"

QA+M architecture
QuitsenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

EAGLE Environmental, Inc.
150 MAIN STREET, SUITE B
BRISTOL, CONNECTICUT 06010
860-589-8257

STATE OF CONNECTICUT
CHRISTOPHER LIBERTI
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ASBESTOS PROJECT DESIGNER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ABATEMENT - FIRST FLOOR PLAN

HM-2

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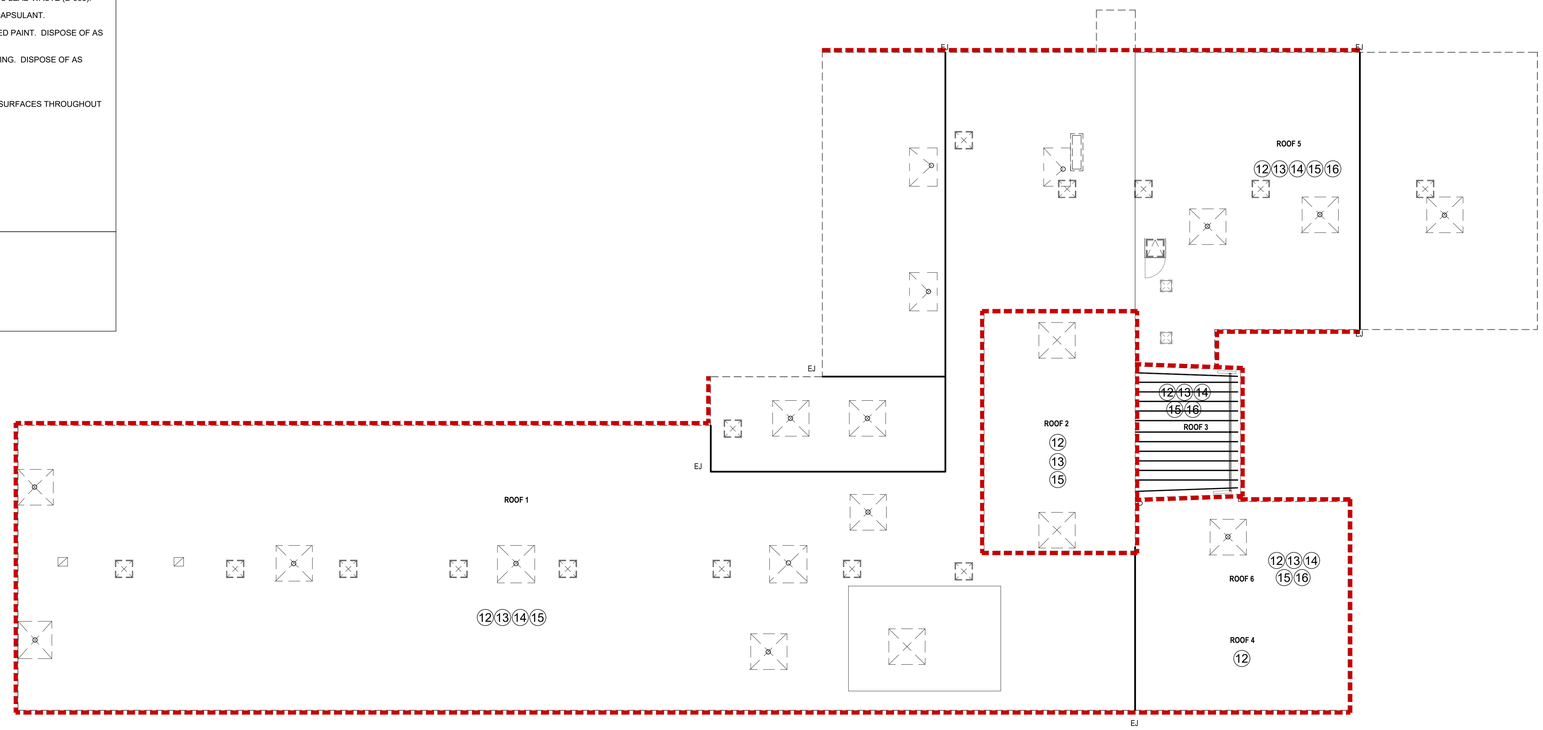

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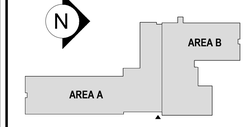

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ABATEMENT - ROOF PLAN

HM-3

LEGEND

UTILITY SERVICES (UNDERGROUND OR OVERHEAD)

- E — ELECTRIC SERVICE
- G — GAS PIPES
- SAN — SANITARY SEWER PIPES
- STORM WATER PIPES (LESS THAN 12")
- STORM WATER PIPES (12" OR LARGER)
- STM — STEAM PIPES (SUPPLY & COND.)
- T — TELEPHONE SERVICE
- W — WATER PIPES
- COM — COMMUNICATION/FIBER OPTIC SERVICE
- FP — FIRE PROTECTION PIPES
- UG — UNKNOWN UTILITY SERVICE
- OH — OVERHEAD WIRES

PROPERTY/BOUNDARY LINES

- PROPERTY/BOUNDARY LINES (CLASS A-2)
- PROPERTY/BOUNDARY LINES (CLASS U)
- EASEMENT LINES

FEATURE LINES

- CURBED ROADWAY
- EDGE OF PAVED ROAD/DRIVE
- BUILDING ROOFLINE (AERIAL PHOTOS)
- RETAINING WALL
- STOCKADE FENCE
- CHAIN LINK/WIRE FENCE
- TREE/VEGETATION LINE
- STONE WALL
- SURFACE WATER (WATERCOURSE)
- WETLANDS LIMIT
- EDGE OF LANDSCAPING
- INTERMEDIATE CONTOUR
- INDEX CONTOUR

SYMBOL LEGEND

- CATCH BASIN
- ROUND DRAIN
- SQUARE DRAIN
- STORM DRAIN MANHOLE
- ELECTRIC MANHOLE
- SANITARY MANHOLE
- STEAM MANHOLE
- TELEPHONE MANHOLE
- WATER MANHOLE
- MANHOLE (OF UNKNOWN TYPE)
- HAND HOLE (SQ. / REC.)
- WATER VALVE
- GAS VALVE
- HYDRANT
- COMBO STANDPIPE
- GUY WIRE
- SIGN (SINGLE POST)
- SIGN (DOUBLE POST)
- BORING (AS DRILLED)
- BORING (AS STAKED)
- SPOT ELEVATION
- WETLANDS FLAG
- PROPERTY MONUMENT
- UTILITY MONUMENT (SET AS 2' OFFSET)
- IRON PIPE OR REBAR FOUND
- IRRIGATION CONTROL BOX
- EMERGENCY PHONE
- TRAFFIC CONTROLLER CABINET
- UTILITY POLE
- UTILITY POLE W/ LIGHT
- STREET LIGHT
- LIGHT POST
- BOLLARD LIGHT
- BOULDER / ROCK
- CONIFER SHRUB
- DECIDUOUS SHRUB
- DECIDUOUS TREE (SAPLING)
- DECIDUOUS TREE
- CONIFER TREE

ABBREVIATIONS

A/C	AIR CONDITIONER
AT&T	AMERICAN TELEPHONE & TELEGRAPH COMPANY
BIT.	BITUMINOUS
BLK.	BLACK
CB	CATCH BASIN
COM	COMMUNICATION
CON.	CONIFER
CONC.	CONCRETE
CNG	CONNECTICUT NATURAL GAS
CL	CENTERLINE
CLF	CHAIN LINK FENCE
CL&P	CONNECTICUT LIGHT & POWER COMPANY
CP	CONTROL POINT
DEC.	DECIDUOUS
DMH	DRAINAGE MANHOLE
E	EAST OR ELECTRIC
EL.	ELECTRIC
ELEV	ELEVATION
EMH	ELECTRIC MANHOLE
F.L.	FLOW LINE
FND.	FOUND
GRAN.	GRANITE
GSTC	GRANITE STONE CURB
HELCO	HARTFORD ELECTRIC COMPANY
HYD.	HYDRANT
H.H.	HAND HOLE
L.P.	LIGHT POLE
MH	MANHOLE
M	METER
M.W.	MONITOR WELL
N	NORTH
NAD	NORTH AMERICAN DATUM
NAVD	NATIONAL AMERICAN VERTICAL DATUM
NE	NORTHEAST
N/F	NOW OR FORMERLY
NW	NORTHWEST
PVC	POLYVINYL CHLORIDE
P.I.V.	POST INDICATOR VALVE
RET.	RETAINING
RCP	REINFORCED CONCRETE PIPE
R.L.	RAIN LEADER
S	SOUTH OR SUPPLY
SE	SOUTHEAST
SW	SOUTHWEST
SAN.	SANITARY
SMH	SANITARY MANHOLE
SNET	SOUTHERN NEW ENGLAND TELEPHONE
STC	STONE CURB
STM	STEAM
TMH	TELEPHONE MANHOLE
TEL.	TELEPHONE
T.F.	TOP OF FRAME
UNK.	UNKNOWN
W	WATER OR WEST
W.G.	WATER GATE

MAP REFERENCES

1. LOVELAND ACRES SECTION 2 LAND IN BRISTOL, CONN OWNED BY ROBERT E LOVELAND SCALE 1IN = 40FT JULY 16, 1962 ADRIAN M MATTHEWS REG LAND SURVEYOR
2. SUBDIVISION OF LOTS #134-2 WILLOW BROOK ROAD BRISTOL, CONN OWNED BY ALICE H MELNIC & ROSE M HAYDEN SCALE 1"=40' DATE 6-10-85 BY A.F. LEPORE JR & ASSOCIATES P.C.
3. DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING CITY OF BRISTOL CONNECTICUT MAP SHOWING PROPOSED UTILITY EASEMENT OVER LOT 140 WILLOW BROOK ROAD BRISTOL, CT DATE OCT 24, 1989 SCALE 1"=20'
4. PLAN OF LAND IN BRISTOL, CONN OWNED BY GEORGE MELNIC SCALE 1IN= 50FT FEB 17 1959 ADRIAN M MATTHEWS SURVEYOR
5. MAP SHOWING PROPOSED SCHOOL SITE MIX STREET BRISTOL, CONN DEC 1955 SCALE 1"=100 C.M. PFENNIG CITY ENGINEER
6. PROPERTY SURVEY MAP OF REVISION TO LOTS LINES LOT 25 AND LOT 26 OWNED BY ROBERT LOVELAND BRISTOL, CONNECTICUT SCALE 1"=20' AUGUST 25, 2003 REVISED DECEMBER 14, 2004 BY ROBERT GREEN ASSOCIATES LLC
7. PROPERTY SURVEY MAP SHOWING ELIMINATION OF LOT 53 AND REVISION OF LOT LINES TO LOT 25 AND LOT 26 PREPARED FOR ROBERT LOVELAND EDROW ROAD BRISTOL, CONN SCALE 1"=30' FEBRUARY 9, 2005 REV FEBRUARY 15, 2005 BY ROBERT GREEN & ASSOCIATES LLC
8. RECORD SUBDIVISION PLAN VALMORE ROAD LOVELAND ACRES – SECTION 4 BRISTOL, CT PREPARED FOR LOVELAND BUILDERS 807 JEROME AVENUE BRISTOL, CT 06010 DATE SEPTEMBER 2006 SCALE 1"=40 REVISED 5/9/07 BY R.R. HILTBRAND ENGINEERS AND SURVEYORS
9. DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING CITY OF BRISTOL CONNECTICUT MAP OF LOT 140 A TO BE CONVEYED TO LITTLE LEAGUE BASEBALL INCORPORATED MIX STREET BRISTOL CONNECTICUT DATE NOV 1990 SCALE 1"=100
10. SUBDIVISION PLAN LAND IN BRISTOL CONN OWNED BY ALESSIO DELFINO SCALE 1IN = 40 FT SEPT 12, 1959 ADRIAN M MATTHEWS REG LAND SURVEYOR

SURVEY NOTES

1. THIS SURVEY AND MAP HAS BEEN PREPARED IN ACCORDANCE WITH THE REGULATIONS OF CONNECTICUT STATE AGENCIES, SECTIONS 20-300B-1 THRU 20-300B-20 AND THE "MINIMUM STANDARDS OF ACCURACY, CONTENT & CERTIFICATION FOR SURVEYS AND MAPS, AS AMENDED OCTOBER 26, 2018.
   - 1.1. THE TYPE OF SURVEY IS A PROPERTY/BOUNDARY, TOPOGRAPHIC AND GENERAL LOCATION SURVEY.
   - 1.2. THE BOUNDARY DETERMINATION CATEGORY IS RESURVEY.
   - 1.3. THE ACCURACIES ARE AS FOLLOWS:

HORIZONTAL CONTROL	CLASS "A-2"
VERTICAL CONTROL	CLASS "V-2"
BOUNDARY	CLASS "A-2"
TOPOGRAPHY	CLASS "T-2"

2. THE COORDINATES AND ELEVATIONS DEPICTED ON THE PLAN REPRESENT THE NAD '83 AND THE NAVD '88 DATUMS. COORDINATES WERE ESTABLISHED ON THE SITE BASED UPON GPS OBSERVATIONS TAKEN ON APRIL 2023 USING TRIMBLE GNSS RTK R10 RECEIVERS AND SOLUTIONS PROVIDED THROUGH THE KEYNET NETWORK.
3. UNDERGROUND UTILITIES (IF DEPICTED) HAVE BEEN COMPILED, IN PART, BASED UPON INFORMATION FURNISHED BY OTHERS. THIS INFORMATION IS TO BE CONSIDERED APPROXIMATE AND ALFRED BENESCH & COMPANY DOES NOT TAKE RESPONSIBILITY FOR SUBSEQUENT ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED INTO THIS PLAN AS A RESULT. ADDITIONALLY, OTHER SUCH FEATURES MAY EXIST ON THE SITE, THE EXISTENCES OF WHICH ARE UNKNOWN TO ALFRED BENESCH & COMPANY. THE SIZE, LOCATION AND EXISTENCE OF ALL SUCH FEATURES MUST BE FIELD DETERMINED AND VERIFIED BY THE APPROPRIATE AUTHORITIES PRIOR TO ANY CONSTRUCTION. CALL "CALL BEFORE YOU DIG" 1-800-922-4455.
4. THE SUBJECT PROPERTY'S CURRENT DEED CAN BE FOUND IN VOLUME 347 PAGE 184 AND VOLUME 343 PAGE 70
5. THE PROPERTY IS LOCATED IN THE "R-15" ZONE PER TOWN.
6. THE PROPERTY LIES WITHIN THE FLOOD ZONE AE BASE FLOOD ELEVATION 260 AND "OTHER AREAS ZONE 'X' – AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN." PER THE FEMA FLOOD INSURANCE RATE MAP HARTFORD COUNTY, CONNECTICUT (ALL JURISDICTIONS) PANEL 458 OF 675 MAP NUMBER: 09003C0458F EFFECTIVE DATE: SEPTEMBER 26, 2008
7. TOTAL PARCEL AREA IS 691,916 SQ. FT. = 15.884 AC.
8. WETLAND WERE FIELD VERIFIED ON 11/19/2025 BY MARTIN BROGIE CERTIFIED SOIL SCIENTIST.
9. THE PROPERTY IS LOCATED WITHIN A LEVEL A – AQUIFER PROTECTION AREA, ANY PROPOSED ACTIVITY REQUIRES A REVIEW BY BRISTOL AQUIFER PROTECTION AGENCY.

STATE OF CONNECTICUT — DAVID A. CARICCHIO — No. 70036 — LICENSED LAND SURVEYOR

TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS MAP IS SUBSTANTIALLY CORRECT AS DEPICTED AND NOTED HEREON.

6/3/2026

DAVID A. CARICCHIO, P.L.S. No. 70036 — *DATE*

ALFRED BENESCH & COMPANY, GLASTONBURY, CONNECTICUT

(not valid without original signature and embossed seal)

PAPER SIZE: C LAYOUT NAME: SV01-REV
VIEWNAME:
LAYER MANAGER NAME:
PLOT TABLE: STB

REVISIONS

No.	DATE	DESCRIPTION

SURVEY BOOK:
SURVEYOR: NDC-AG
DRAWN: DAC
CHECKED: RS
APPROVED: WW

SCALE: HORZ.: 1" = 60'
SURVEY DATUM: HORZ.: NAD 1983
VERT.: NAVD 1988

GRAPHIC SCALE 60 0 30 60

Prepared By:

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Phone (860) 633-8341, Fax: (860) 633-1068
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TOPOGRAPHIC SURVEY
PREPARED FOR
CITY OF BRISTOL
EDGEWOOD SCHOOL
MIX STREET & WILLOW BROOK ROAD
BRISTOL CONNECTICUT

PROJ. No.: 0726-500158
DATE: NOV 2025

SV.01

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Date of Plot: June 03, 2026 - 10:54 AM

TOPOGRAPHIC SURVEY
PREPARED FOR
CITY OF BRISTOL
EDGEWOOD SCHOOL
MIX STREET & WILLOW BROOK ROAD
BRISTOL CONNECTICUT

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SCALE: HORZ.: 1" = 20'
SURVEY DATUM: HORZ.: NAD 1983
VERT.: NAVD 1988

GRAPHIC SCALE
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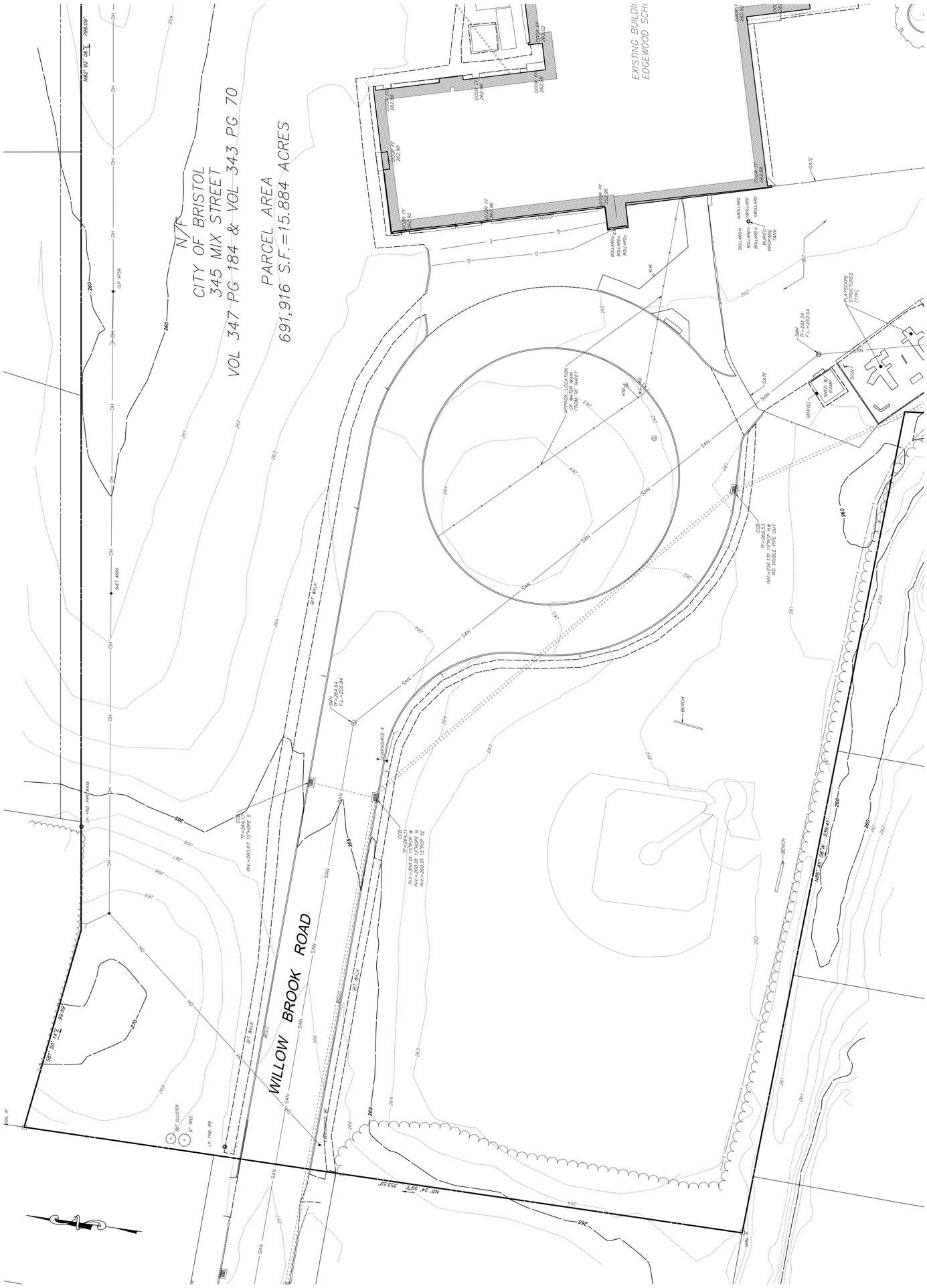
		REVISIONS



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PROJ. No.:	0726-500158
DATE:	NOV 2025

SV.03

TOPOGRAPHIC SURVEY
PREPARED FOR
CITY OF BRISTOL
EDGEWOOD SCHOOL
MIX STREET & WILLOW BROOK ROAD
BRISTOL CONNECTICUT

Prepared By:

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GRAPHIC SCALE
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No.	DATE	DESCRIPTION

REVISIONS

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DRAWN: DAC	
CHECKED: RS	
APPROVED: WW	

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Date of Plot: June 03, 2026 - 11:05 AM

LEGEND

UTILITY SERVICES (UNDERGROUND OR OVERHEAD)

E	ELECTRIC SERVICE
G	GAS PIPES
SAN	SANITARY SEWER PIPES
	STORM WATER PIPES (LESS THAN 12")
S	STORM WATER PIPES (12" OR LARGER)
STM	STEAM PIPES (SUPPLY & COND.)
T	TELEPHONE SERVICE
W	WATER PIPES
COM	COMMUNICATION/FIBER OPTIC SERVICE
FP	FIRE PROTECTION PIPES
UG	UNKNOWN UTILITY SERVICE
OH	OVERHEAD WIRES

PROPERTY/BOUNDARY LINES

- PROPERTY/BOUNDARY LINES (CLASS A-2)
- PROPERTY/BOUNDARY LINES (CLASS D)
- EASEMENT LINES

NATURE LINES

- CURBED ROADWAY
- EDGE OF PAVED ROAD/DRIVE
- BUILDING ROOFLINE (AERIAL PHOTOS)
- RETAINING WALL
- STOCKADE FENCE
- CHAIN LINK/WIRE FENCE
- TREE/VEGATATION LINE
- STONE WALL
- SURFACE WATER (WATERCOURSE)
- WETLANDS LIMIT
- EDGE OF LANDSCAPING
- INTERMEDIATE CONTOUR
- INDEX CONTOUR

SYMBOL LEGEND

- CATCH BASIN
- ROUND DRAIN
- SQUARE DRAIN
- STORM DRAIN MANHOLE
- ELECTRIC MANHOLE
- SANITARY MANHOLE
- STEAM MANHOLE
- TELEPHONE MANHOLE
- WATER MANHOLE
- MANHOLE (OF UNKNOWN TYPE)
- HAND HOLE (SQ. / REC.)
- W.G. WATER VALVE
- G.G. GAS VALVE
- HYDRANT
- COMBO STANDPIPE
- GUY WIRE
- SIGN (SINGLE POST)
- SIGN (DOUBLE POST)
- BORING (AS DRILLED)
- BORING (AS STAKED)
- x 427.3 SPOT ELEVATION
- WETLANDS FLAG
- PROPERTY MONUMENT
- UTILITY MONUMENT (SET AS 2' OFFSET)
- IRON PIPE OR REBAR FOUND
- IRRIGATION CONTROL BOX
- EMERGENCY PHONE
- TRAFFIC CONTROLLER CABINET
- UTILITY POLE
- UTILITY POLE W/ LIGHT
- STREET LIGHT
- LIGHT POST
- BOLLARD LIGHT
- BOULDER / ROCK
- CONIFER SHRUB
- DECIDUOUS SHRUB
- DECIDUOUS TREE (SAPLING)
- DECIDUOUS TREE
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ABBREVIATIONS

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AT&T	AMERICAN TELEPHONE & TELEGRAPH COMPANY
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M	METER
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N/F	NOW OR FORMERLY
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PVC	POLYVINYL CHLORIDE
P.I.V.	POST INDICATOR VALVE
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RCP	REINFORCED CONCRETE PIPE
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SW	SOUTHWEST
SAN.	SANITARY
SMH	SANITARY MANHOLE
SNET	SOUTHERN NEW ENGLAND TELEPHONE
SQ	SQUARE
STM	STEAM
TMH	TELEPHONE MANHOLE
TEL	TELEPHONE
T.F.	TOP OF FRAME
UNK.	UNKNOWN
W	WATER OR WEST
W.G.	WATER GATE

REVISIONS		
No.	DATE	DESCRIPTION

SURVEY BOOK:
SURVEYOR: NDC-AG
DRAWN: DAC
CHECKED: RS
APPROVED: WW

SCALE: HORZ.: 1" = 20'
SURVEY DATUM: HORZ.: NAD 1983
VERT.: NAVD 1988

GRAPHIC SCALE 20 0 10 20

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TOPOGRAPHIC SURVEY
PREPARED FOR
CITY OF BRISTOL
EDGEWOOD SCHOOL
MIX STREET & WILLOW BROOK ROAD
BRISTOL CONNECTICUT

PROJ. No.: 0726-500158
DATE: NOV 2025

SV.04

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Date of Plot: June 03, 2026 - 11:06 AM

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Date of Plot: June 03, 2026 - 11:07 AM

TOPOGRAPHIC SURVEY
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MIX STREET & WILLOW BROOK ROAD
BRISTOL CONNECTICUT

SV.05

PROJ. No.: 0726-500158
DATE: NOV 2025

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GRAPHIC SCALE
20 10 0 20

No.	DATE	DESCRIPTION

REVISIONS

SURVEY BOOK:
SURVEYOR: NDC-AG
DRAWN: DAC
CHECKED: RS
APPROVED: WW

N71° 54' 10"W 342.58'
N71° 54' 10"W 342.58'
N71° 54' 10"W 342.58'

LEGEND

	0 SF	DISTURBANCE WITHIN WETLANDS
	40,555 SF	DISTURBANCE WITHIN 100' UPLAND REVIEW AREA
	39,955 SF	DISTURBANCE WITHIN FLOODPLAIN
	31,685 SF	DISTURBANCE WITHIN FLOODWAY

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qamarch.com

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860-633-8341

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

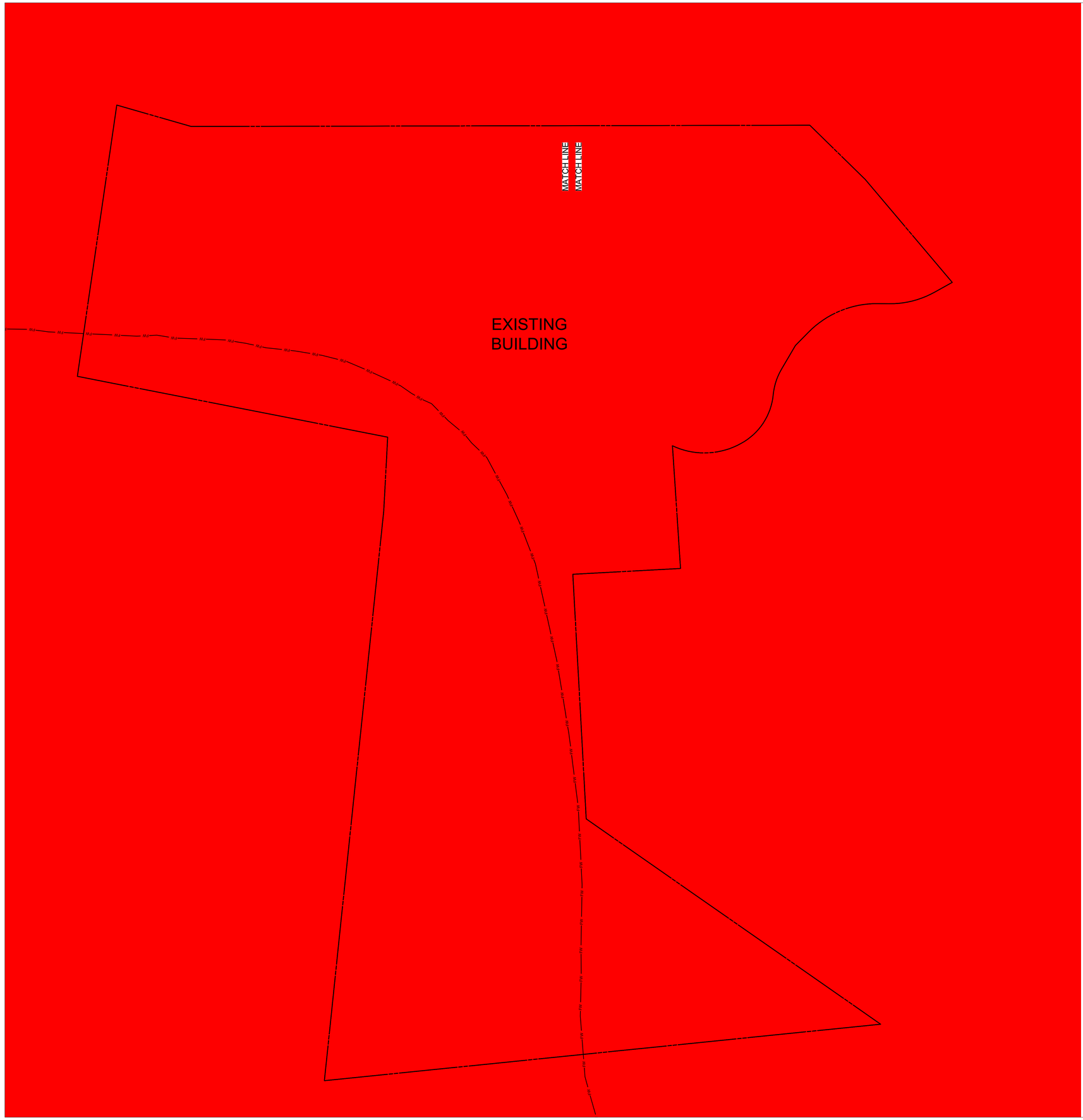
STATE OF CONNECTICUT
LICENSED PROFESSIONAL ENGINEER

0 50' 100'
SCALE: 1" = 50'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INLAND WETLANDS FLOODWAY & FLOODPLAIN IMPACT PLAN

C0.1



LEGEND

FINAL ADOPTED AQUIFER PROTECTION - AQUIFER PROTECTION AREA: WHITES BRIDGE LOWER

NOTES:

1. AQUIFER PROTECTION MAPPING IS BASED ON THE CONNECTICUT DEPARTMENT OF THE ENERGY AND ENVIRONMENTAL PROTECTION (DEEP) "AQUIFER PROTECTION AREA INTERACTIVE MAP". DATE OF ACCESS: 03/30/2026

Connecticut Department of ENERGY & ENVIRONMENTAL PROTECTION

79 Elm Street • Hartford, CT 06106-5127 www.ct.gov/deep Affirmative Action/Equal Opportunity Employer

AQUIFER PROTECTION AREA GUIDANCE

Best Management Practices for Temporary Construction and Reconstruction Operations in Aquifer Protection Areas

Issues and Concerns
Potential groundwater quality concerns include stormwater, fuel, and other maintenance chemicals associated with vehicles, machinery, and equipment.

Guidance/Recommendations
For the protection of ground water quality at construction operations in aquifer protection areas, DEEP recommends the following:

Temporary Construction Measures

- Significant fuel, chemical or other hazardous materials storage and handling, including fueling of construction vehicles, should be located outside well field area and aquifer protection area.
- No repair or maintenance of construction vehicles or washing of construction vehicles is permitted within the aquifer protection area.
- Any necessary temporary storage should be aboveground, protected from rainfall, and on an impervious containment surface.
- An emergency spill and response plan should be developed, including coordination with the water supplier.
- The site access should be adequately secured at all times to prohibit any unauthorized disposal of waste materials.

Stormwater Pollution Prevention Measures:

- Ways to minimize pollutant load (sand, salt, etc.) should be examined.
- Deicing management areas should be established including low salt use areas, alternative chemical or sand methods.
- Wellhead protection signs shall be posted in clear visibility of the highway at the entrance and exit points of the aquifer protection area and at ½ mile intervals.

Drainage System Design Criteria:

- Select best management practices from the DEEP stormwater manual based on treatment effectiveness and low groundwater pollution potential.

CT Department of Energy and Environmental Protection 6/29/2016

- Sheetflow and swale collection is encouraged, where possible, outside of immediate well field area.
- Catch basins and curbs should be used in immediate wellhead area to divert and control runoff and spills away from wellhead.
- Dry wells or similar subsurface leaching structures should not be used for stormwater disposal from paved or other areas that have high potential to pollute groundwater; existing structures which have high potential to pollute groundwater should be removed or converted.
- Gross particle/oil separators (well concentrator type) may be used for pretreatment of consecutive catch basins. Deep catch basins (minimum 4' deep and tight construction, with baffles, may also be used).
- Stormwater discharge points shall outlet to aboveground land surface or basin type structures. Significant or critical discharge points should have a basin designed with a forebay (tight soil or lined) capable of containing an 8,000-10,000 gallon spill volume and 3-6 feet above water table, 4 feet above bedrock.
- Potential strategic groundwater monitoring should be considered.

For questions or more information, please contact the Aquifer Protection Area Program at 860-424-3040 or visit our website at www.ct.gov/deep/aquiferprotection.

CT Department of Energy and Environmental Protection 7/7/2014

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

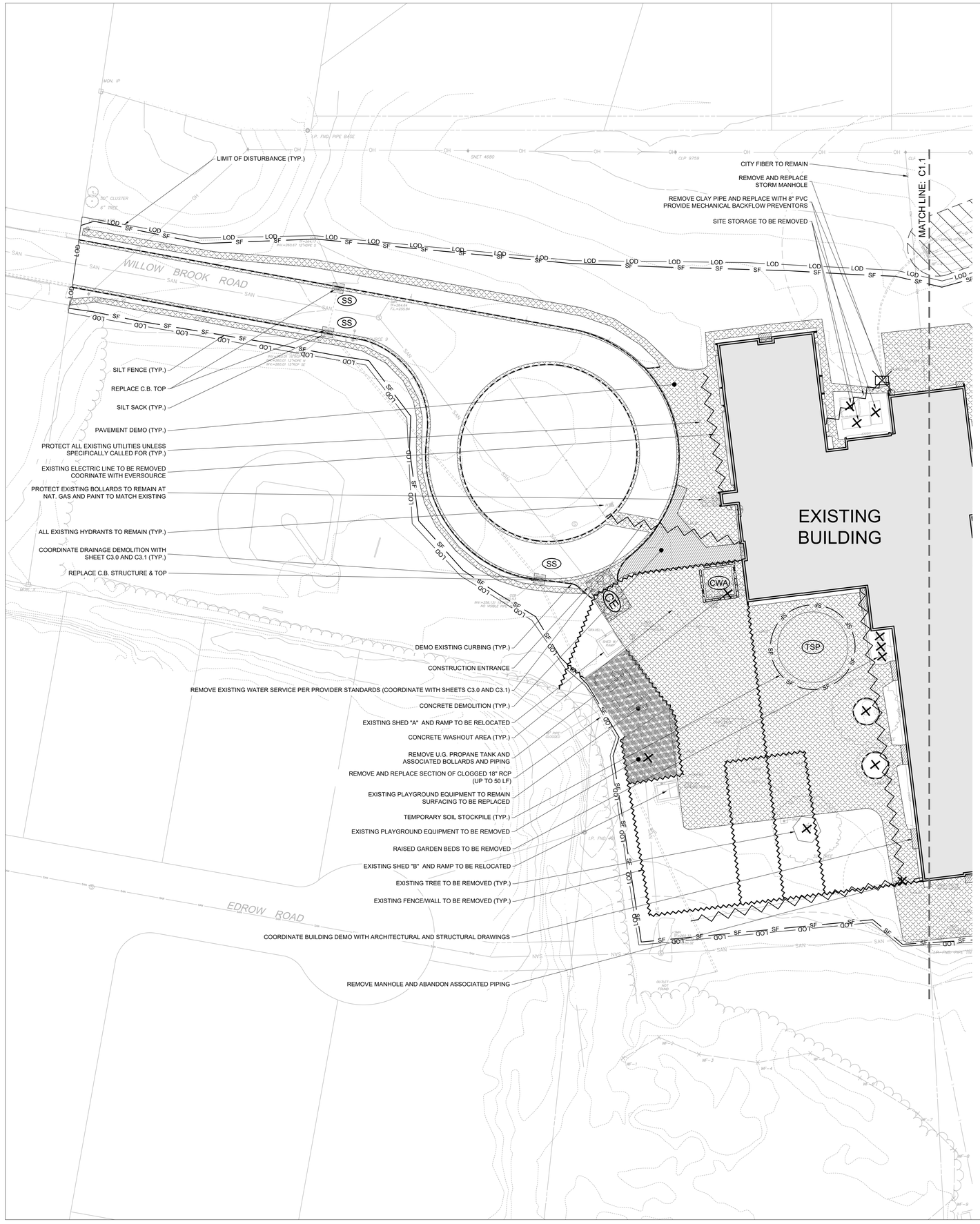
STATE OF CONNECTICUT
LICENSED PROFESSIONAL ENGINEER
28064

0 50' 100'
SCALE: 1" = 50'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

AQUIFER PROTECTION PLAN

C0.2



EROSION & SEDIMENTATION CONTROL LEGEND

- SILT FENCE
- HAYBALES
- SILT SACKS
- RIP RAP
- CONSTRUCTION ENTRANCE
- TEMPORARY DIVERSION
- TEMPORARY SEDIMENTATION TRAP
- EROSION CONTROL BLANKET
- TEMPORARY SEDIMENTATION BASIN

DEMOLITION & SITE PREPARATION LEGEND

- CURB TO BE REMOVED
- BIT. PAVEMENT TO BE REMOVED
- CONC. PAVEMENT TO BE REMOVED
- CONSTRUCTION FENCE
- SITE ELEMENT TO BE REMOVED
- SITE ELEMENT TO BE RELOCATED
- FENCE/WALL TO BE REMOVED
- LEDGE/ROCK TO BE REMOVED
- VEGETATION TO BE REMOVED/GRUBBED
- TREE TO BE REMOVED
- TREE PROTECTION
- TREE TO BE TRANSPLANTED
- NEW LOCATION FOR EXISTING TREE
- UTILITY PIPE TO BE REMOVED
- STRUCTURE TO BE REMOVED
- STRUCTURE TO BE RAISED OR LOWERED

NOTES:

1. ALL STORM STRUCTURES ARE TO HAVE TOPS, FRAMES, AND GRATES/COVERS REPLACED IN KIND UNLESS OTHERWISE NOTED.
2. ALL SANITARY STRUCTURES TO HAVE FRAMES AND COVERS REMOVED AND REPLACED IN KIND UNLESS OTHERWISE NOTED.
3. ALL EXISTING STORM AND SANITARY PIPING TO REMAIN IS TO BE VIDEO INSPECTED AND REPORT PROVIDED TO ENGINEER FOR REVIEW.
4. EXISTING WATER SERVICE TO BE REMOVED BACK TO GATE VALVE AT MAIN.
5. EXISTING ELECTRICAL SERVICE TO BE REMOVED BACK TO CONNECTION POINT.
6. GAS SERVICE TO REMAIN AND BE PROTECTED AT ALL TIMES DURING CONSTRUCTION.
7. ALL EXISTING UTILITY STRUCTURES, FRAMES, AND COVERS TO BE ADJUSTED TO PROPOSED GRADES ACCORDINGLY.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

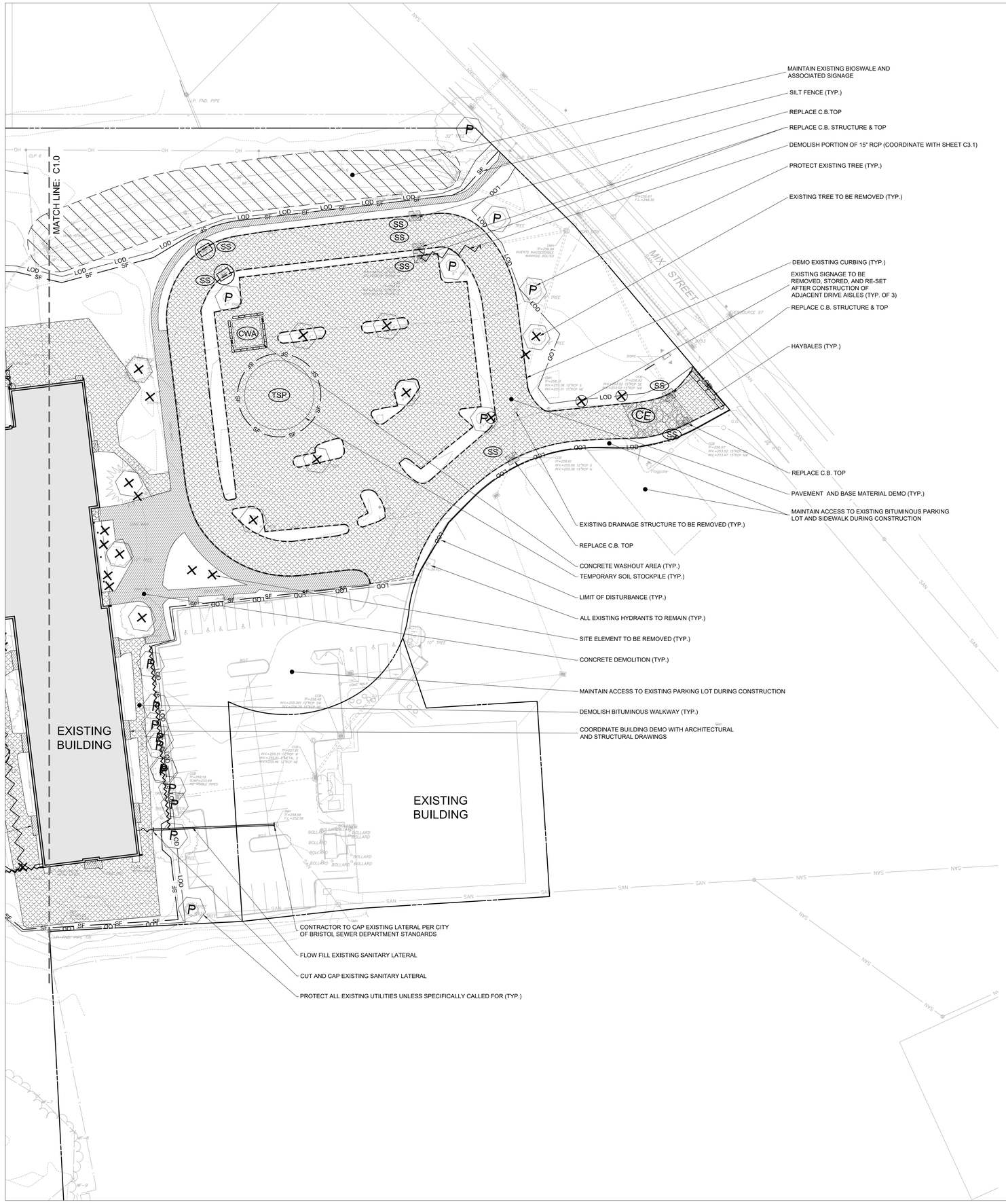
STATE OF CONNECTICUT
CHRISTOPHER J. SCRITTORE
28064
LICENSED
PROFESSIONAL ENGINEER

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMOLITION, EROSION & SEDIMENTATION CONTROL PLAN (WEST)

C1.0



EROSION & SEDIMENTATION CONTROL LEGEND

- SF — SILT FENCE
- HB — HAYBALES
- SS — SILT SACKS
- RIP RAP
- CE — CONSTRUCTION ENTRANCE
- TEMPORARY DIVERSION
- TST — TEMPORARY SEDIMENTATION TRAP
- ECB — EROSION CONTROL BLANKET
- TSB — TEMPORARY SEDIMENTATION BASIN

DEMOLITION & SITE PREPARATION LEGEND

- CURB TO BE REMOVED
- BIT. PAVEMENT TO BE REMOVED
- CONC. PAVEMENT TO BE REMOVED
- CONSTRUCTION FENCE
- SITE ELEMENT TO BE REMOVED
- SITE ELEMENT TO BE RELOCATED
- FENCE/WALL TO BE REMOVED
- LEDGE/ROCK TO BE REMOVED
- VEGETATION TO BE REMOVED/GRUBBED
- TREE TO BE REMOVED
- P — TREE PROTECTION
- TAG # — TREE TO BE TRANSPLANTED
- TAG # — NEW LOCATION FOR EXISTING TREE
- UTILITY PIPE TO BE REMOVED

NOTES:

1. ALL STORM STRUCTURES ARE TO HAVE TOPS, FRAMES, AND GRATES/COVERS REPLACED IN KIND UNLESS OTHERWISE NOTED.
2. ALL SANITARY STRUCTURES TO HAVE FRAMES AND COVERS REMOVED AND REPLACED IN KIND UNLESS OTHERWISE NOTED.
3. ALL EXISTING STORM AND SANITARY PIPING TO REMAIN IS TO BE VIDEO INSPECTED AND REPORT PROVIDED TO ENGINEER FOR REVIEW.
4. EXISTING WATER SERVICE TO BE REMOVED BACK TO GATE VALVE AT MAIN.
5. EXISTING ELECTRICAL SERVICE TO BE REMOVED BACK TO CONNECTION POINT.
6. GAS SERVICE TO REMAIN AND BE PROTECTED AT ALL TIMES DURING CONSTRUCTION.
7. ALL EXISTING UTILITY STRUCTURES, FRAMES, AND COVERS TO BE ADJUSTED TO PROPOSED GRADES ACCORDINGLY.

QA+M architecture
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195 Scott Swamp Road
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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

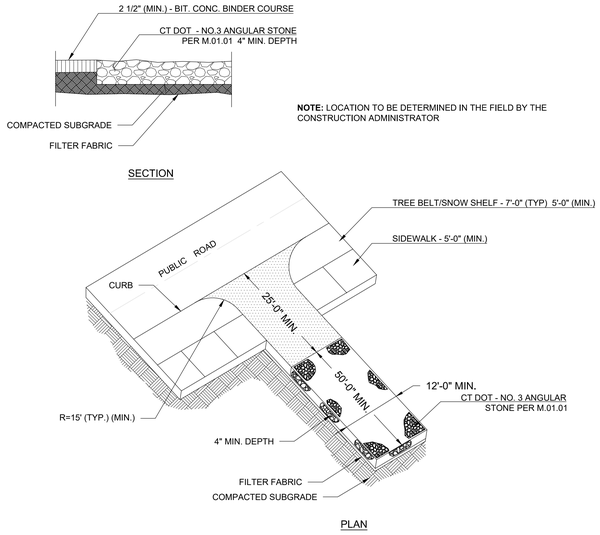
STATE OF CONNECTICUT
JAMES G. SCRITTON
28064
LICENSED
PROFESSIONAL ENGINEER

0 30' 60'
SCALE: 1" = 30'

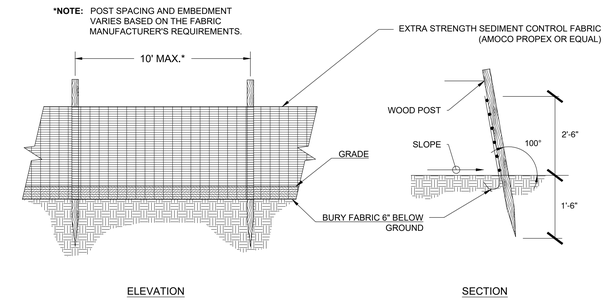
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMOLITION, EROSION & SEDIMENTATION CONTROL PLAN (EAST)

C1.1



CONSTRUCTION ENTRANCE (CE)
N.T.S.



SILT FENCE BARRIER (SF)
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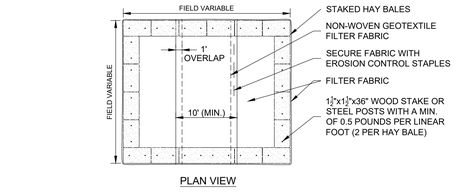
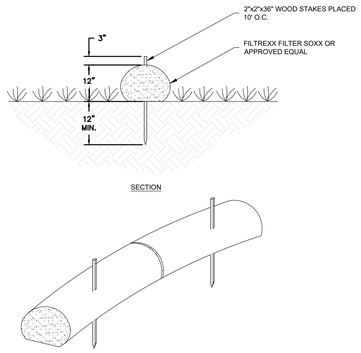


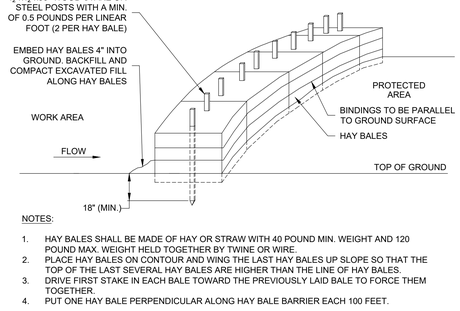
NOTES:

1. CONSTRUCT WASHOUT AREA LARGE ENOUGH TO ENSURE MATERIALS WILL BE CONTAINED WHERE WASTE CONCRETE CAN SOLIDIFY IN PLACE AND EXCESS WATER CAN SAFELY EVAPORATE.
2. WASHOUT AREA SHALL BE LARGE ENOUGH TO RETAIN ALL LIQUID AND WASTE CONCRETE MATERIALS FROM WASHOUT OPERATION.
3. WEEKLY INSPECTIONS OF WASHOUT AREAS SHALL BE CONDUCTED TO ASSESS THE HOLDING CAPACITY AND FUNCTIONALITY OF THE WASHOUT AREA.

TEMPORARY CONCRETE WASHOUT AREA (CWA)
N.T.S.



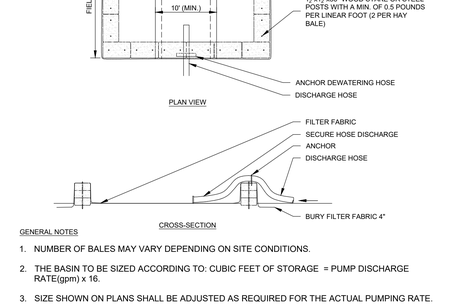
FILTER SOCK
N.T.S.



NOTES:

1. HAY BALES SHALL BE MADE OF HAY OR STRAW WITH 40 POUND MIN. WEIGHT AND 120 POUND MAX. WEIGHT HELD TOGETHER BY TWINE OR WIRE.
2. PLACE HAY BALES ON CONTOUR AND WING THE LAST HAY BALES UP SLOPE SO THAT THE TOP OF THE LAST SEVERAL HAY BALES ARE HIGHER THAN THE LINE OF HAY BALES.
3. DRIVE FIRST STAKE IN EACH BALE TOWARD THE PREVIOUSLY LAID BALE TO FORCE THEM TOGETHER.
4. PUT ONE HAY BALE PERPENDICULAR ALONG HAY BALE BARRIER EACH 100 FEET.

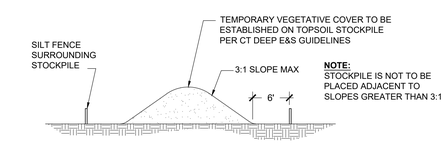
HAY BALE BARRIER (HB)
N.T.S.



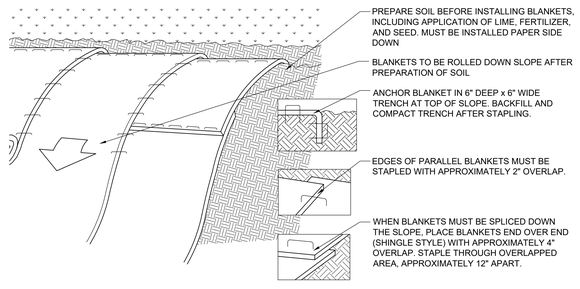
GENERAL NOTES

1. NUMBER OF BALES MAY VARY DEPENDING ON SITE CONDITIONS.
2. THE BASIN TO BE SIZED ACCORDING TO: CUBIC FEET OF STORAGE = PUMP DISCHARGE RATE(gpm) x 16.
3. SIZE SHOWN ON PLANS SHALL BE ADJUSTED AS REQUIRED FOR THE ACTUAL PUMPING RATE.

DEWATERING STRAW BALE BASIN
SCALE: NONE



TEMPORARY STOCKPILE (STK)
N.T.S.



SLOPE STABILIZATION USING EROSION CONTROL BLANKET (ECB)
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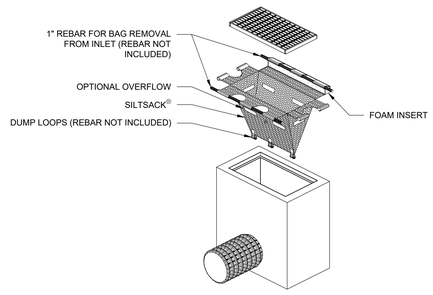

'SILTSACK' SEDIMENT CONTROL DEVICE, TERRAFIX GEOSYNTHETICS INC. TORONTO, ONTARIO, CA WWW.TERRAFIXGEO.COM

SILT SACK DETAIL (SS)
N.T.S.

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RENOVATIONS TO:
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMOLITION, EROSION & SEDIMENTATION CONTROL DETAILS

C1.2

SITE PREPARATION NOTES:

1. CONTRACTOR SHALL NOTIFY "CALL BEFORE YOU DIG" (1-800-922-4455) AND VERIFY UTILITY MARK-OUT WITH THE OWNER PRIOR TO THE INITIATION OF ANY SITE DISTURBANCE.
2. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR VERIFICATION OF THE LOCATION AND NATURE OF ALL SUBSURFACE UTILITIES AT THE PROJECT WHICH MAY BE AFFECTED BY THE WORK. COORDINATE WITH RESPECTIVE UTILITY OWNERS AND PERFORM VERIFICATION OF TYPE, LOCATION, AND INVERTS AS REQUIRED.
3. PROTECT ALL IMPROVEMENTS NOT INCLUDED WITHIN THE LIMITS OF WORK. ANY IMPROVEMENT WHICH IS DAMAGED SHALL BE REPAIRED OR REPLACED IN-KIND TO THE OWNER'S SATISFACTION.
4. DURING DEMOLITION, PROTECT ALL ADJACENT CURBING, SIDEWALKS, RAMPS, ABOVE-GRADE AND BELOW-GRADE UTILITIES, DRAINAGE STRUCTURES, LIGHT BASES, AND OTHER IMPROVEMENTS POTENTIALLY AFFECTED BY THE WORK. CLEARLY DELINEATE THE LIMITS OF WORK AND MARK, BARRICADE, OR OTHERWISE IDENTIFY THOSE IMPROVEMENTS THAT ARE TO BE PROTECTED AND/OR AVOIDED. ANY IMPROVEMENT WHICH IS DAMAGED SHALL BE REPAIRED OR REPLACED IN-KIND TO THE OWNER'S SATISFACTION.
5. THE LOCATIONS OF EXISTING SITE FEATURES AS SHOWN HAVE BEEN OBTAINED FROM MAPS, SURVEYS, FIELD INSPECTIONS, AND OTHER AVAILABLE INFORMATION. THEY MUST BE CONSIDERED APPROXIMATE BOTH TO LOCATION, SIZE, AND AS-BUILT CONDITION AND ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DETERMINING ACTUAL FIELD CONDITIONS.
6. THE DIMENSIONS SHOWN ON THE PLANS, INCLUDING THE INTENDED DIMENSIONS OF THE WORK, MAY VARY FROM ACTUAL EXISTING CONDITIONS IN THE FIELD. THE CONTRACTOR SHALL TAKE APPROPRIATE MEASUREMENTS TO VERIFY ALL DIMENSIONS SHOWN ON THE DRAWINGS AS WELL AS OTHER DIMENSIONS HE MAY DEEM APPROPRIATE TO FACILITATE THE COMPLETION OF THE WORK. NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN EXISTING CONDITIONS AND THE CONTRACT DOCUMENTS BEFORE PROCEEDING WITH THAT PORTION OF THE WORK.
7. IMPLEMENTING WORKER SAFETY AND/OR HEALTH PROTOCOLS THAT ADDRESS COMPLIANCE WITH RULES, LAWS, AND REGULATIONS PERTAINING TO CONSTRUCTION SAFETY AND/OR THE POTENTIAL AND/OR ACTUAL RISK OF EXPOSURE TO SITE-SPECIFIC PHYSICAL OR CHEMICAL HAZARDS IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.
8. PRIOR TO THE TERMINATION, ABANDONMENT, OR REMOVAL OF ANY UTILITY, VERIFY THAT APPLICABLE NOTIFICATIONS HAVE BEEN MADE TO THE UTILITY OWNER/OPERATOR AND THAT THE UTILITY HAS BEEN PROPERLY TERMINATED, CAPPED, OR PLUGGED AS REQUIRED.
9. PROVIDE PAVEMENT SAWCUT AT THE EDGE OF EACH PAVEMENT REMOVAL AREA TO ESTABLISH A CLEAN EDGE WHERE NEW WORK WILL MEET EXISTING PAVEMENT. SAWCUT SHALL BE A MINIMUM OF 12 INCHES FROM EDGE OF PAVEMENT REMOVAL.
10. UNLESS OTHERWISE INDICATED, ALL DISTURBED AREAS SHALL BE RESTORED WITH SIX (6) INCHES OF LOAM, SEEDED, FERTILIZED, AND MULCHED. PROVIDE ADDITIONAL EROSION CONTROLS AS REQUIRED.
11. ALL SIDEWALK CLOSURES AND MEASURES FOR TEMPORARY PEDESTRIAN ACCESS, SIDEWALKS, CROSSINGS, AND BIKE LANES SHALL MEET THE APPROVAL OF THE TOWN OF BRISTOL.

EROSION AND SEDIMENTATION CONTROL NARRATIVE:

PER STATE OF CONNECTICUT
ALL APPLICABLE PRACTICES RECOMMENDED BY THE 2023 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL AS AMENDED.

DESCRIPTION

THE PROPOSED PROJECT CONSISTS OF RENOVATING THE EXISTING SCHOOL, EDGEWOOD PRE-K ACADEMY. THE SITE IS TO BE FULLY REHABILITATED WITH MATERIALS MOSTLY BEING REPLACED IN KIND TO EXISTING CONDITIONS. THE BUILDING IS TO REMAIN WITH IMPROVEMENTS BEING MADE TO THE INTERIOR AND FASCIA.

DESIGN AND CRITERIA

NOTE: THE CONTRACTOR SHALL NAME ONE INDIVIDUAL AS HIS SEDIMENT AND EROSION CONTROL SUPERVISOR WHOSE PRIMARY RESPONSIBILITY WILL BE THE MAINTENANCE OF ALL ON-SITE EROSION CONTROL MEASURES. HE WILL KEEP A DAILY LOG OF HIS ACTIVITIES AND AN UPDATED SCHEDULE OF PROPOSED CONSTRUCTION ACTIVITIES. THE LOG WILL BE MADE AVAILABLE TO INSPECTORS.

A. GEOTEXTILE SILT FENCE (SF) - SHALL BE NON-WOVEN MATERIAL, MINIMUM 36" HIGH AND FASTENED TO WOOD STAKES. SILT FENCE SHALL BE INSTALLED WITH END RUNS TURNED UP GRADE AT 45 DEGREES FOR A DISTANCE OF 10 FEET (SEE DETAIL).

B. TEMPORARY SEEDING (TS)

1. CONTRACTOR SHALL SCARIFY THE SOIL TO A DEPTH OF 2" BEFORE APPLYING FERTILIZER, LIMESTONE AND SEED.
2. SEED MAY BE APPLIED BY HAND OR MECHANICALLY. SEED APPLICATION SHALL BE UNIFORM. SEED RATE SHALL BE IN ACCORDANCE WITH THE 2023 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL AS AMENDED (INCREASE SEEDING RATES BY 10% WHEN HYDROSEEDING, LIMESTONE, FERTILIZER AND SEED MAY BE APPLIED IN SLURRY.)
3. CONTRACTOR SHALL MULCH AREA (MS) IMMEDIATELY FOLLOWING SEEDING. (NOTE: IN THE EVENT SEEDING OPERATIONS ARE NOT FEASIBLE DUE TO SEASONAL RESTRICTIONS OR EXTENDED INCLEMENT WEATHER PATTERNS, THE CONTRACTOR SHALL INSTALL AN EROSION CONTROL BLANKET OVER EXPOSED SOILS.)

C. PERMANENT SEEDING (PS)

1. CONTRACTOR SHALL APPLY TOPSOIL AND FINE GRADE ALL AREAS BEFORE THE APPLICATION OF PERMANENT SEED. APPLY LIMESTONE AND FERTILIZER AS NEEDED, IN ACCORDANCE WITH SOIL TESTS.
2. REMOVE ALL SURFACE STONES ½ INCH AND LARGER. REMOVE ALL OTHER DEBRIS AND RAKE SEED BED.
3. APPLY SEED WITHIN 7 DAYS AFTER ESTABLISHING FINAL GRADES. SEE PLANTING PLAN.

D. STRAW BALE BARRIER (HB) - SHALL BE MADE OF STRAW WITH 40 POUNDS MINIMUM WEIGHT AND 120 POUNDS MAXIMUM WEIGHT, HELD TOGETHER BY TWINE OR WIRE. (SEE DETAIL.)

E. CONSTRUCTION ENTRANCE (CE) - SHALL BE AN ANGULAR STONE PAD, A MINIMUM OF 12' WIDE AND 50' LONG. (SEE DETAIL).

F. EROSION CONTROL BLANKET (ECB) - EROSION MAT SHALL BE PLACED ON ALL EXPOSED CUT/FILL SLOPES STEEPER THAN 3:1 (INCLUDING SWALES & DITCHES) TO PROTECT AGAINST RAINFALL AND HOLD MOISTURE CONTENT TO ENHANCE VEGETATION GROWTH IN SEEDED AREAS. MAT (OR BLANKETS) SHALL BE STRAW OR STRAW/COCONUT FIBER COMBINATION SEWN TOGETHER WITH LIGHTWEIGHT NETTING. USE NORTH AMERICAN GREEN. S150 - SLOPES UP TO 3:1, SC150-SLOPES FROM 3:1 UP TO 2:1 OR GREATER. TEMPORARY HAY MULCH TO BE APPLIED TO AREAS LESS THAN 3:1 SLOPE AND ALL AREAS TO BE LEFT BARREN OVER THE WINTER, MULCH RATE TO BE 70 POUNDS/1000 S.F.

APPLICATION/GENERAL PROCEDURES

SOIL EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED PRIOR TO ANY SITE DISTURBANCE, AND DEVELOPMENT WILL PROCEED ACCORDING TO A SPECIFIC CONSTRUCTION SEQUENCE. THE OBJECTIVE IS TO MAXIMIZE THE REDUCTION OF SEDIMENT-LADEN RUNOFF THROUGH IMPLEMENTATION OF CONVENTIONAL SOIL SEDIMENTATION AND EROSION CONTROL PRACTICES CURRENTLY RECOMMENDED BY THE 2023 CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL

A. EARTHWORK WILL BE SCHEDULED FOR PERIODS WHEN SOIL SATURATION IS LOW AND SOIL LOSS HAZARD IS AT A MINIMUM.
B. SUSPEND EARTHWORK FOR MAJOR STORM EVENTS AND IMPLEMENT ADDITIONAL SEDIMENTATION AND EROSION CONTROL MEASURES AS NECESSARY.
C. THERE SHALL BE NO CUTS OR FILL LEFT EXPOSED FOR LONGER THAN 30 DAYS. THE ESTABLISHED PROCEDURE OF TEMPORARILY SEEDING AND/OR COVER WITH EROSION PROTECTION (MAT OR STRAW) SHALL BE FOLLOWED TO INSURE MINIMAL SOIL LOSS.
D. THE DISCHARGE OF UNTREATED STORMWATER TO ANY ADJACENT ROADWAYS, DRAINAGE INLETS, OR PROPERTIES IS NOT ALLOWED.

EROSION AND SEDIMENT CONTROL NOTES:

1. THIS PLAN IS FOR EROSION AND SEDIMENTATION (E&S) CONTROL ONLY. SEE OTHER PLANS FOR THE SCOPE OF CONSTRUCTION WORK.
2. THE MEASURES SPECIFIED HEREON ARE THE MINIMUM REQUIREMENTS FOR E&S CONTROL AND ARE SHOWN IN GENERAL SIZE AND LOCATION ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ALL E&S CONTROL MEASURES ARE CONFIGURED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION OF SOILS AND PREVENT THE TRANSPORT OF SEDIMENTS AND OTHER POLLUTANTS TO ANY RESOURCE AREAS. ALL EROSION CONTROLS SHALL BE INSTALLED PRIOR TO ANY SITE WORK. CONTROLS SHOULD BE INSPECTED WEEKLY AND AFTER EACH RAINFALL. EXCAVATED MATERIAL SHOULD NOT BE DISPOSED OF IN THE WETLAND AREA. PROVIDE ADITIONAL E&S MEASURES AS REQUIRED TO CONTROL EROSION AND SILTATION THROUGHOUT THE DURATION OF THE CONSTRUCTION AS CONDITIONS DICTATE AND/OR AS DIRECTED BY THE OWNER OR THE ENGINEER.
3. MONITOR AND INSPECT ALL E&S MEASURES IN AN ONGOING MANNER THROUGHOUT THE WORK AND TAKE CORRECTIVE MEASURES, AS REQUIRED, TO MINIMIZE EROSION OF SOILS AND PREVENT THE TRANSPORT OF SEDIMENTS AND OTHER POLLUTANTS TO ANY RESOURCE AREAS.
4. ANY EROSION AND SEDIMENTATION MEASURE IMPLEMENTED BEYOND THAT SHOWN HEREON SHALL CONFORM TO APPLICABLE SECTIONS OF THE STATE OF CONNECTICUT'S 2023 "CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL."
5. ANY STOCKPILED MATERIAL SHALL BE SUBJECT TO EROSION CONTROL MEASURES THAT INCLUDE A MINIMUM OF SILT FENCE OR HAY BALE BARRIER. COVER STOCKPILES IF SIGNIFICANT RAINFALL IS PREDICTED.
6. PROVIDE TEMPORARY SEEDING WITH MULCH ON ALL EXPOSED SOIL AREAS WHERE WORK WILL BE SUSPENDED FOR LONGER THAN 30 DAYS. APPLY SEED AND MULCH WITHIN THE FIRST 7 DAYS OF SUSPENDING WORK. WHEN SEEDING IS NOT POSSIBLE DUE TO SEASONAL WEATHER CONDITIONS OR OTHER FACTORS, PROVIDE TEMPORARY STRUCTURAL SOIL PROTECTION SUCH AS MULCH, WOODCHIPS, EROSION CONTROL MATTING, OR COMPOST.
7. ALL TEMPORARY SLOPES IN EXCESS OF 3 (HORIZONTAL) TO 1 (VERTICAL) SHALL BE STABILIZED WITH EROSION CONTROL MATTING OR APPROVED EQUIVALENT.
8. NO RUNOFF SHALL BE ALLOWED TO ENTER ANY STORMWATER SYSTEM OR EXIT THE SITE PRIOR TO TREATMENT FOR SEDIMENT REMOVAL.
9. THE CONTRACTOR SHALL MAINTAIN A CLEAN CONSTRUCTION SITE AND SHALL NOT ALLOW THE ACCUMULATION OF RUBBISH OR CONSTRUCTION DEBRIS. ALL TRASH SHALL BE CLEANED ON A DAILY BASIS AND THE SITE SHALL BE LEFT IN A NEAT CONDITION AT THE END OF EACH WORK DAY.
10. TAKE ALL NECESSARY PRECAUTIONS TO AVOID THE SPILLAGE OF FUEL OR OTHER POLLUTANTS AND ADHERE TO ALL APPLICABLE POLICIES AND REGULATIONS RELATED TO SPILL PREVENTION, CONTROL, AND RESPONSE.
11. FOR DUST CONTROL, PERIODICALLY MOISTEN EXPOSED SOIL SURFACES WITH WATER AND MAINTAIN ADEQUATE MOISTURE LEVELS.
12. SWEEP ADJACENT ROADWAYS IF MUD OR SOIL IS TRACKED ON TO THEM, OR AS DIRECTED BY THE ENGINEER.
13. ALL SEDIMENTATION AND EROSION CONTROL MEASURES SHALL BE INSTALLED BY THE PERMITTEE AND INSPECTED BY THE TOWN ENGINEER AND/OR THE WETLANDS ENFORCEMENT OFFICER / DULY AUTHORIZED AGENT; ADDITIONAL OR SUPPLEMENTAL CONTROLS MAY BE REQUIRED. THE PERMITTEE SHALL MAINTAIN THE CONTROLS DURING AND AFTER CONSTRUCTION AND REMOVE THEM UPON SITE STABILIZATION OF THE AFFECTED AREA.
14. AN ANTI-TRACKING APRON SHALL BE INSTALLED AT THE SITE ACCESS DRIVE AT A LOCATION APPROVED BY THE TOWN ENGINEER, WITH 6 INCHED OF CRUSHED STONE (SIZED 1 ½" TO 3") UNDERLAIN WITH CONSTRUCTION FRAME SPREAD TO THE TRAVELED WIDTH AND 50 FEET IN LENGTH OR WITH APRON MATS. THE APRON SHALL BE MAINTAINED AT ALL TIMES.
15. THE PERMITTEE AND THEIR CONTRACTOR SHALL MEET WITH AGENCY STAFF, INCLUDING BUT NOT LIMITED TO THE WETLANDS ENFORCEMENT OFFICER / DULY AUTHORIZED AGENT AND TOWN ENGINEER, TO REVIEW THE CONDITIONS OF THIS APPROVAL AND THE CONSTRUCTION PROGRAM TO BE UTILIZED TO IMPLEMENT THE APPROVED REGULATED ACTIVITY.
16. THE WETLANDS ENFORCEMENT OFFICER / DULY AUTHORIZED AGENT SHALL BE NOTIFIED IN WRITING FORTY-EIGHT (48) HOURS PRIOR TO THE START OF CONSTRUCTION.
17. DURING THE DURATION OF THIS APPROVAL, THE CHAIRMAN OF THE AGENCY OR THE WETLANDS ENFORCEMENT OFFICER / DULY AUTHORIZED AGENT SHALL HAVE PERMISSION TO ENTER UPON THE SUBJECT PROPERTY AT REASONABLE TIMES FOR THE PURPOSE OF VIEWING AND INSPECTING THE CONDUCT OF THE APPROVED REGULATED ACTIVITY.
18. NO WORK OTHER THAN MAINTENANCE OF SEDIMENT AND EROSION CONTROL SHALL BE PERFORMED DURING SIGNIFICANT RAINFALL OF ONE (1) INCH OR MORE WITHIN A TWENTY-FOUR (24) HOUR PERIOD. ALL WORK SHALL BE PERFORMED BETWEEN 7:00 AM AND 4:00 PM, MONDAY THROUGH FRIDAY. NO WORK MAY BE CONDUCTED ON LEGAL HOLIDAYS OR WEEKENDS WITHOUT THE EXPRESSED APPROVAL OF THE AGENCY.
19. UPON COMPLETION OF THE REGULATED ACTIVITY APPROVED HEREIN, THE PERMITTEE SHALL NOTIFY THE WETLANDS ENFORCEMENT OFFICER / DULY AUTHORIZED AGENT FOR A FINAL INSPECTION AND CONFIRMATION OF SATISFACTORY COMPLETION AND COMPLIANCE WITH THE APPROVED SITE PLANS AND ALL STANDARD AND SPECIAL SUPPLEMENTAL CONDITIONS, REQUIREMENTS AND MODIFICATIONS OF THIS APPROVAL.
20. TOTAL SITE DISTURBANCE IS APPROXIMATELY 4.27 ACRES.

SUGGESTED CONSTRUCTION SEQUENCE:

1. CONDUCT A PRE-CONSTRUCTION MEETING WITH THE OWNER AND ENGINEER PRIOR TO ANY CONSTRUCTION ACTIVITY.
2. INSTALL CONSTRUCTION ENTRANCE(S) AND PLACE CATCH BASIN FILTER INSERTS IN EXISTING CATCH BASINS.
3. INSTALL PERIMETER E&S CONTROLS AND REQUEST PRE-CONSTRUCTION INSPECTION FROM THE ENGINEER.
4. BEGIN WORK ON THE EXISTING BUILDING. (REFER TO ARCHITECTURAL / STRUCTURAL / M.E.P. PLANS)
5. REMOVE EXISTING PAVING AND CURBING.
6. PERFORM BULK EARTHWORK OPERATIONS.
7. CONSTRUCT STORMWATER APPURTENANCES AND UTILITIES.
8. BOX OUT ROADWAYS AND PARKING LOTS WITH IMPORTED BASE MATERIALS.
9. CONSTRUCT BOTTOM COURSE OF BITUMINOUS PAVEMENT.
10. CONSTRUCT LANDSCAPING AND OTHER SITE AMENITIES.
11. CONSTRUCT CURBING AND TOP COURSE OF BITUMINOUS PAVEMENT.
12. AT THE CONCLUSION OF CONSTRUCTION, COMPLETE THE INSTALLATION OF POST-CONSTRUCTION SITE STABILIZATION MEASURES AS SHOWN ON THE DRAWINGS.

TEMPORARY E&S MEASURES MAINTENANCE SCHEDULE

E&S MEASURE	MAINTENANCE MEASURES	SCHEDULE
FILTER INSERTS IN DRAINAGE SYSTEM	CLEAN CATCH BASIN GRATE, REMOVE SEDIMENT/DEBRIS FROM FILTER INSERTS	WEEKLY & WITHIN 24 HOURS AFTER STORM GENERATING A DISCHARGE
HAY BALES/ SILT FENCE BARRIER	REPAIR/REPLACE WHEN FAILURE OBSERVED, REMOVE SILT WHEN ACCUMULATION REACHES APPROX. HALF HEIGHT OF BARRIER	WEEKLY & WITHIN 24 HOURS AFTER STORM GENERATING A DISCHARGE
CONSTRUCTION ENTRANCE	SWEEP PAVED ROADWAY ADJACENT TO SITE ENTRANCE AS NECESSARY. REFRESH STONE AS NECESSARY, REMOVE SILTED GRAVEL	WEEKLY
MOISTEN EXPOSED SOILS	PERIODICALLY MOISTEN EXPOSED SOIL SURFACES WITH WATER ON UNPAVED TRAVELWAYS AND KEEP TRAVELWAYS DAMP	DAILY
TEMPORARY SEDIMENT TRAP	CHECK AND REPAIR STONE OUTLET, CLEAN WHEN HALF FULL OF SEDIMENT (DEWATER IF NECESSARY), RESTORE TRAP TO ORIGINAL DIMENSIONS	WEEKLY & WITHIN 24 HOURS AFTER STORM GENERATING A DISCHARGE
TEMPORARY DIVERSION SWALE	REPAIR DAMAGED AREAS WITHIN 24 HOURS OF OBSERVED FAILURE	WEEKLY & WITHIN 24 HOURS AFTER STORM GENERATING A DISCHARGE. INSPECT DAILY WHEN CONSTRUCTION ACTIVITIES ARE IN CLOSE PROXIMITY

TEMPORARY CONSTRUCTION MEASURES WITHIN AQUIFER PROTECTION AREAS:

1. SIGNIFICANT FUEL, CHEMICAL OR OTHER HAZARDOUS MATERIALS STORAGE AND HANDLING, INCLUDING FUELING OF CONSTRUCTION VEHICLES, SHOULD BE LOCATED OUTSIDE WELL FIELD AREA AND AQUIFER PROTECTION AREA.
2. NO REPAIR OR MAINTENANCE OF CONSTRUCTION VEHICLES OR WASHING OF CONSTRUCTION VEHICLES IS PERMITTED WITHIN THE AQUIFER PROTECTION AREA.
3. ANY NECESSARY TEMPORARY STORAGE SHOULD BE ABOVEGROUND, PROTECTED FROM RAINFALL, AND ON AN IMPERVIOUS CONTAINMENT SURFACE.
4. AN EMERGENCY SPILL AND RESPONSE PLAN SHOULD BE DEVELOPED, INCLUDING COORDINATION WITH THE WATER SUPPLIER.
5. THE SITE ACCESS SHOULD BE ADEQUATELY SECURED AT ALL TIMES TO PROHIBIT ANY UNAUTHORIZED DISPOSAL OF WASTE MATERIALS.

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860-633-8341

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

STATE OF CONNECTICUT
SCRIFTON
29064
LICENSED
PROFESSIONAL ENGINEER

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMOLITION, EROSION & SEDIMENTATION CONTROL NOTES

C1.3

DEMOLITION GENERAL NOTES

1. REMOVE EXISTING FINISHES AS NECESSARY

2. REMOVE ALL CEILING GRIDS, LIGHTING FIXTURES & SOFFITS REFER TO MEP DEMO DRAWINGS FOR ADDITIONAL INFORMATION.

3. REMOVE ANY WALL COVERINGS, TREATMENTS & ASSOCIATED ADHESIVES.

4. REMOVE ALL FLOOR TILES & ASSOCIATED SUBSTRATES WHERE INDICATED ON THE DWGS. REFER TO HAZMAT DRAWINGS FOR ADDITIONAL INFORMATION.

5. COORDINATE REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING FIXTURES, REFER TO DEMO MEP DRAWINGS.

6. DEMOLITION DRAWINGS DO NOT SHOW ALL COMPONENTS WHICH REQUIRE REMOVAL. CONTRACTOR SHALL VISIT SITE TO DETERMINE THE EXTENT OF THE DEMOLITION WORK. DO NOT REMOVE ANY STRUCTURAL OR LOAD BEARING MEMBERS WITHOUT PRIOR APPROVAL OF THE ARCHITECT AND ENGINEER.

7. REMOVAL OF ANY HAZARDOUS MATERIAL SHALL BE DONE BY A LICENSED CONTRACTOR AND BE REMOVED AND DISPOSED OF OFF SITE IN ACCORDANCE WITH ALL STATE AND LOCAL CODES. REFER TO HAZ MAT DRAWINGS.

8. REMOVE ALL EXISTING WALLS, WINDOWS, DOORS, FRAMES & ASSOCIATED HARDWARE WHERE INDICATED ON DRAWINGS AS WELL AS ANY ADDITIONAL REMOVAL REQUIRED TO ACCOMPLISH THE SCOPE OF THE NEW CONSTRUCTION. AT EXISTING WALLS DESIGNATED TO REMAIN, REMOVE ALL EXISTING GYPSUM WALLBOARD (GWB) AND PREPARE SURFACES FOR NEW FINISHES, V.I.F.

9. SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION

10. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD, TYP

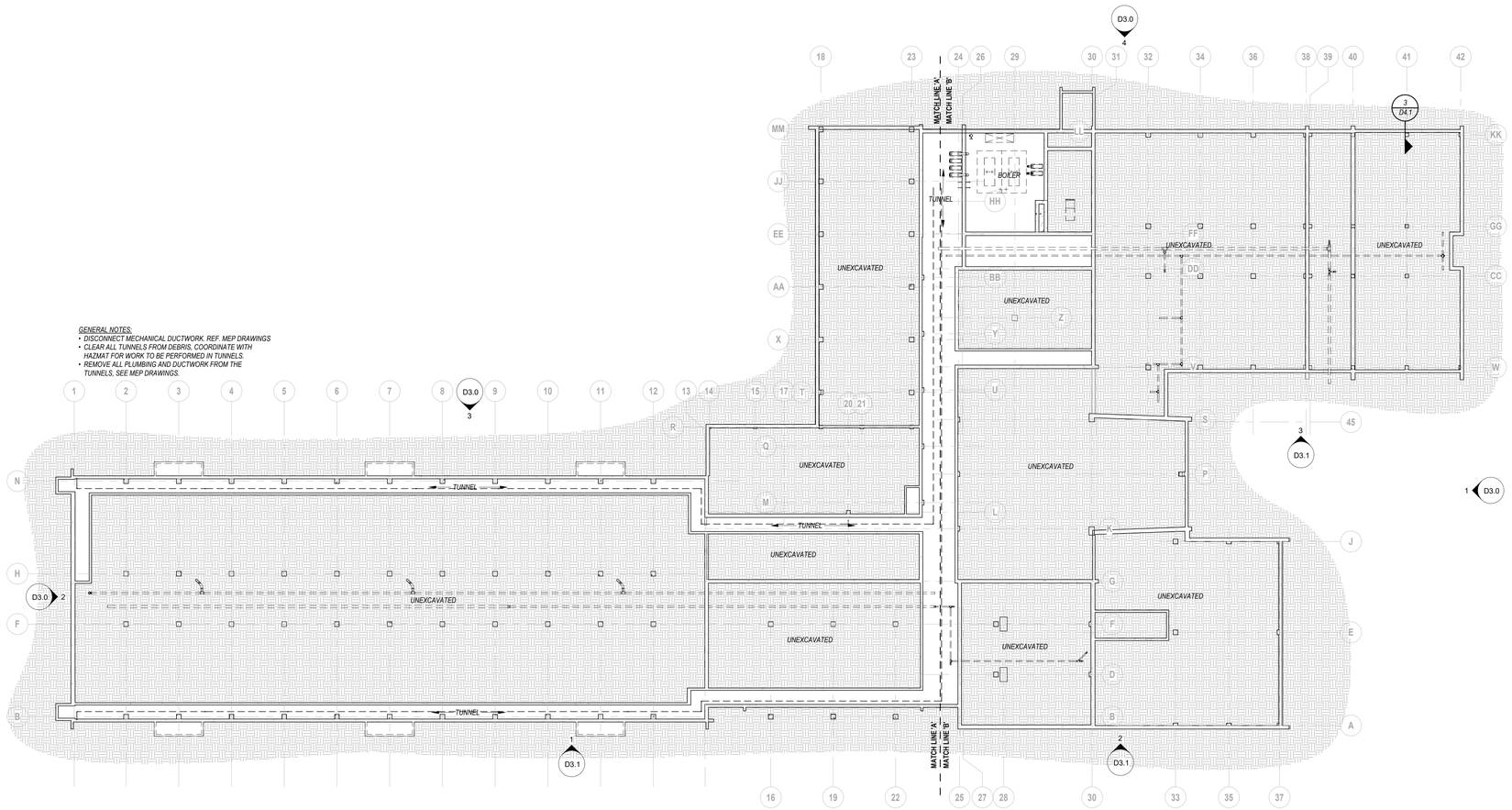
11. **EXISTING FIRE ALARM PANELS TO BE SAVED AND REUSED.** REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION.

12. **CONTRACTORS TO WALK EXISTING BUILDING. ANY EXISTING FURNITURE, FIXTURES, DEVICES, SMALLWARES, ETC LEFT WITHIN THE BUILDING ARE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE AND DISPOSE OF PROPERLY.**

13. **DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.**

DEMOLITION PLAN GRAPHICS LEGEND

- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- FLOOR SLAB TO BE DEMOLISHED
- DOOR TO BE DEMOLISHED
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE
- EXISTING BRICK LAYER TO BE DEMOLISHED



1 D1.0 **DEMO-OVERALL TUNNEL PLAN**
1/16" = 1'-0"

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STATE OF CONNECTICUT · EDWARD MALIK · REG. 9193 · REGISTERED ARCHITECT

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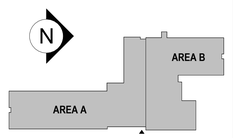
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO- OVERALL FOUNDATION PLAN

D1.0

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2. REMOVE ALL CEILING GRIDS, LIGHTING FIXTURES & SOFFITS REFER TO MEP DEMO DRAWINGS FOR ADDITIONAL INFORMATION.

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DEMOLITION PLAN GRAPHICS LEGEND

- EXISTING WALL TO REMAIN
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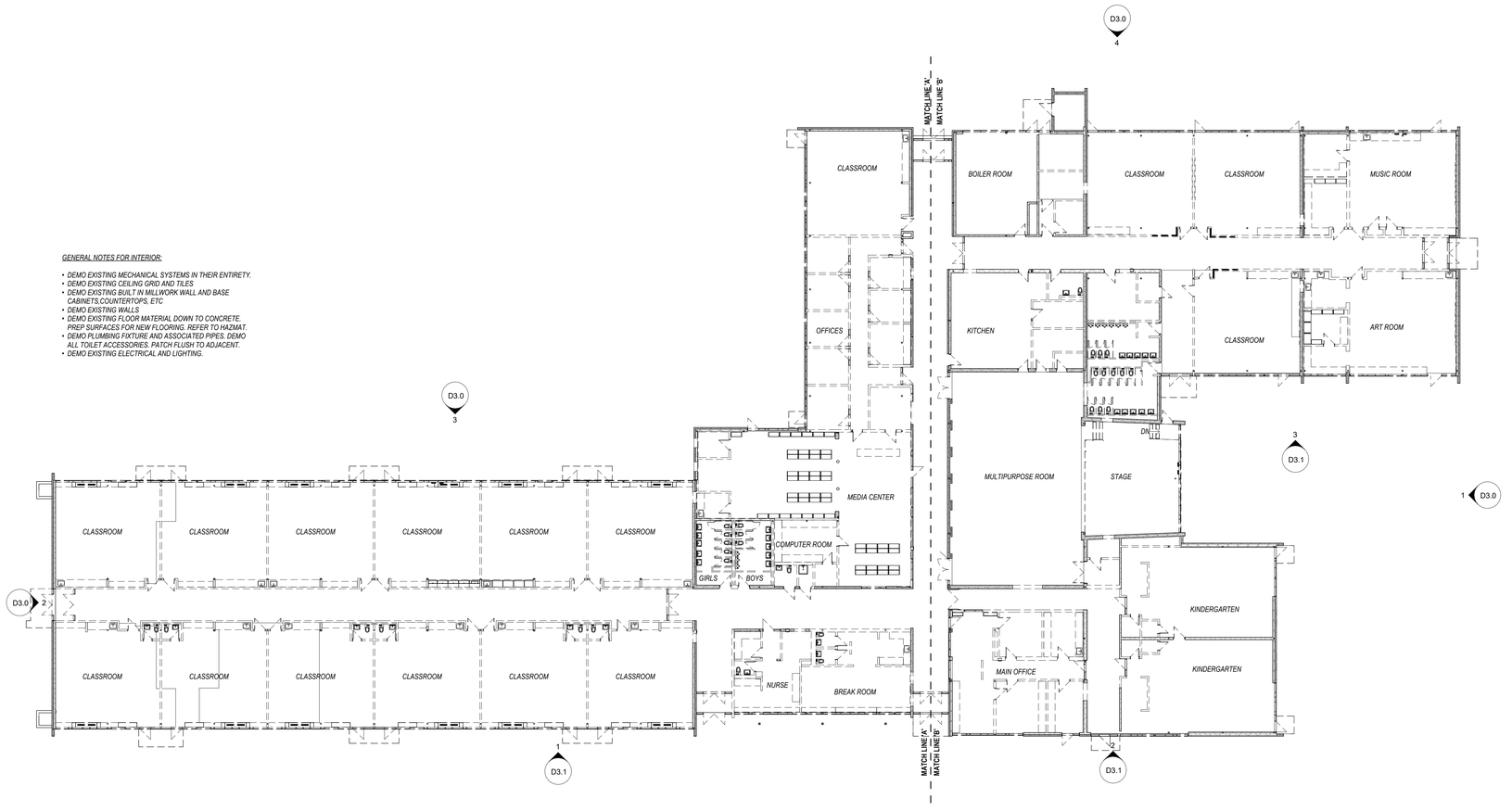

GENERAL NOTES FOR INTERIOR:

- DEMO EXISTING MECHANICAL SYSTEMS IN THEIR ENTIRETY.
- DEMO EXISTING CEILING GRID AND TILES
- DEMO EXISTING BUILT IN MILLWORK, WALL AND BASE CABINETS,COUNTERTOPS, ETC
- DEMO EXISTING WALLS
- DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT.
- DEMO PLUMBING FIXTURE AND ASSOCIATED PIPES. DEMO ALL TOILET ACCESSORIES. PATCH FLUSH TO ADJACENT.
- DEMO EXISTING ELECTRICAL AND LIGHTING.

1 / D1.1 **OVERALL DEMO FLOOR PLAN**
1/16" = 1'-0"

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STATE OF CONNECTICUT · LANCE MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
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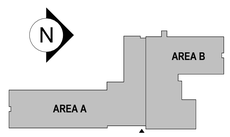
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-OVERALL FIRST FLOOR PLAN

D1.1

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10. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD, TYP
11. **EXISTING FIRE ALARM PANELS TO BE SAVED AND REUSED.** REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION.
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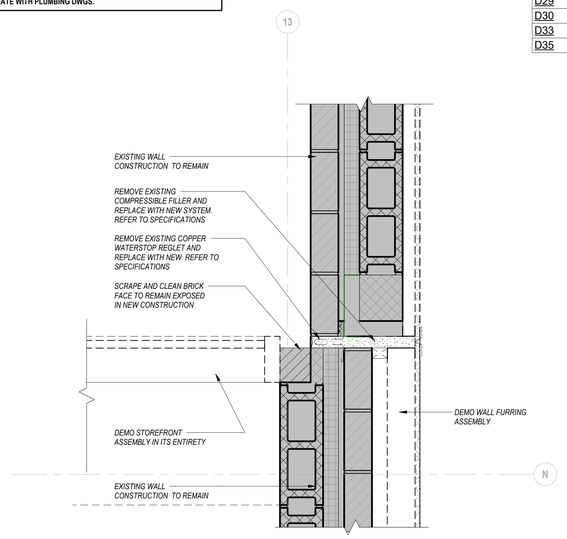
DEMOLITION PLAN GRAPHICS LEGEND

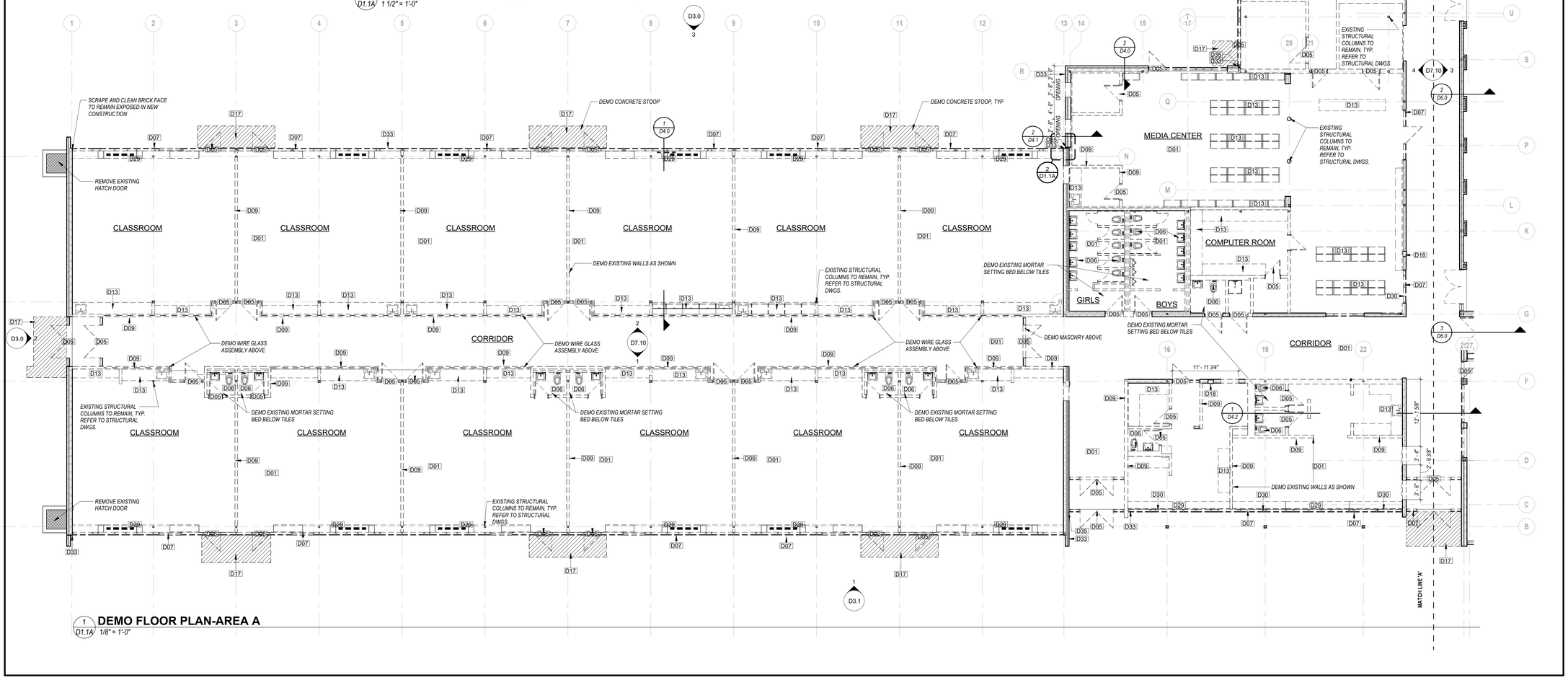
- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- FLOOR SLAB TO BE DEMOLISHED
- DOOR TO BE DEMOLISHED
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE
- EXISTING BRICK LAYER TO BE DEMOLISHED

DEMOLITION KEYNOTE LEGEND- PLAN

Key Value	Keynote Text
D01	DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT REPORT.
D02	HATCHED AREA INDICATES GENERAL EXTENT OF EXISTING SLAB TO BE REMOVED TO ACCOMMODATE NEW MECHANICAL, ELECTRICAL, AND PLUMBING INFRASTRUCTURE TO BE INSTALLED.
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY. TYP.
D06	DEMO PLUMBING FIXTURE AND ASSOCIATED PIPES. DEMO ALL TOILET ACCESSORIES. PATCH FLUSH TO ADJACENT.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D09	DEMO EXISTING WALLS. PATCH AND REPAIR ADJOINING SURFACES WHERE WALLS ARE REMOVED.
D13	REMOVE EXISTING BUILT IN MILLWORK WALL AND BASE CABINETS,COUNTERTOPS, ETC
D17	DEMO EXTERIOR CONCRETE SLAB AS SHOWN.
D18	DEMO ALL EXISTING FIRE EXTINGUISHER CABINETS
D29	DEMO EXISTING FIN TUBE RADIATORS, UNIT VENTILATORS, ETC. REFER TO MEP FOR EXTENT OF WORK
D30	DEMO EXISTING ALL WINDOW BLINDS, TYP.
D33	SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION
D35	DEMO EXISTING EXTERIOR CAULK JOINTS AND REPLACE WITH NEW. REFER TO HAZMAT REPORT



2 / D1.1A — **DEMO PLAN DETAIL 1 (@ EXPANSION JOINT)**
1 1/2" = 1'-0"



1 / D1.1A — **DEMO FLOOR PLAN-AREA A**
1/8" = 1'-0"

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STATE OF CONNECTICUT — STEVEN MALIK — REG. 9193 — REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-FIRST FLOOR PLAN-AREA A

D1.1A

DEMOLITION GENERAL NOTES

1. REMOVE EXISTING FINISHES AS NECESSARY

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13. DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.

DEMOLITION KEYNOTE LEGEND- PLAN

Key Value	Keynote Text
D01	DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT REPORT.
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY, TYP.
D06	DEMO PLUMBING FIXTURE AND ASSOCIATED PIPES. DEMO ALL TOILET ACCESSORIES. PATCH FLUSH TO ADJACENT.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D09	DEMO EXISTING WALLS. PATCH AND REPAIR ADJOINING SURFACES WHERE WALLS ARE REMOVED.
D13	REMOVE EXISTING BUILT IN MILLWORK WALL AND BASE CABINETS,COUNTERTOPS, ETC
D16	DEMO STAIR AND RAILING ASSEMBLY IN ITS ENTIRETY. REFER TO HAZMAT REPORT
D17	DEMO EXTERIOR CONCRETE SLAB AS SHOWN.
D18	DEMO ALL EXISTING FIRE EXTINGUISHER CABINETS
D19	DEMO EXTERIOR LOUVERS. PREP OPENING FOR INFILL MATCH
D28	DEMO EXISTING WIRE GLASS ASSEMBLY. PREP FOR NEW WORK.
D30	DEMO EXISTING ALL WINDOW BLINDS, TYP.
D33	SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION
D34	EXISTING FIRE ALARM PANELS TO BE SAVED AND REUSED. REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION.
D35	DEMO EXISTING EXTERIOR CAULK JOINTS AND REPLACE WITH NEW. REFER TO HAZMAT REPORT

DEMOLITION PLAN GRAPHICS LEGEND

- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- FLOOR SLAB TO BE DEMOLISHED
- DOOR TO BE DEMOLISHED
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE
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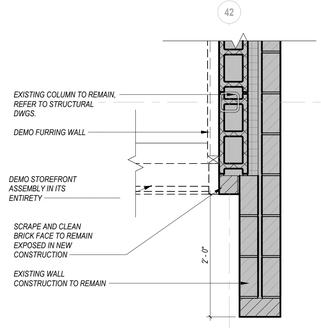
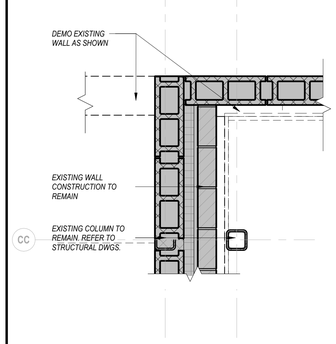
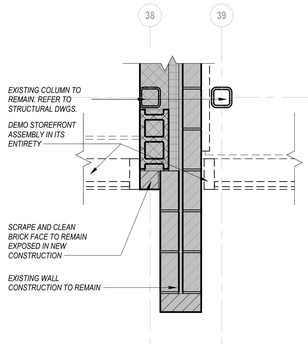


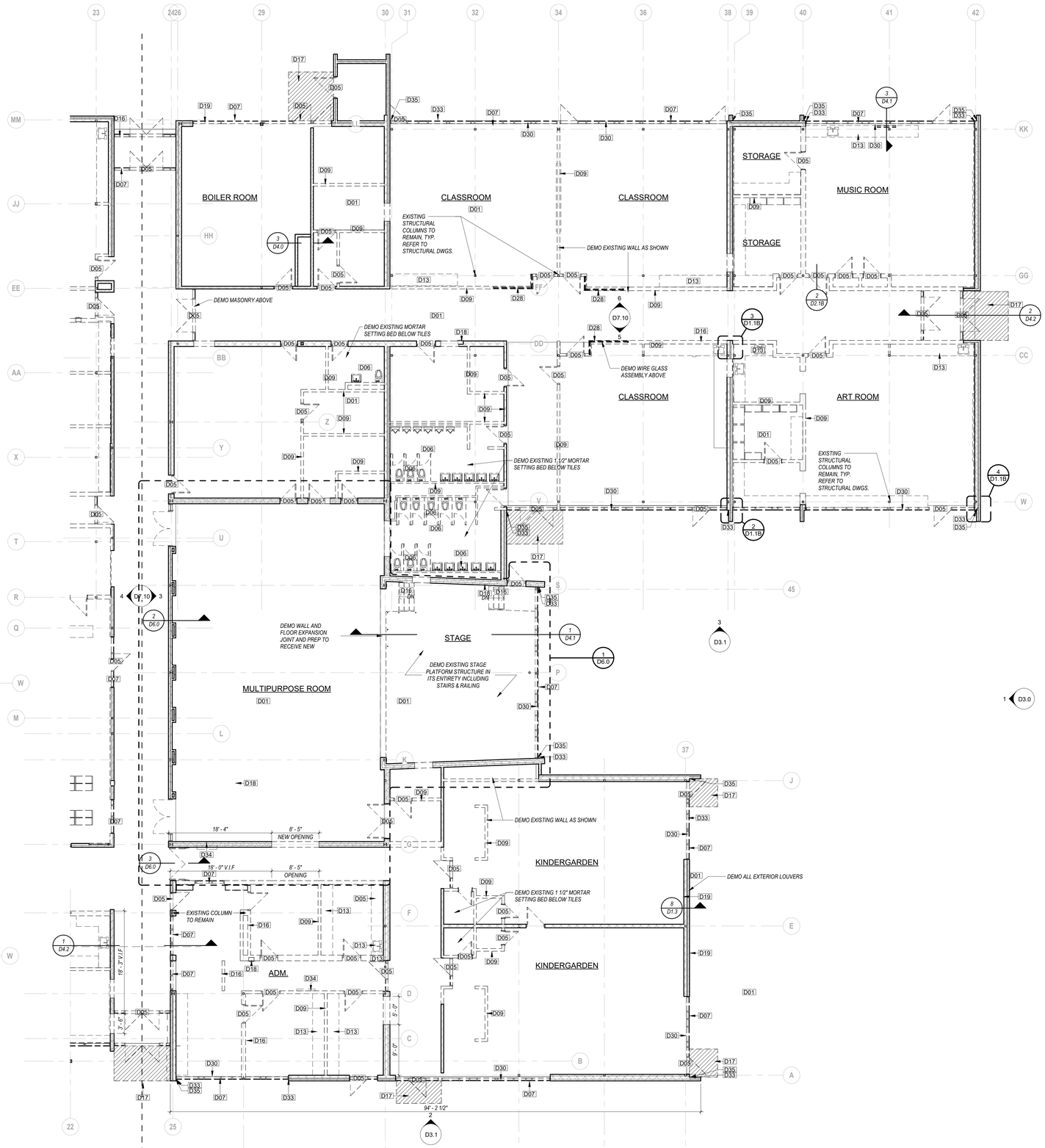
4 D1.1B **DEMO FLOOR PLAN DETAIL-4** 1" = 1'-0"



3 D1.1B **DEMO PLAN DETAIL-2** 1" = 1'-0"



2 D1.1B **DEMO PLAN DETAIL 3** 1" = 1'-0"



1 D1.1B **DEMO FLOOR PLAN-AREA B** 1/8" = 1'-0"

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STATE OF CONNECTICUT · DAVID MALIK · REG. 21827 · REG. 9193 · REGISTERED ARCHITECT

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State Project #: 017-0090 RNV
Project #:250064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-FIRST FLOOR PLAN-AREA B

D1.1B

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DEMOLITION GENERAL NOTES

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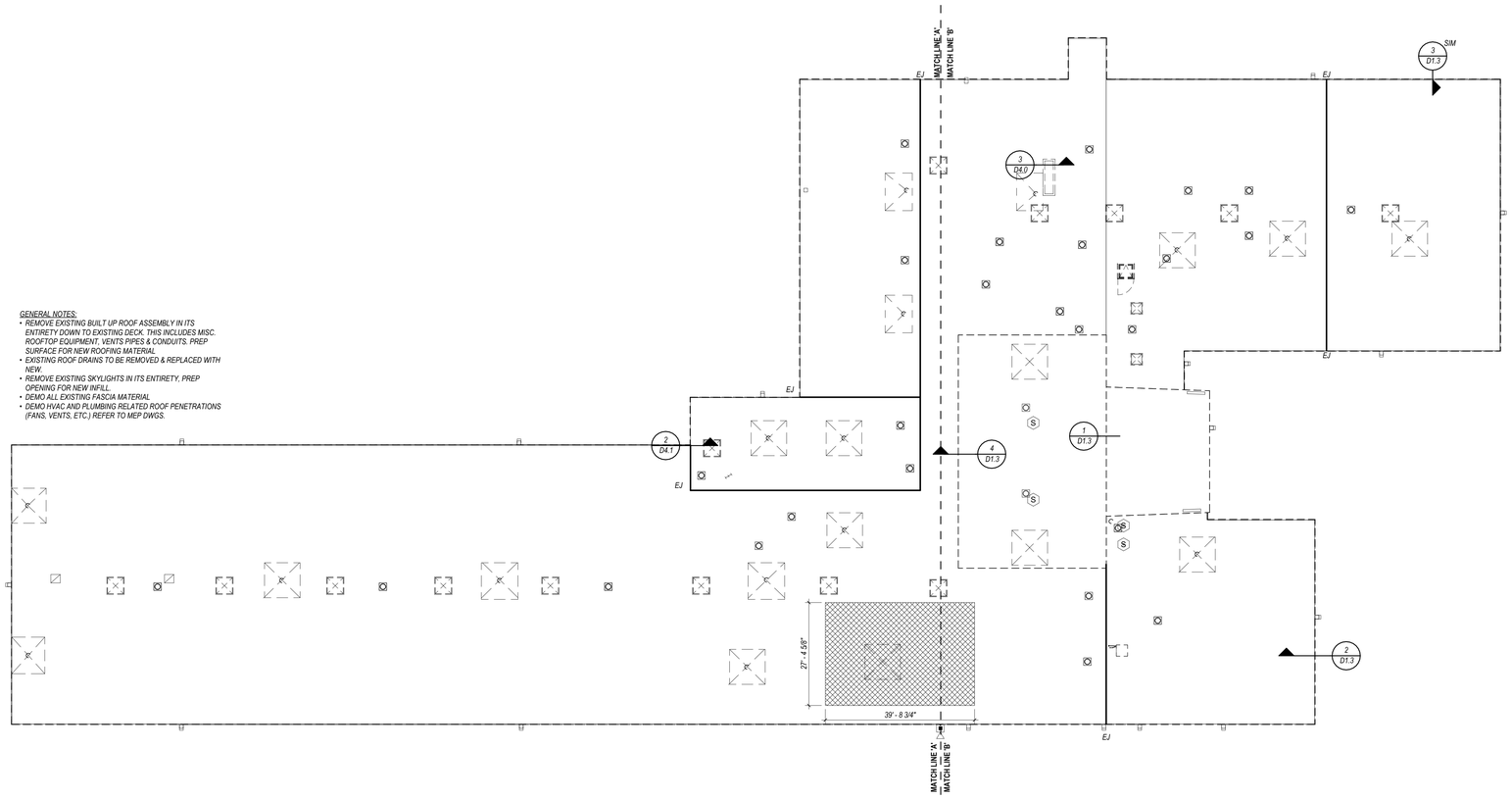
DEMOLITION ROOF GRAPHICS LEGEND

- EXISTING ROOF ASSEMBLY
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE
- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- FLOOR TO BE DEMOLISHED
- ENTIRE ROOF INCLUDING STRUCTURAL COMPONENTS TO BE DEMOLISHED



GENERAL NOTES:
- REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL.
- EXISTING ROOF DRAINS TO BE REMOVED & REPLACED WITH NEW.
- REMOVE EXISTING SKYLIGHTS IN ITS ENTIRETY, PREP OPENING FOR NEW INFILL.
- DEMO ALL EXISTING FASCIA MATERIAL
- DEMO HVAC AND PLUMBING RELATED ROOF PENETRATIONS (FANS, VENTS, ETC.) REFER TO MEP DWGS.

1 D1.2 **DEMO-OVERALL ROOF PLAN**
1/16" = 1'-0"

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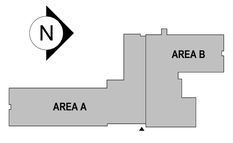
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

STATE OF CONNECTICUT · EDWARD MALIK · NO. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-OVERALL ROOF PLAN

D1.2

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DEMOLITION GENERAL NOTES

1. REMOVE EXISTING FINISHES AS NECESSARY

2. REMOVE ALL CEILING GRIDS, LIGHTING FIXTURES & SOFFITS REFER TO MEP DEMO DRAWINGS FOR ADDITIONAL INFORMATION.

3. REMOVE ANY WALL COVERINGS, TREATMENTS & ASSOCIATED ADHESIVES.

4. REMOVE ALL FLOOR TILES & ASSOCIATED SUBSTRATES WHERE INDICATED ON THE DWGS. REFER TO HAZMAT DRAWINGS FOR ADDITIONAL INFORMATION.

5. COORDINATE REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING FIXTURES, REFER TO DEMO MEP DRAWINGS.

6. DEMOLITION DRAWINGS DO NOT SHOW ALL COMPONENTS WHICH REQUIRE REMOVAL. CONTRACTOR SHALL VISIT SITE TO DETERMINE THE EXTENT OF THE DEMOLITION WORK. DO NOT REMOVE ANY STRUCTURAL OR LOAD BEARING MEMBERS WITHOUT PRIOR APPROVAL OF THE ARCHITECT AND ENGINEER.

7. REMOVAL OF ANY HAZARDOUS MATERIAL SHALL BE DONE BY A LICENSED CONTRACTOR AND BE REMOVED AND DISPOSED OF OFF SITE IN ACCORDANCE WITH ALL STATE AND LOCAL CODES. REFER TO HAZ MAT DRAWINGS.

8. REMOVE ALL EXISTING WALLS, WINDOWS, DOORS, FRAMES & ASSOCIATED HARDWARE WHERE INDICATED ON DRAWINGS AS WELL AS ANY ADDITIONAL REMOVAL REQUIRED TO ACCOMPLISH THE SCOPE OF THE NEW CONSTRUCTION. AT EXISTING WALLS DESIGNATED TO REMAIN, REMOVE ALL EXISTING GYPSUM WALLBOARD (GWB) AND PREPARE SURFACES FOR NEW FINISHES, V.I.F.

9. SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION

10. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD, TYP

11. **EXISTING FIRE ALARM PANELS TO BE SAVED AND REUSED.** REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION.

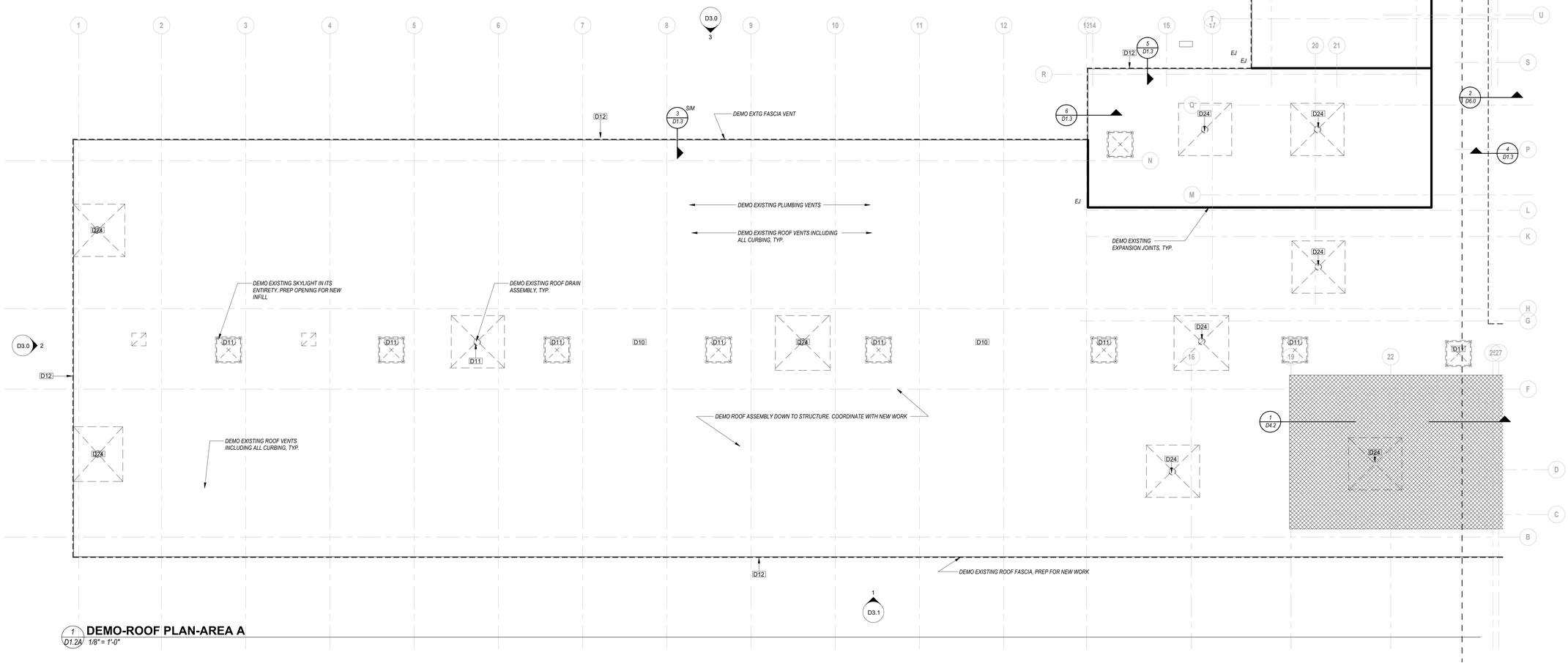
12. **CONTRACTORS TO WALK EXISTING BUILDING. ANY EXISTING FURNITURE, FIXTURES, DEVICES, SMALLWARES, ETC LEFT WITHIN THE BUILDING ARE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE AND DISPOSE OF PROPERLY.**

13. **DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.**

DEMOLITION ROOF GRAPHICS LEGEND

- EXISTING ROOF ASSEMBLY
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE
- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- FLOOR TO BE DEMOLISHED
- ENTIRE ROOF INCLUDING STRUCTURAL COMPONENTS TO BE DEMOLISHED

DEMOLITION KEYNOTE LEGEND - ROOF	
Key Value	Keynote Text
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D12	DEMO ALL EXISTING FASCIA MATERIAL
D24	DEMO HVAC AND PLUMBING RELATED ROOF PENETRATIONS (FANS, VENTS, ETC.) REFER TO MEP DWGS.



1 D1.2A **DEMO-ROOF PLAN-AREA A**
1/8" = 1'-0"

QA+M architecture
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STATE OF CONNECTICUT — JOSEPH MARK MALIK — REG. NO. 9193 — REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

A8.6

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO ROOF PLAN-AREA A

D1.2A

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DEMOLITION GENERAL NOTES

1. REMOVE EXISTING FINISHES AS NECESSARY

2. REMOVE ALL CEILING GRIDS, LIGHTING FIXTURES & SOFFITS REFER TO MEP DEMO DRAWINGS FOR ADDITIONAL INFORMATION.

3. REMOVE ANY WALL COVERINGS, TREATMENTS & ASSOCIATED ADHESIVES.

4. REMOVE ALL FLOOR TILES & ASSOCIATED SUBSTRATES WHERE INDICATED ON THE DWGS. REFER TO HAZMAT DRAWINGS FOR ADDITIONAL INFORMATION.

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DEMOLITION KEYNOTE LEGEND - ROOF

Key Value	Keynote Text
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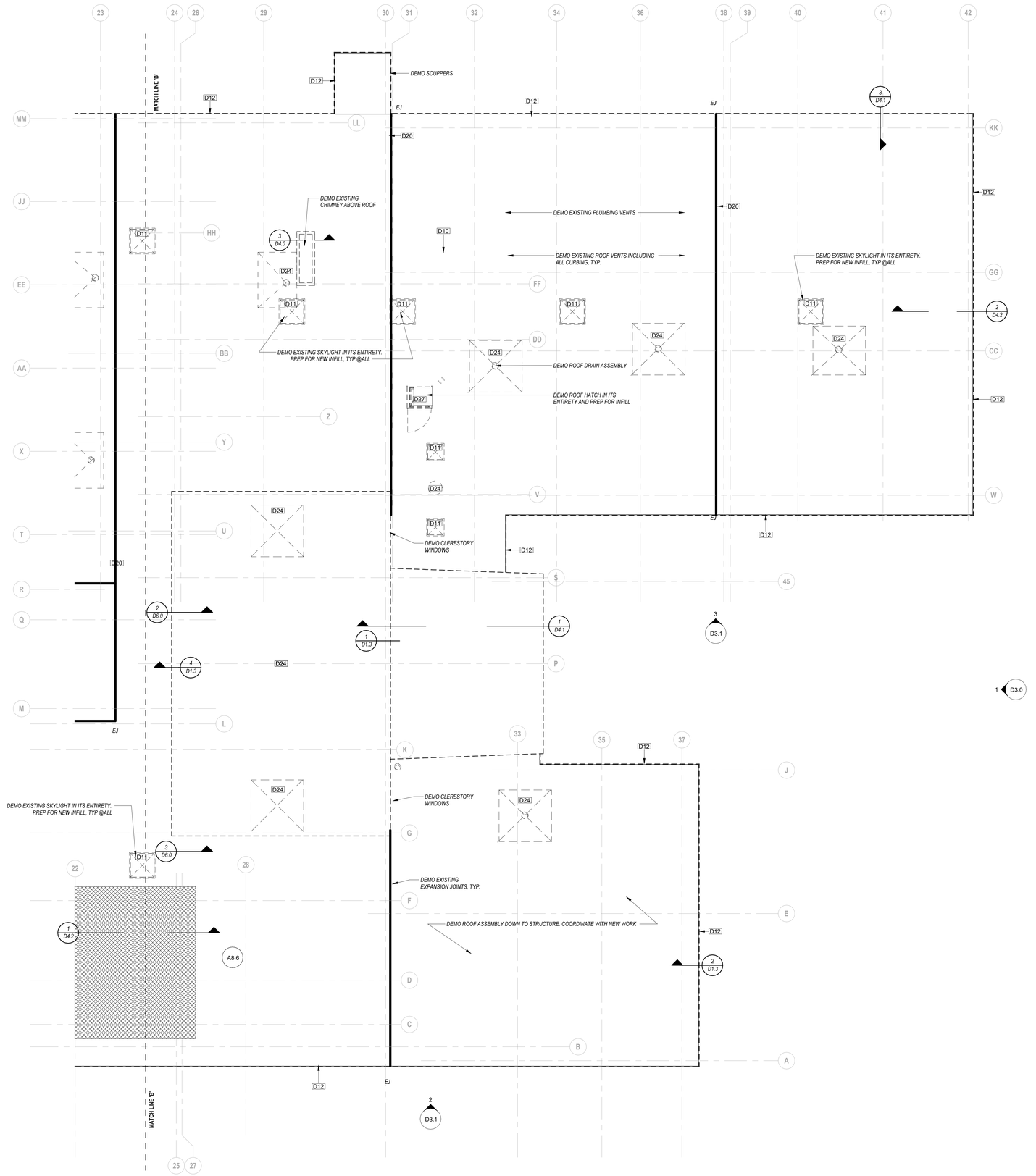
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D12	DEMO ALL EXISTING FASCIA MATERIAL
D20	REMOVE & REPLACE EXISTING EXPANSION JOINTS
D24	DEMO HVAC AND PLUMBING RELATED ROOF PENETRATIONS (FANS, VENTS, ETC.) REFER TO MEP DWGS.
D27	DEMO EXISTING ROOF HATCH IN INTS ENTIRETY AND PREP FOR INFILL

DEMOLITION ROOF GRAPHICS LEGEND

- *EXISTING ROOF ASSEMBLY*
- *OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE*
- *EXISTING WALL TO REMAIN*
- *EXISTING WALL / ITEM TO BE DEMOLISHED*
- *FLOOR TO BE DEMOLISHED*
- *ENTIRE ROOF INCLUDING STRUCTURAL COMPONENTS TO BE DEMOLISHED*



1 D1.2B **DEMO-ROOF PLAN-AREA B**
1/8" = 1'-0"

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STATE OF CONNECTICUT · JOSEPH MALIK · NO. 9193 · REGISTERED ARCHITECT

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EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO ROOF PLAN-AREA B

D1.2B

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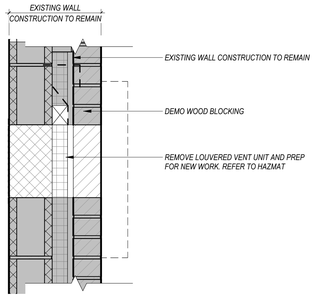
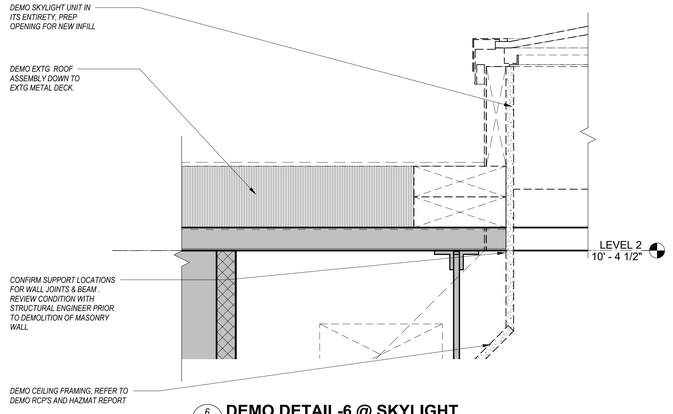
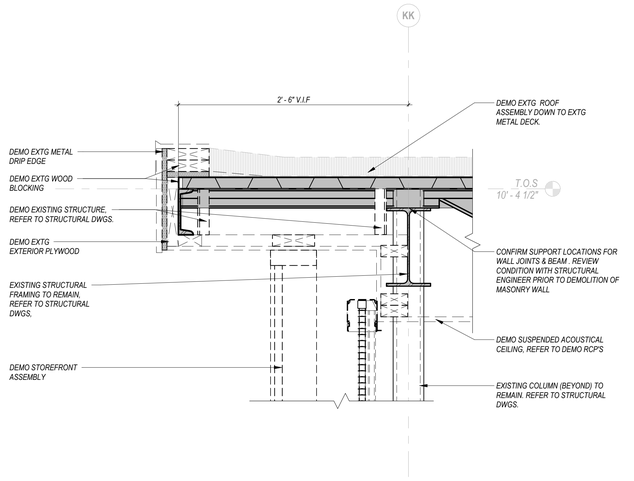


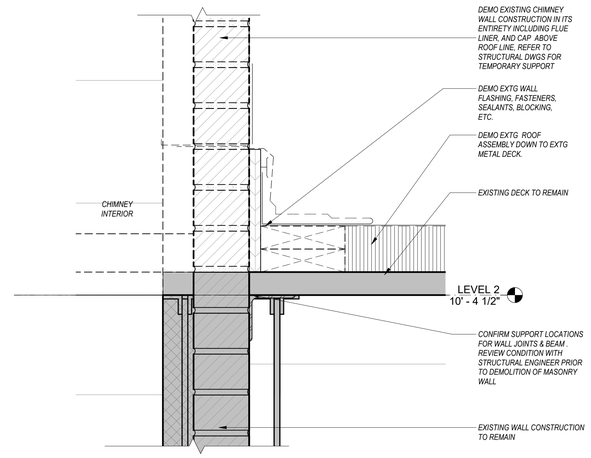
8 D1.3 DEMO WALL VENT DETAIL
1 1/2" = 1'-0"



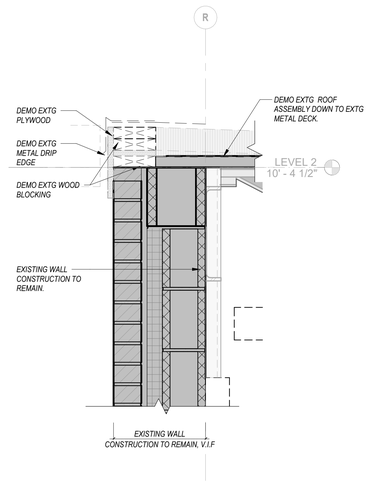
6 D1.3 DEMO DETAIL-6 @ SKYLIGHT
3" = 1'-0"



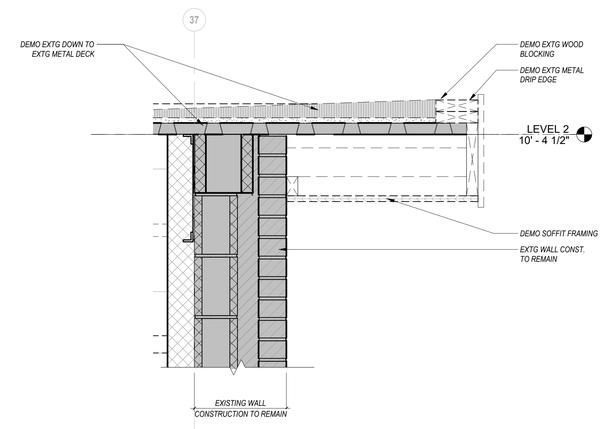
3 D1.3 DEMO DETAIL 3
1 1/2" = 1'-0"



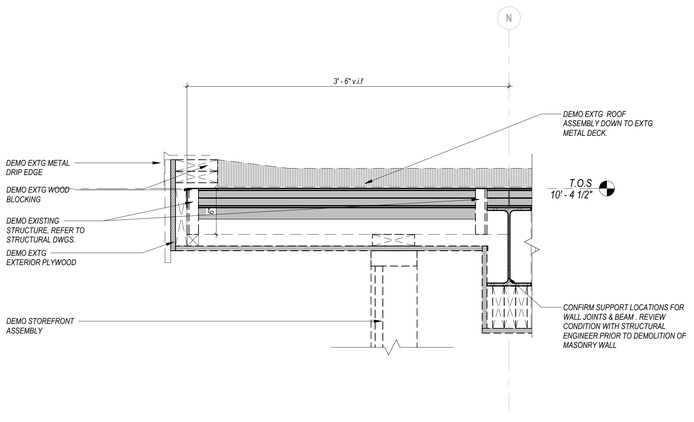
7 D1.3 ROOF DETAIL @ CHIMNEY
3" = 1'-0"



5 D1.3 DEMO DETAIL 5
1 1/2" = 1'-0"



2 D1.3 DEMO DETAIL 2
1 1/2" = 1'-0"



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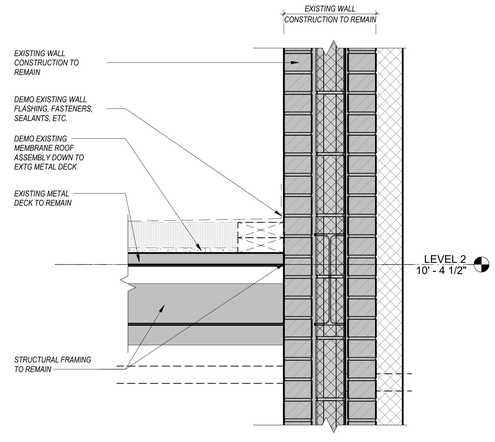
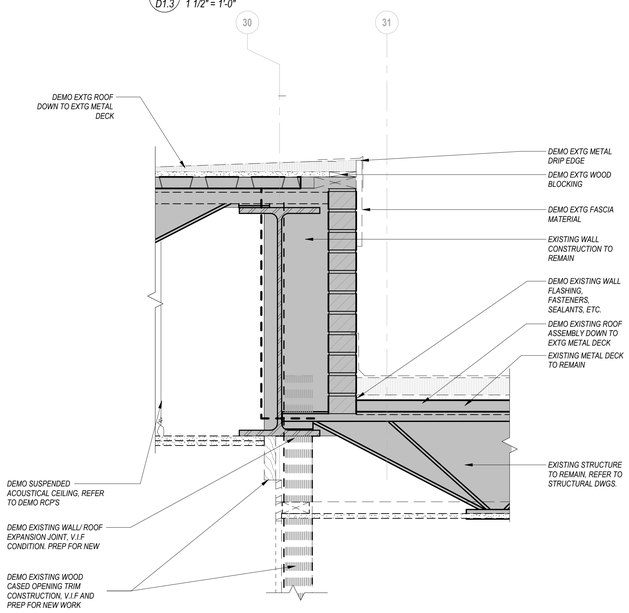


4 D1.3 DEMO DETAIL 4
1 1/2" = 1'-0"



1 D1.3 DEMO DETAIL-1
1 1/2" = 1'-0"

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STATE OF CONNECTICUT · STEPHEN MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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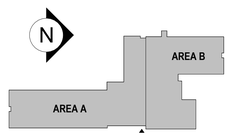
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO TYPICAL DETAILS

D1.3

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1. REMOVE EXISTING FINISHES AS NECESSARY

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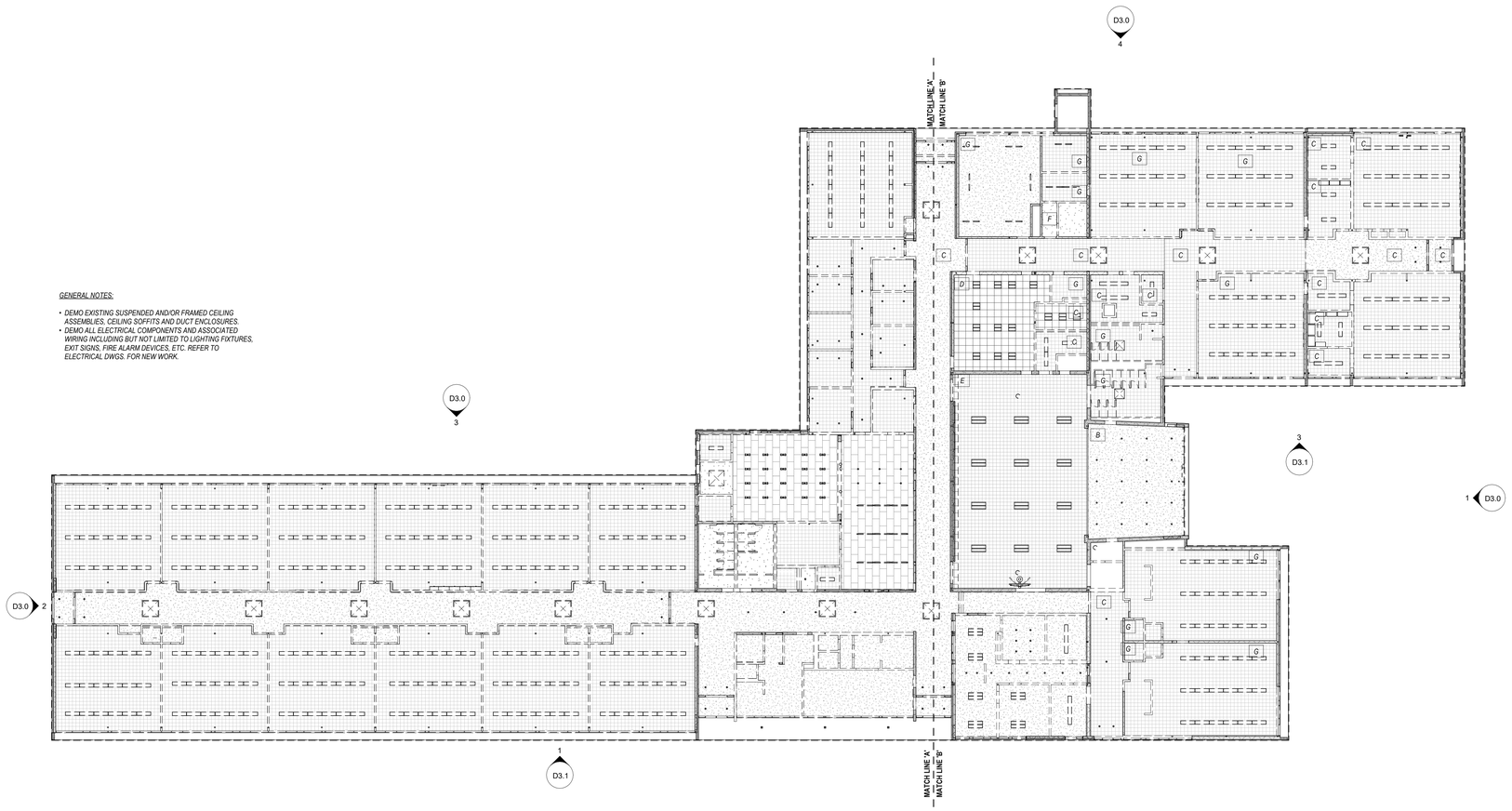
13. **DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.**

DEMOLITION CEILING GRAPHICS LEGEND

- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- A — CEILING GRID TO BE DEMOLISHED (TYPE A-SUSPENDED TECTUM)
- B — CEILING TO BE DEMOLISHED (TYPE B-GLUED-UP 12X12 ON GWB)
- C — CEILING GRID TO BE DEMOLISHED (TYPE C- SUSPENDED 12"X12" CONCEALED GRID)
- D — CEILING GRID TO BE DEMOLISHED (TYPE D- SUSPENDED ALUMINUM FACED 24"X24"
- E — CEILING GRID TO BE DEMOLISHED. (TYPE E-GLUED UP 12X12 ROCKFACE ON GWB)
- F — CEILING GRID TO BE DEMOLISHED. (TYPE F-SUSPENDED GWB)
- G — CEILING GRID TO BE DEMOLISHED. (TYPE G-SUSPENDED, V.I.F)
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE



1 / D2.0 **DEMO-OVERALL RCP**
1/16" = 1'-0"

QA+M architecture
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STATE OF CONNECTICUT · DAVID MALIK · REG. 21827 · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

N
AREA B
AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-OVERALL RCP

D2.0

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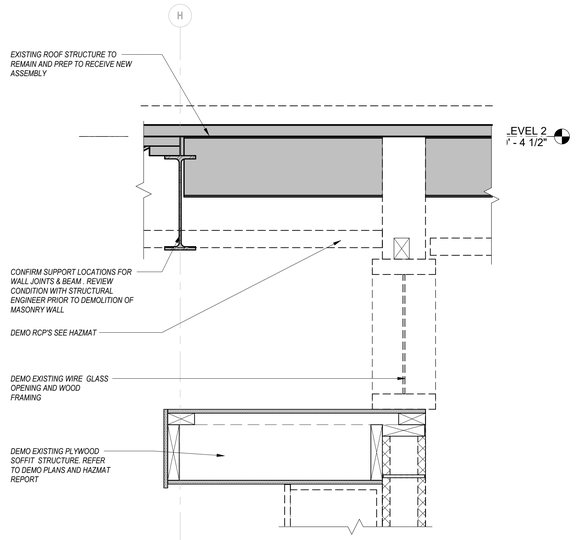
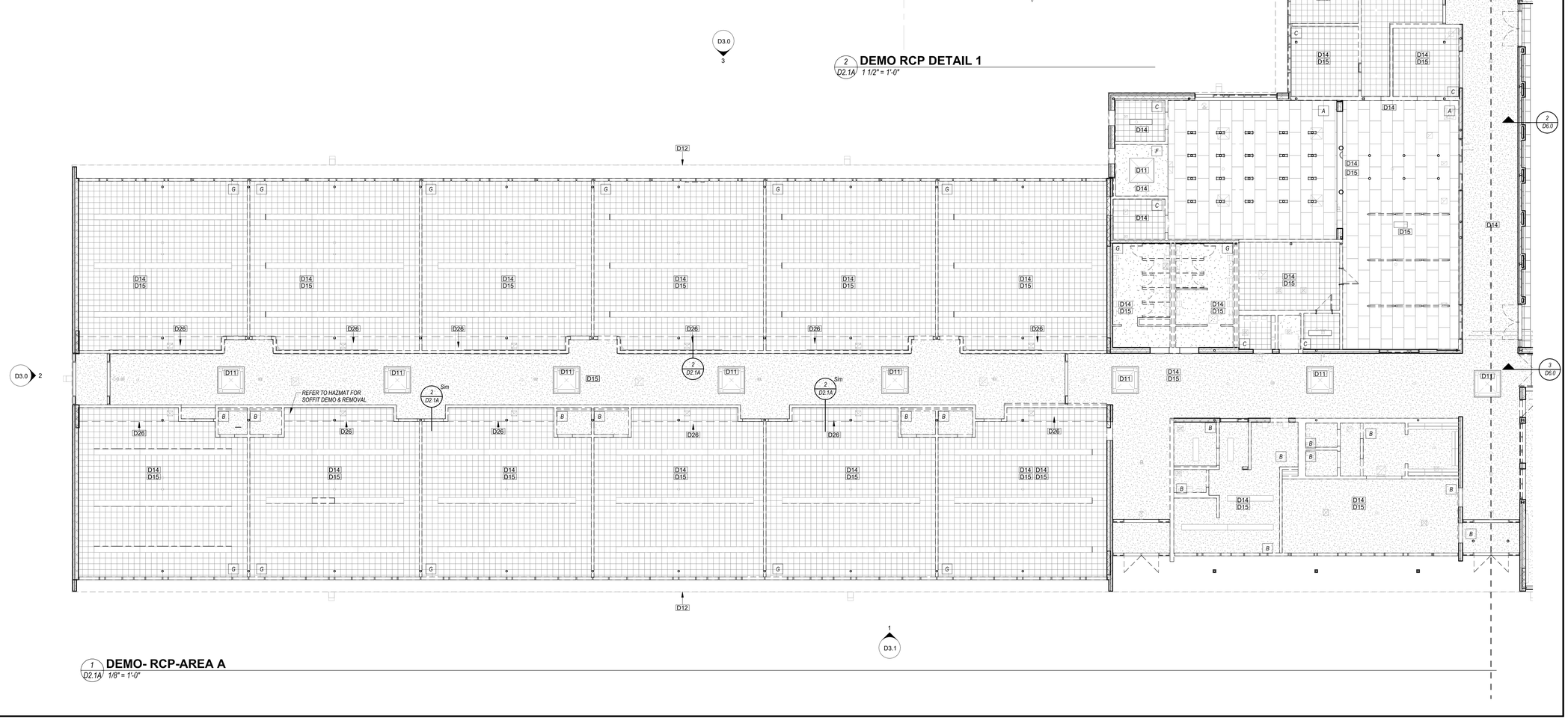
- F — CEILING GRID TO BE DEMOLISHED. (TYPE F-SUSPENDED GWB)
- G — CEILING GRID TO BE DEMOLISHED. (TYPE G-SUSPENDED, V.I.F)
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE

DEMOLITION KEYNOTE LEGEND - RCP

Key Value	Keynote Text
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D12	DEMO ALL EXISTING FASCIA MATERIAL
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES, CEILING SOFFITS AND DUCT ENCLOSURES
D26	DEMO WOOD SOFFIT ASSEMBLY. REFER TO HAZMAT



2 **DEMO RCP DETAIL 1**
D2.1A 1 1/2" = 1'-0"



1 **DEMO- RCP-AREA A**
D2.1A 1/8" = 1'-0"

QA+M architecture
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STATE OF CONNECTICUT · LANCE MALIK · REG. 9193 · REGISTERED ARCHITECT

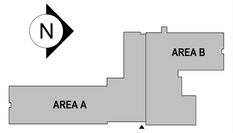
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO RCP-AREA A

D2.1A

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DEMOLITION GENERAL NOTES

1. REMOVE EXISTING FINISHES AS NECESSARY

2. REMOVE ALL CEILING GRIDS, LIGHTING FIXTURES & SOFFITS REFER TO MEP DEMO DRAWINGS FOR ADDITIONAL INFORMATION.

3. REMOVE ANY WALL COVERINGS, TREATMENTS & ASSOCIATED ADHESIVES.

4. REMOVE ALL FLOOR TILES & ASSOCIATED SUBSTRATES WHERE INDICATED ON THE DWGS. REFER TO HAZMAT DRAWINGS FOR ADDITIONAL INFORMATION.

5. COORDINATE REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING FIXTURES, REFER TO DEMO MEP DRAWINGS.

6. DEMOLITION DRAWINGS DO NOT SHOW ALL COMPONENTS WHICH REQUIRE REMOVAL. CONTRACTOR SHALL VISIT SITE TO DETERMINE THE EXTENT OF THE DEMOLITION WORK. DO NOT REMOVE ANY STRUCTURAL OR LOAD BEARING MEMBERS WITHOUT PRIOR APPROVAL OF THE ARCHITECT AND ENGINEER.

7. REMOVAL OF ANY HAZARDOUS MATERIAL SHALL BE DONE BY A LICENSED CONTRACTOR AND BE REMOVED AND DISPOSED OF OFF SITE IN ACCORDANCE WITH ALL STATE AND LOCAL CODES. REFER TO HAZ MAT DRAWINGS.

8. REMOVE ALL EXISTING WALLS, WINDOWS, DOORS, FRAMES & ASSOCIATED HARDWARE WHERE INDICATED ON DRAWINGS AS WELL AS ANY ADDITIONAL REMOVAL REQUIRED TO ACCOMPLISH THE SCOPE OF THE NEW CONSTRUCTION. AT EXISTING WALLS DESIGNATED TO REMAIN, REMOVE ALL EXISTING GYPSUM WALLBOARD (GWB) AND PREPARE SURFACES FOR NEW FINISHES, V.I.F.

9. SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION

10. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD, TYP

11. **EXISTING FIRE ALARM PANELS TO BE SAVED AND REUSED.** REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION.

12. **CONTRACTORS TO WALK EXISTING BUILDING. ANY EXISTING FURNITURE, FIXTURES, DEVICES, SMALLWARES, ETC LEFT WITHIN THE BUILDING ARE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE AND DISPOSE OF PROPERLY.**

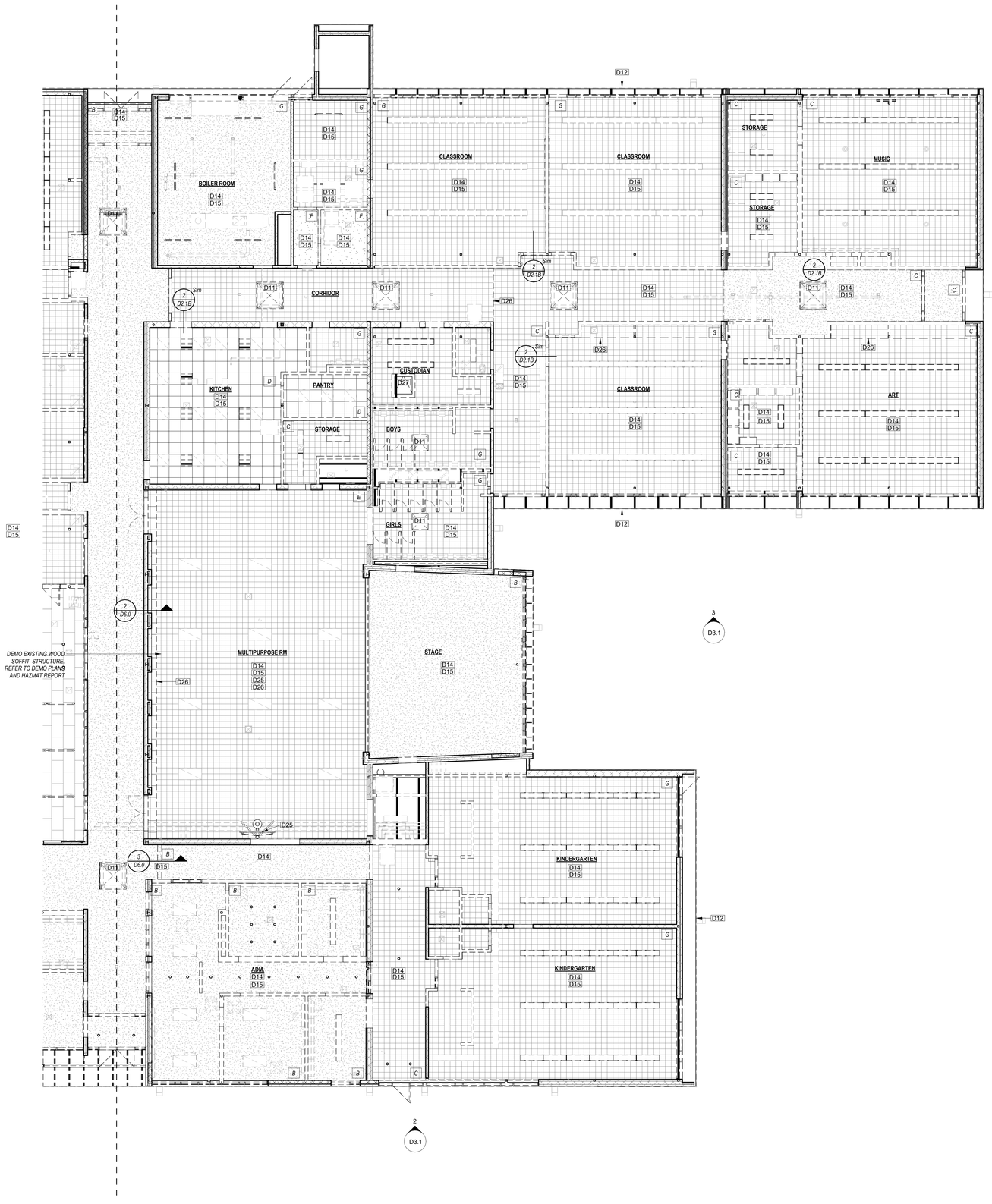
13. **DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.**

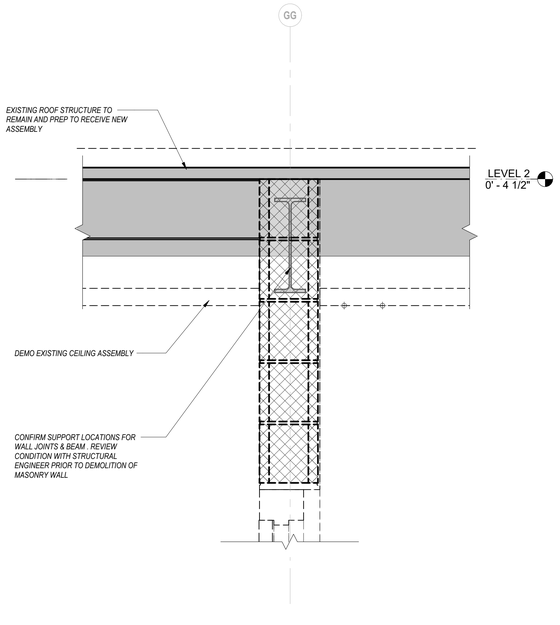
DEMOLITION KEYNOTE LEGEND - RCP

Key Value	Keynote Text
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY, PREP OPENING FOR NEW INFILL.
D12	DEMO ALL EXISTING FASCIA MATERIAL
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES, CEILING SOFFITS AND DUCT ENCLOSURES
D25	DEMO ALL EXISTING GYM EQUIPMENT, INCLUDING BUT NOT LIMITED TO BASKETBALL HOOP ASSEMBLIES AND HANGERS, NETS, WALL AND MOUNTED EQUIPMENT
D26	DEMO WOOD SOFFIT ASSEMBLY, REFER TO HAZMAT
D27	DEMO EXISTING ROOF HATCH IN INTS ENTIRETY AND PREP FOR INFILL

DEMOLITION CEILING GRAPHICS LEGEND

- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- A — CEILING GRID TO BE DEMOLISHED (TYPE A-SUSPENDED TECTUM)
- B — CEILING TO BE DEMOLISHED (TYPE B-GLUED-UP 12X12 ON GWB)
- C — CEILING GRID TO BE DEMOLISHED (TYPE C- SUSPENDED 12"X12" CONCEALED GRID)
- D — CEILING GRID TO BE DEMOLISHED (TYPE D- SUSPENDED ALUMINUM FACED 24"X24"
- E — CEILING GRID TO BE DEMOLISHED. (TYPE E-GLUED UP 12X12 ROCKFACE ON GWB)
- F — CEILING GRID TO BE DEMOLISHED. (TYPE F-SUSPENDED GWB)
- G — CEILING GRID TO BE DEMOLISHED. (TYPE G-SUSPENDED, V.I.F)
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE





2 D2.1B **DEMO RCP DETAIL 2**
1 1/2" = 1'-0"

1 D2.1B **DEMO-RCP-AREA B**
1/8" = 1'-0"

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STATE OF CONNECTICUT · MICHAEL MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
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State Project #: 017-0090 RNV
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Revisions

AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-RCP-AREA B

D2.1B

DEMOLITION GENERAL NOTES

1. REMOVE EXISTING FINISHES AS NECESSARY

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3. REMOVE ANY WALL COVERINGS, TREATMENTS & ASSOCIATED ADHESIVES.

4. REMOVE ALL FLOOR TILES & ASSOCIATED SUBSTRATES WHERE INDICATED ON THE DWGS. REFER TO HAZMAT DRAWINGS FOR ADDITIONAL INFORMATION.

5. COORDINATE REMOVAL OF MECHANICAL, ELECTRICAL AND PLUMBING FIXTURES, REFER TO DEMO MEP DRAWINGS.

6. DEMOLITION DRAWINGS DO NOT SHOW ALL COMPONENTS WHICH REQUIRE REMOVAL. CONTRACTOR SHALL VISIT SITE TO DETERMINE THE EXTENT OF THE DEMOLITION WORK. DO NOT REMOVE ANY STRUCTURAL OR LOAD BEARING MEMBERS WITHOUT PRIOR APPROVAL OF THE ARCHITECT AND ENGINEER.

7. REMOVAL OF ANY HAZARDOUS MATERIAL SHALL BE DONE BY A LICENSED CONTRACTOR AND BE REMOVED AND DISPOSED OF OFF SITE IN ACCORDANCE WITH ALL STATE AND LOCAL CODES. REFER TO HAZ MAT DRAWINGS.

8. REMOVE ALL EXISTING WALLS, WINDOWS, DOORS, FRAMES & ASSOCIATED HARDWARE WHERE INDICATED ON DRAWINGS AS WELL AS ANY ADDITIONAL REMOVAL REQUIRED TO ACCOMPLISH THE SCOPE OF THE NEW CONSTRUCTION. AT EXISTING WALLS DESIGNATED TO REMAIN, REMOVE ALL EXISTING GYPSUM WALLBOARD (GWB) AND PREPARE SURFACES FOR NEW FINISHES, V.I.F.

9. SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION

10. CONTRACTOR TO VERIFY ALL DIMENSIONS IN FIELD, TYP

11. **EXISTING FIRE ALARM PANELS TO BE SAVED AND REUSED.** *REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION.*

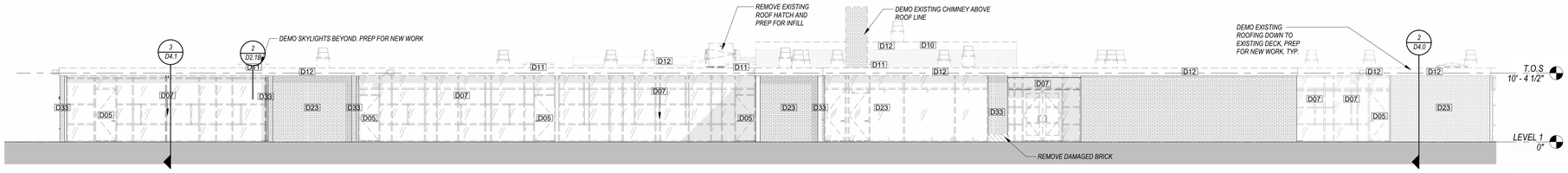
12. **CONTRACTORS TO WALK EXISTING BUILDING. ANY EXISTING FURNITURE, FIXTURES, DEVICES, SMALLWARES, ETC LEFT WITHIN THE BUILDING ARE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE AND DISPOSE OF PROPERLY.**

13. **DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.**

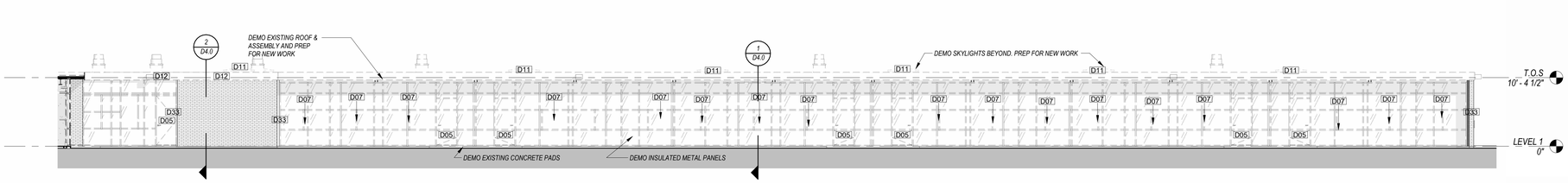
DEMOLITION KEYNOTE LEGEND- PLAN	
Key Value	Keynote Text
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY, TYP.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D08	DEMO EXTERIOR MOUNTED LIGHTS, CAMERAS, ETC.
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D12	DEMO ALL EXISTING FASCIA MATERIAL
D19	DEMO EXTERIOR LOUVERS. PREP OPENING FOR INFILL MATCH
D20	REMOVE & REPLACE EXISTING EXPANSION JOINTS
D21	REMOVE EXTERIOR VENTS, AC UNITS, FANS, ETC
D22	REMOVE ALL EXTERIOR SIGNAGE
D23	EXISTING BRICK TO BE FULLY CLEANED. CARRY 25% FOR REPAIR AND REPOINTING.
D33	SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION

GENERAL EXTERIOR DEMO NOTES:

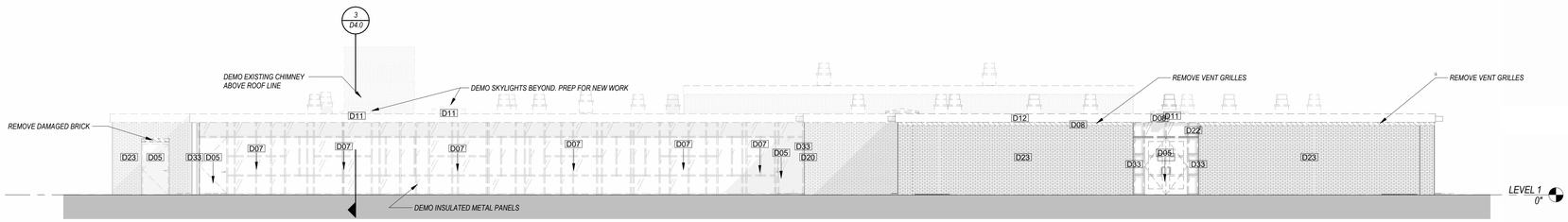
- *EXISTING BRICK TO BE FULLY CLEANED. CARRY 25% FOR REPAIR AND REPOINTING.*
- *REMOVE ALL EXTERIOR SIGNAGE.*
- *REMOVE EXTERIOR MOUNTED LIGHTS, CAMERAS, ETC.*
- *REMOVE EXTERIOR VENTS, AC UNITS, FANS, ETC.*
- **13. DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH.**



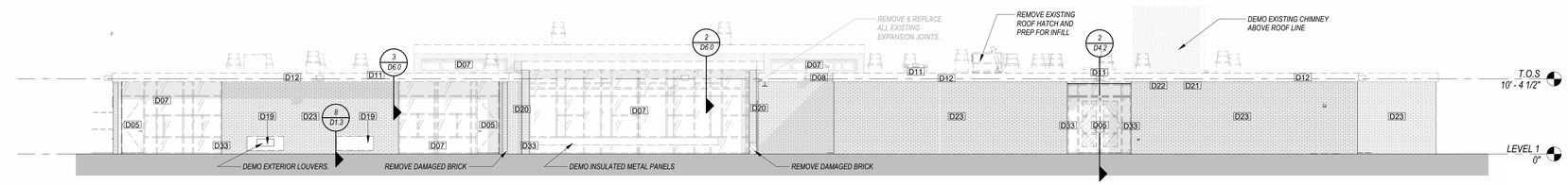
4 D3.0 **DEMO WEST ELEVATION - A**
1/8" = 1'-0"



3 D3.0 **DEMO WEST ELEVATION - B**
1/8" = 1'-0"



2 D3.0 **DEMO-SOUTH ELEVATION**
1/8" = 1'-0"



1 D3.0 **DEMO-NORTH ELEVATION**
1/8" = 1'-0"

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RENOVATIONS TO:
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

N
AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-OVERALL EXTERIOR ELEVATIONS

D3.0

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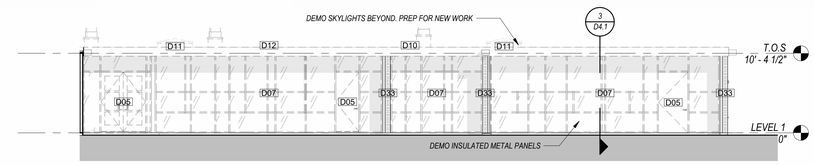
13. DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH. COORDINATE WITH PLUMBING DWGS.

DEMOLITION KEYNOTE LEGEND- PLAN

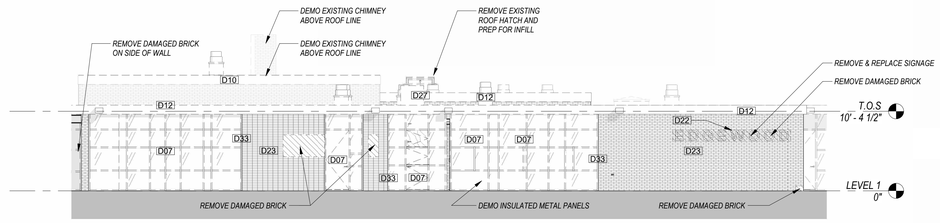
Key Value	Keynote Text
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY, TYP.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D12	DEMO ALL EXISTING FASCIA MATERIAL
D22	REMOVE ALL EXTERIOR SIGNAGE
D23	EXISTING BRICK TO BE FULLY CLEANED. CARRY 25% FOR REPAIR AND REPOINTING.
D27	DEMO EXISTING ROOF HATCH IN INTS ENTIRETY AND PREP FOR INFILL
D33	SCRAPE AND CLEAN BRICK FACE TO REMAIN EXPOSED IN NEW CONSTRUCTION

GENERAL EXTERIOR DEMO NOTES:

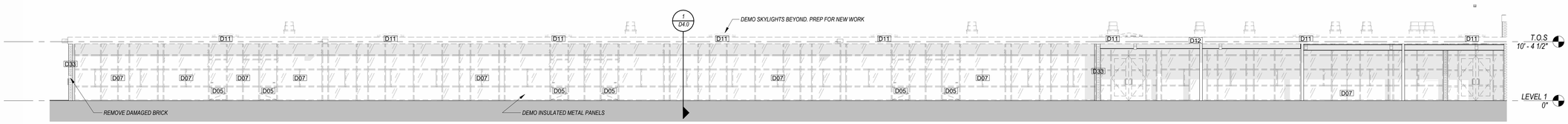
- *EXISTING BRICK TO BE FULLY CLEANED. CARRY 25% FOR REPAIR AND REPOINTING.*
- *REMOVE ALL EXTERIOR SIGNAGE.*
- *REMOVE EXTERIOR MOUNTED LIGHTS, CAMERAS, ETC.*
- *REMOVE EXTERIOR VENTS, AC UNITS, FANS, ETC.*
- **13. DEMO ALL THE CLEANOUTS COVERS AND PIPING, TOOTH IN NEW BRICK TO MATCH.**



3 D3.1 **DEMO EAST ELEVATION - C**
1/8" = 1'-0"



2 D3.1 **DEMO EAST ELEVATION - B**
1/8" = 1'-0"



1 D3.1 **DEMO EAST ELEVATION - A**
1/8" = 1'-0"

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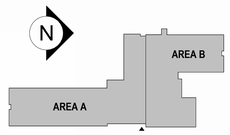

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO-OVERALL EXTERIOR ELEVATIONS

D3.1

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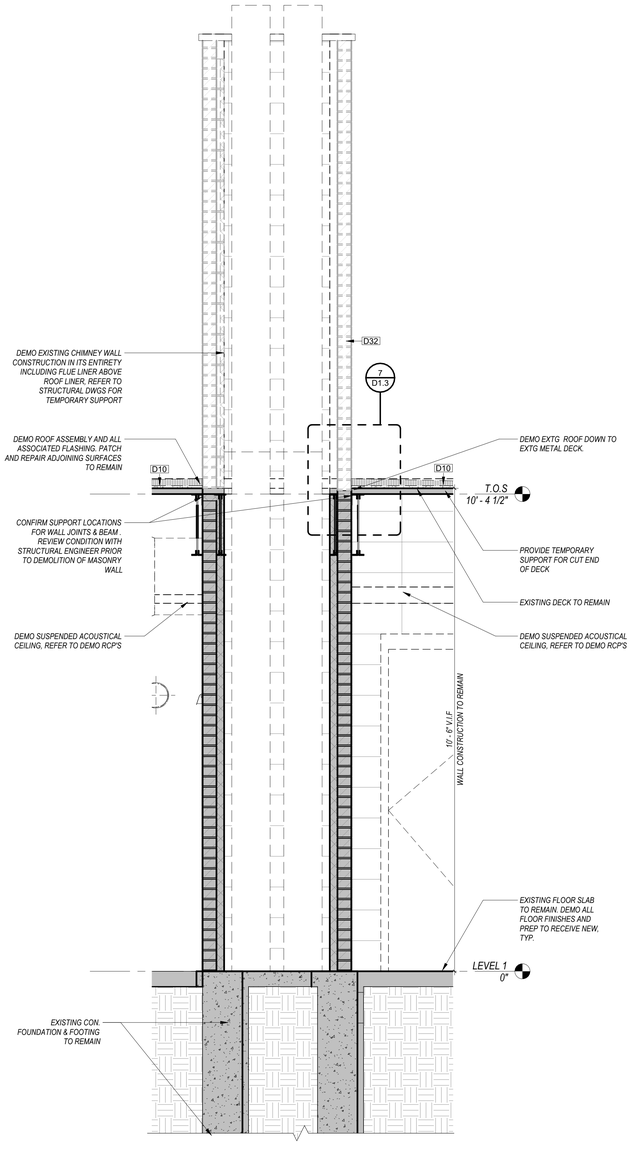
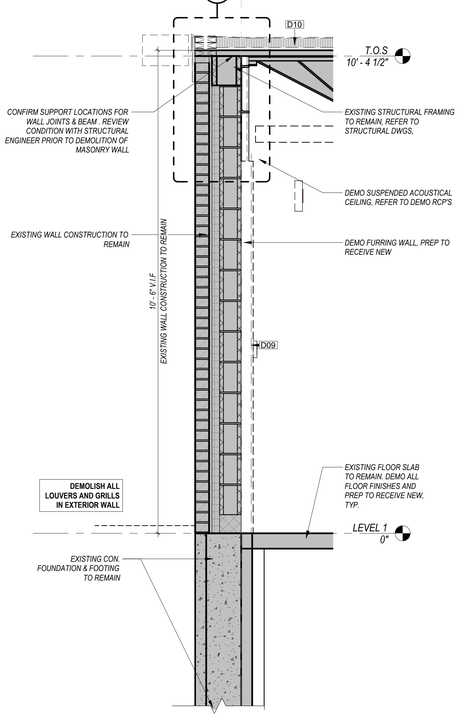
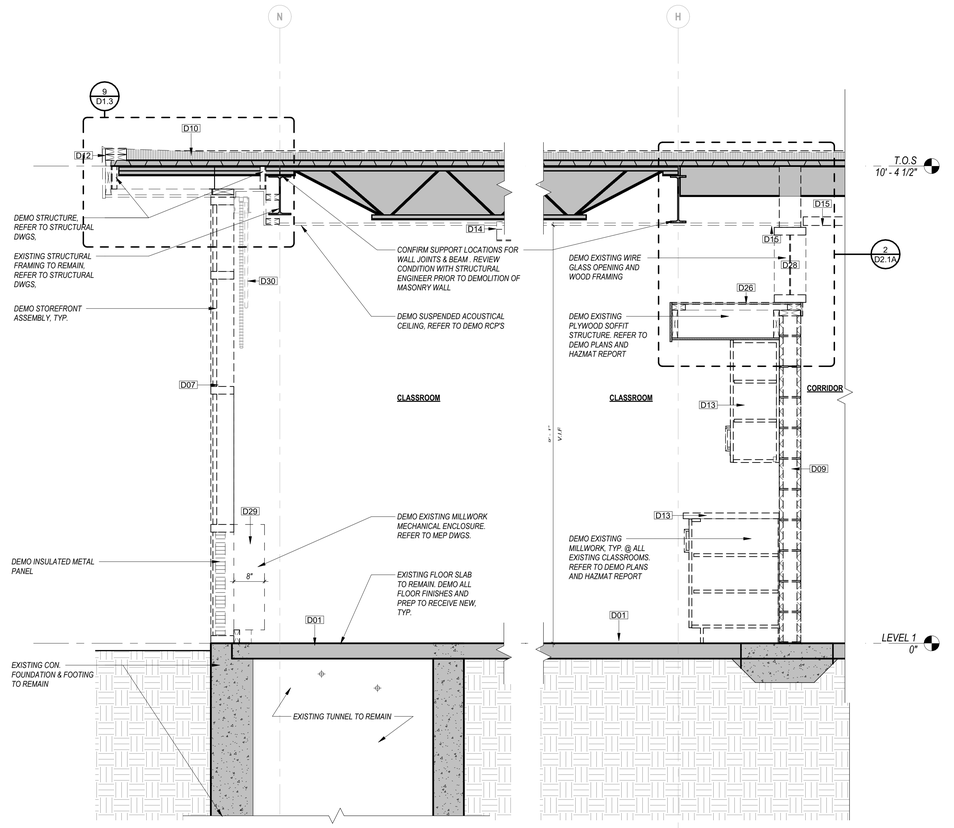
DEMOLITION KEYNOTE LEGEND- PLAN	
Key Value	Keynote Text
D01	DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT REPORT.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D09	DEMO EXISTING WALLS. PATCH AND REPAIR ADJOINING SURFACES WHERE WALLS ARE REMOVED.
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D12	DEMO ALL EXISTING FASCIA MATERIAL
D13	REMOVE EXISTING BUILT IN MILLWORK WALL AND BASE CABINETS,COUNTERTOPS. ETC
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES. CEILING SOFFITS AND DUCT ENCLOSURES
D26	DEMO WOOD SOFFIT ASSEMBLY. REFER TO HAZMAT
D28	DEMO EXISTING WIRE GLASS ASSEMBLY. PREP FOR NEW WORK.
D29	DEMO EXISTING FIN TUBE RADIATORS, UNIT VENTILATORS, ETC. REFER TO MEP FOR EXTENT OF WORK
D30	DEMO EXISTING ALL WINDOW BLINDS, TYP.
D32	DEMO EXISTING CHIMNEY WALL CONSTRUCTION IN ITS ENTIRETY INCLUDING FLUE LINER ABOVE ROOF LINER. REFER TO STRUCTURAL DWGS FOR TEMPORARY SUPPORT



3 D4.0 **DEMO WALL SECTION 3 (AREA B)**
3/4" = 1'-0"



2 D4.0 **DEMO WALL SECTION 2 (AREA A)**
3/4" = 1'-0"



1 D4.0 **DEMO WALL SECTION 1-TYP. CLASSROOM**
3/4" = 1'-0"

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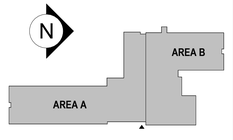

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO WALL SECTIONS

D4.0

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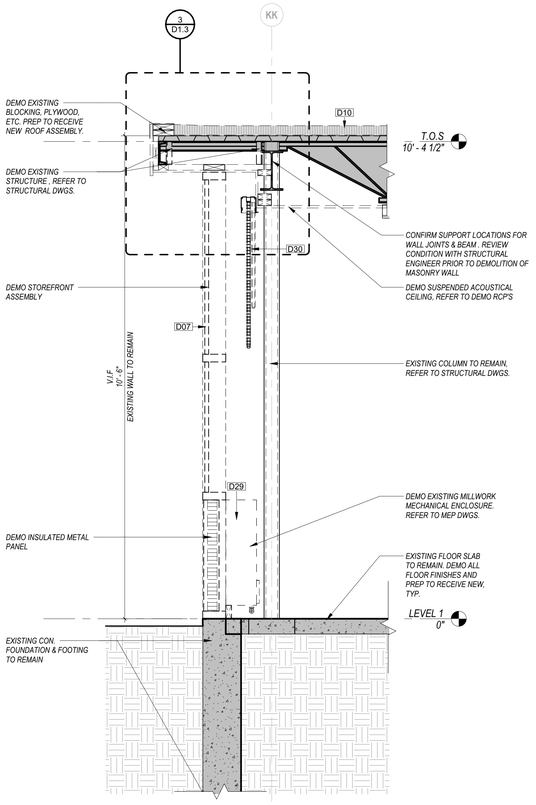
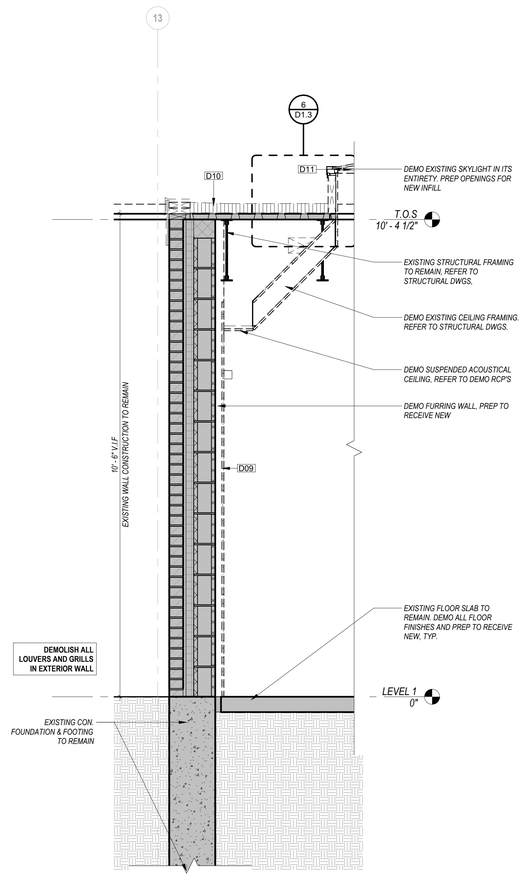
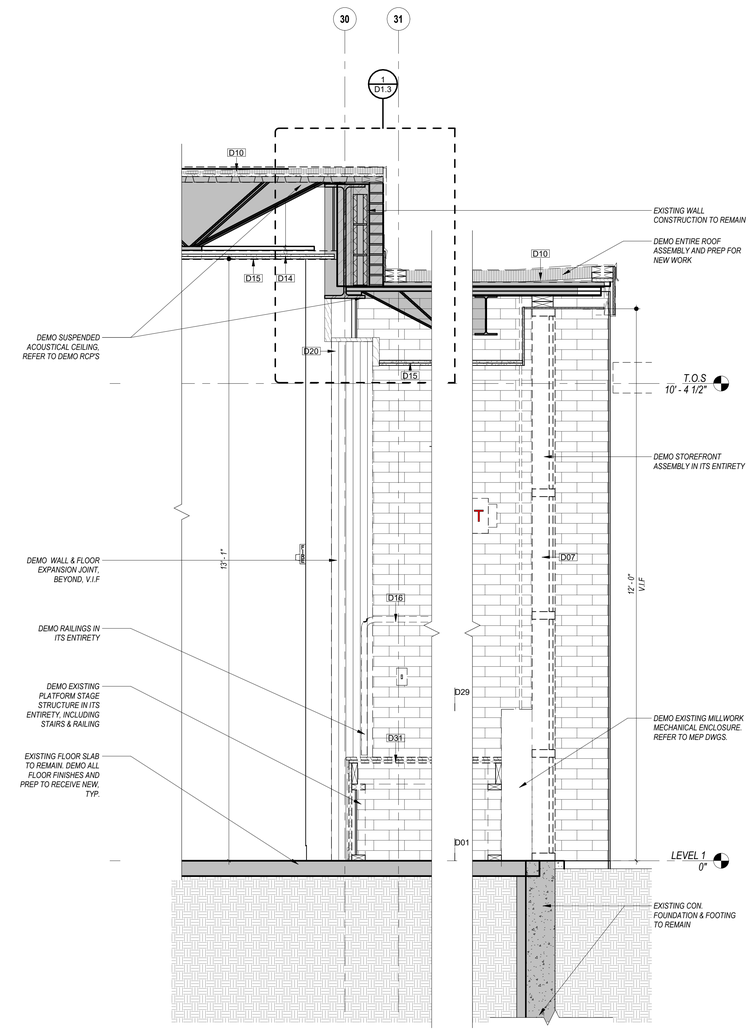
DEMOLITION KEYNOTE LEGEND- PLAN	
Key Value	Keynote Text
D01	DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT REPORT.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D09	DEMO EXISTING WALLS. PATCH AND REPAIR ADJOINING SURFACES WHERE WALLS ARE REMOVED.
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES, CEILING SOFFITS AND DUCT ENCLOSURES
D16	DEMO STAIR AND RAILING ASSEMBLY IN ITS ENTIRETY. REFER TO HAZMAT REPORT
D20	REMOVE & REPLACE EXISTING EXPANSION JOINTS
D29	DEMO EXISTING FIN TUBE RADIATORS, UNIT VENTILATORS, ETC. REFER TO MEP FOR EXTENT OF WORK
D30	DEMO EXISTING ALL WINDOW BLINDS, TYP.
D31	DEMO ENTIRE STAGE PLATFORM ASSEMBLY AND PREP FOR NEW WORK.



3 D4.1 **DEMO WALL SECTION 6 (AREA B)**
3/4" = 1'-0"



2 D4.1 **DEMO WALL SECTION 5**
3/4" = 1'-0"



1 D4.1 **DEMO WALL SECTION 4 (AREA B)**
3/4" = 1'-0"

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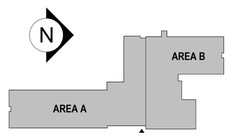
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

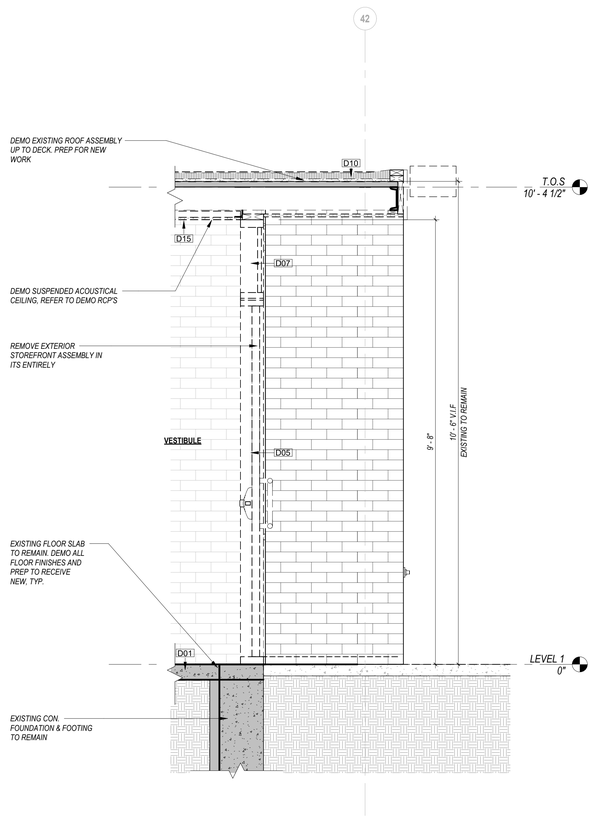


CONSTRUCTION DOCUMENTS
JUNE 5, 2026

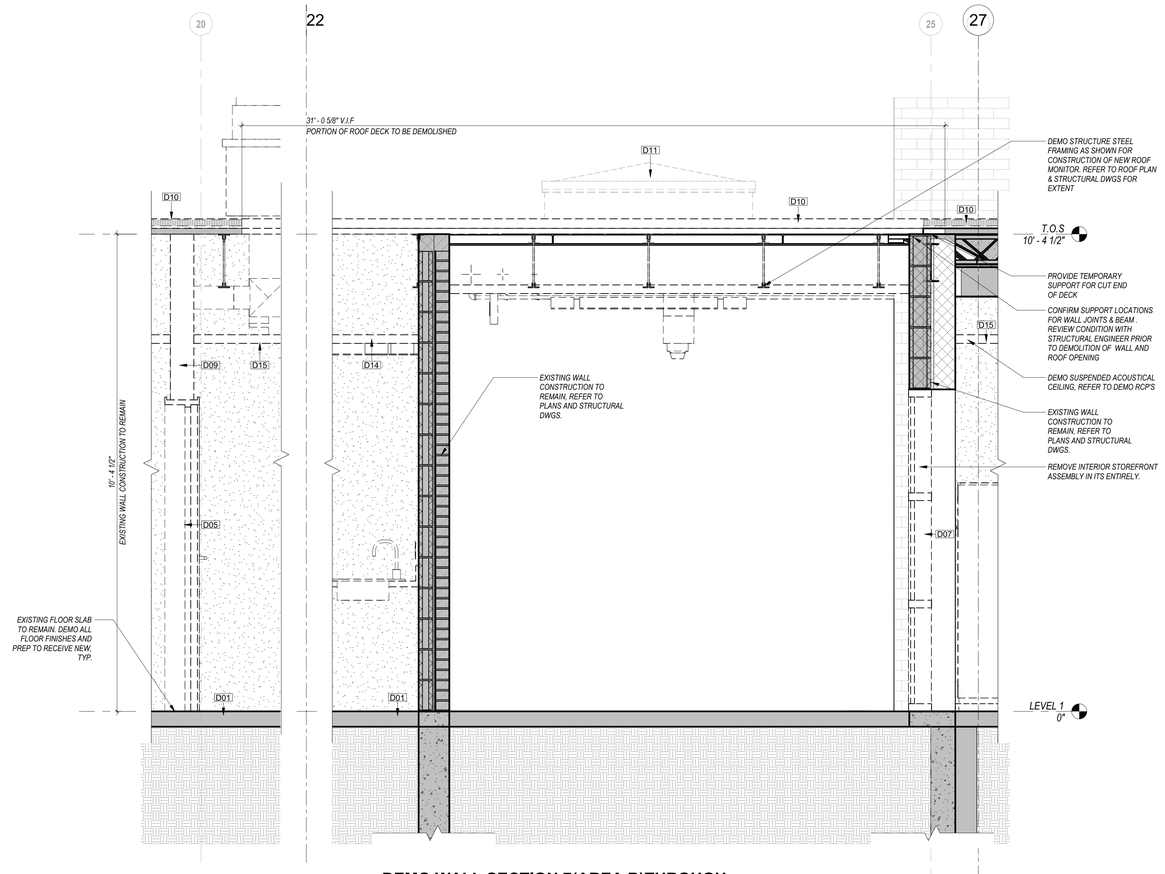
DEMO WALL SECTIONS

D4.1

DEMOLITION KEYNOTE LEGEND- PLAN	
Key Value	Keynote Text
D01	DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT REPORT.
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY. TYP.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D09	DEMO EXISTING WALLS. PATCH AND REPAIR ADJOINING SURFACES WHERE WALLS ARE REMOVED.
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES, CEILING SOFFITS AND DUCT ENCLOSURES



2 D4.2 **DEMO WALL SECTION 8**
3/4" = 1'-0"



1 D4.2 **DEMO WALL SECTION 7(AREA B)THROUGH ROOF MONITOR**
3/4" = 1'-0"

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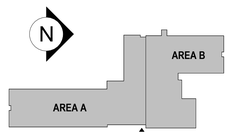
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO WALL SECTIONS

D4.2

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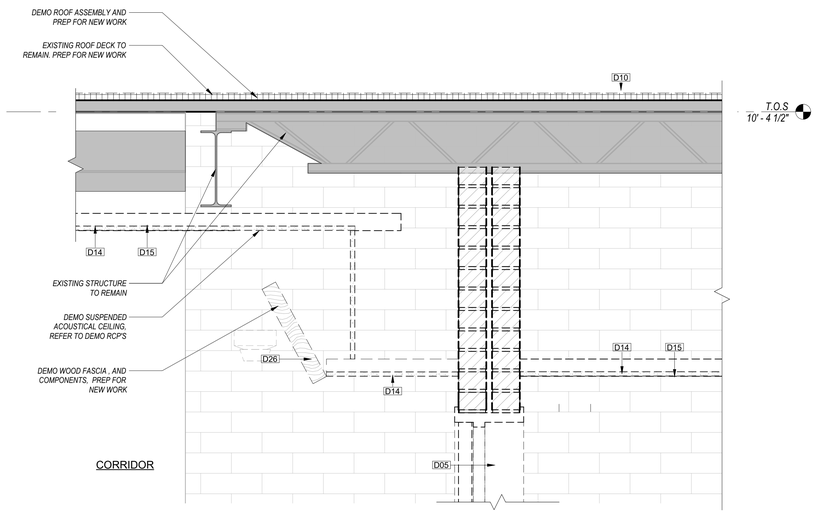
DEMOLITION PLAN GRAPHICS LEGEND

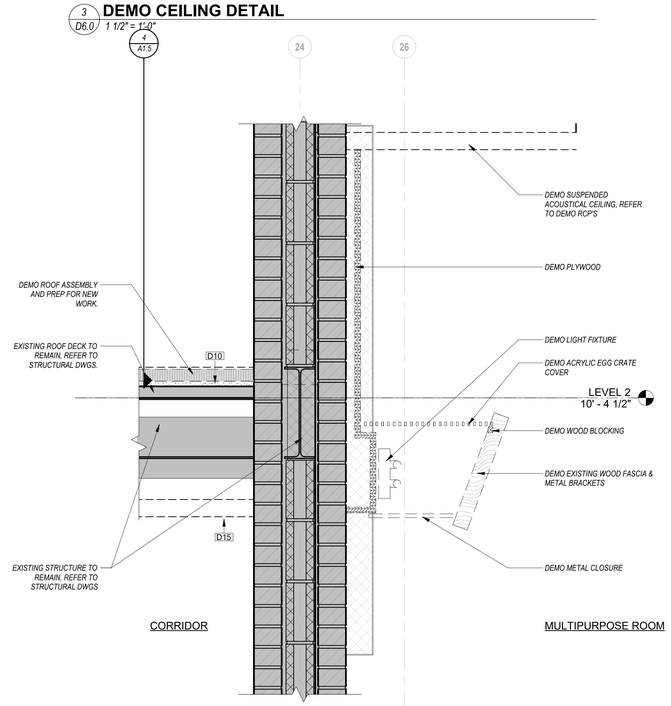
- EXISTING WALL TO REMAIN
- EXISTING WALL / ITEM TO BE DEMOLISHED
- FLOOR SLAB TO BE DEMOLISHED
- DOOR TO BE DEMOLISHED
- OBJECT TO BE DEMOLISHED. REFER TO NOTE OR KEYNOTE
- EXISTING BRICK LAYER TO BE DEMOLISHED

DEMOLITION KEYNOTE LEGEND- PLAN

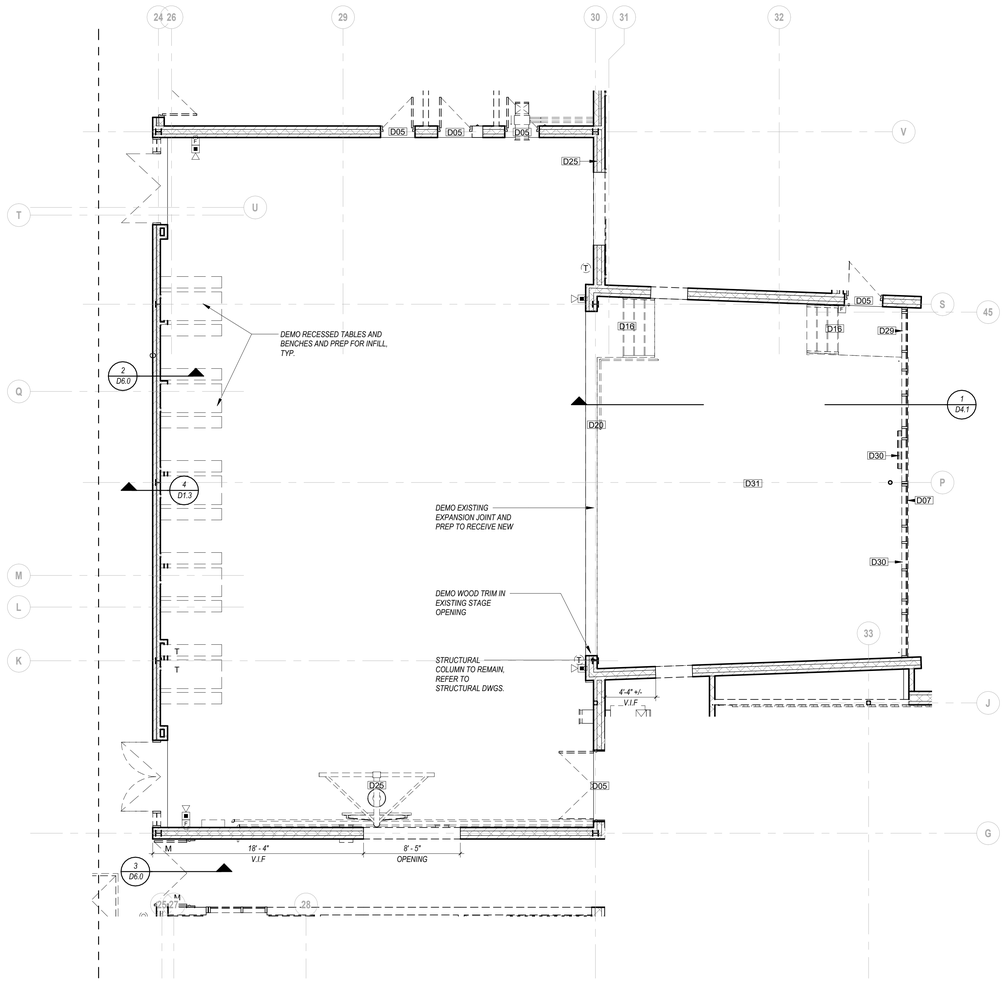
Key Value	Keynote Text
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY, TYP.
D07	DEMO STOREFRONT SYSTEM, IN ITS ENTIRETY. PREP FOR NEW WORK.
D10	REMOVE EXISTING BUILT UP ROOF ASSEMBLY IN ITS ENTIRETY DOWN TO EXISTING DECK. THIS INCLUDES MISC. ROOFTOP EQUIPMENT, VENTS PIPES & CONDUITS. PREP SURFACE FOR NEW ROOFING MATERIAL
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES, CEILING SOFFITS AND DUCT ENCLOSURES
D16	DEMO STAIR AND RAILING ASSEMBLY IN ITS ENTIRETY. REFER TO HAZMAT REPORT
D20	REMOVE & REPLACE EXISTING EXPANSION JOINTS
D25	DEMO ALL EXISTING GYM EQUIPMENT, INCLUDING BUT NOT LIMITED TO BASKETBALL HOOP ASSEMBLIES AND HANGERS, NETS, WALL AND MOUNTED EQUIPMENT
D26	DEMO WOOD SOFFIT ASSEMBLY. REFER TO HAZMAT
D29	DEMO EXISTING FIN TUBE RADIATORS, UNIT VENTILATORS, ETC. REFER TO MEP FOR EXTENT OF WORK
D30	DEMO EXISTING ALL WINDOW BLINDS, TYP.
D31	DEMO ENTIRE STAGE PLATFORM ASSEMBLY AND PREP FOR NEW WORK.



3 DEMO CEILING DETAIL
3 / D6.0 — 1 1/2" = 1'-0"



2 DEMO CEILING DETAIL 1
2 / D6.0 — 1 1/2" = 1'-0"



1 DEMO ENLARGED MULTIPURPOSE ROOM
1 / D6.0 — 3/16" = 1'-0"

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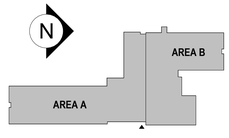
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

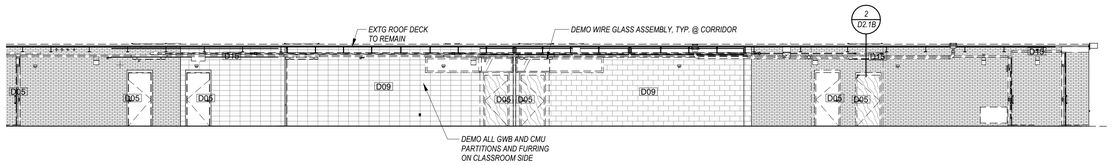


CONSTRUCTION DOCUMENTS
JUNE 5, 2026

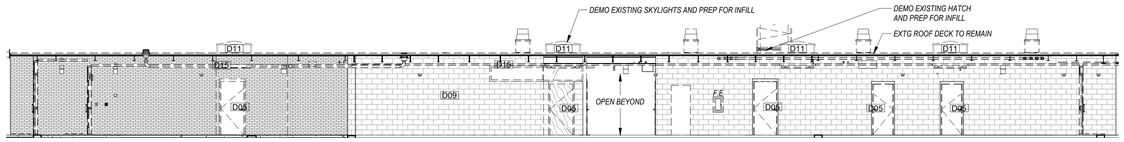
DEMO-ENLARGED GYM PLAN & DETAILS

D6.0

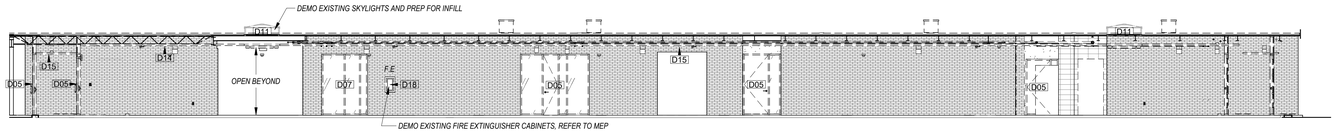
DEMOLITION KEYNOTE LEGEND- PLAN	
Key Value	Keynote Text
D01	DEMO EXISTING FLOOR MATERIAL DOWN TO CONCRETE. PREP SURFACES FOR NEW FLOORING. REFER TO HAZMAT REPORT.
D05	DEMO DOOR AND FRAME IN ITS ENTIRETY, TYP.
D07	DEMO STOREFRONT SYSTEM. IN ITS ENTIRETY. PREP FOR NEW WORK.
D09	DEMO EXISTING WALLS. PATCH AND REPAIR ADJOINING SURFACES WHERE WALLS ARE REMOVED.
D11	REMOVE EXISTING SKYLIGHTS IN INTS ENTIRETY. PREP OPENING FOR NEW INFILL.
D14	DEMO ALL ELECTRICAL COMPONENTS AND ASSOCIATED WIRING INCLUDING BUT NOT LIMITED TO LIGHTING FIXTURES, EXIT SIGNS, FIRE ALARM DEVICES, ETC. REFER TO ELECTRICAL DWGS. FOR NEW WORK.
D15	DEMO EXISTING SUSPENDED AND/OR FRAMED CEILING ASSEMBLIES, CEILING SOFFITS AND DUCT ENCLOSURES
D18	DEMO ALL EXISTING FIRE EXTINGUISHER CABINETS
D28	DEMO EXISTING WIRE GLASS ASSEMBLY. PREP FOR NEW WORK.



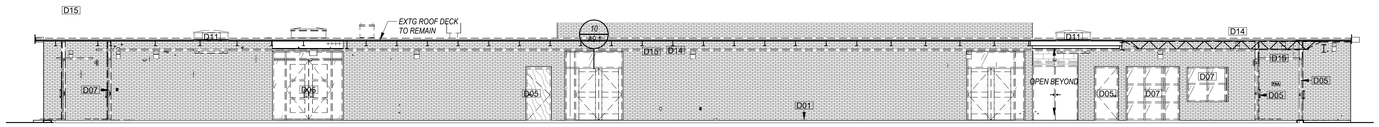
6 D7.10 **DEMO CORRIDOR 156-INT. ELEVATION (WEST)**
1/8" = 1'-0"



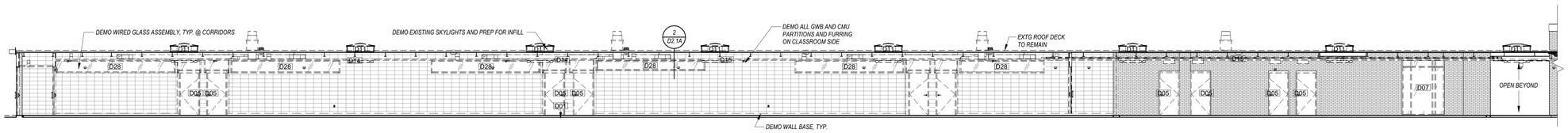
5 D7.10 **DEMO-CORRIDOR 106-EAST ELEVATION**
1/8" = 1'-0"



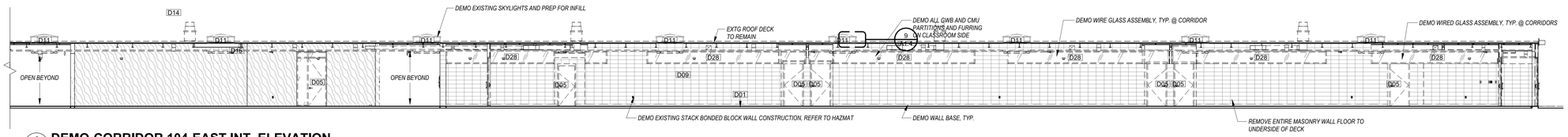
4 D7.10 **DEMO CORRIDOR 1102-SOUTH INTERIOR ELEV.**
1/8" = 1'-0"



3 D7.10 **DEMO-CORRIDOR 1102-NORTH ELEVATION**
1/8" = 1'-0"



2 D7.10 **DEMO-CORRIDOR 104 INT. WEST ELEVATION**
1/8" = 1'-0"



1 D7.10 **DEMO-CORRIDOR 104-EAST INT. ELEVATION**
1/8" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

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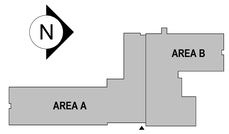

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DEMO INTERIOR ELEVATIONS

D7.10

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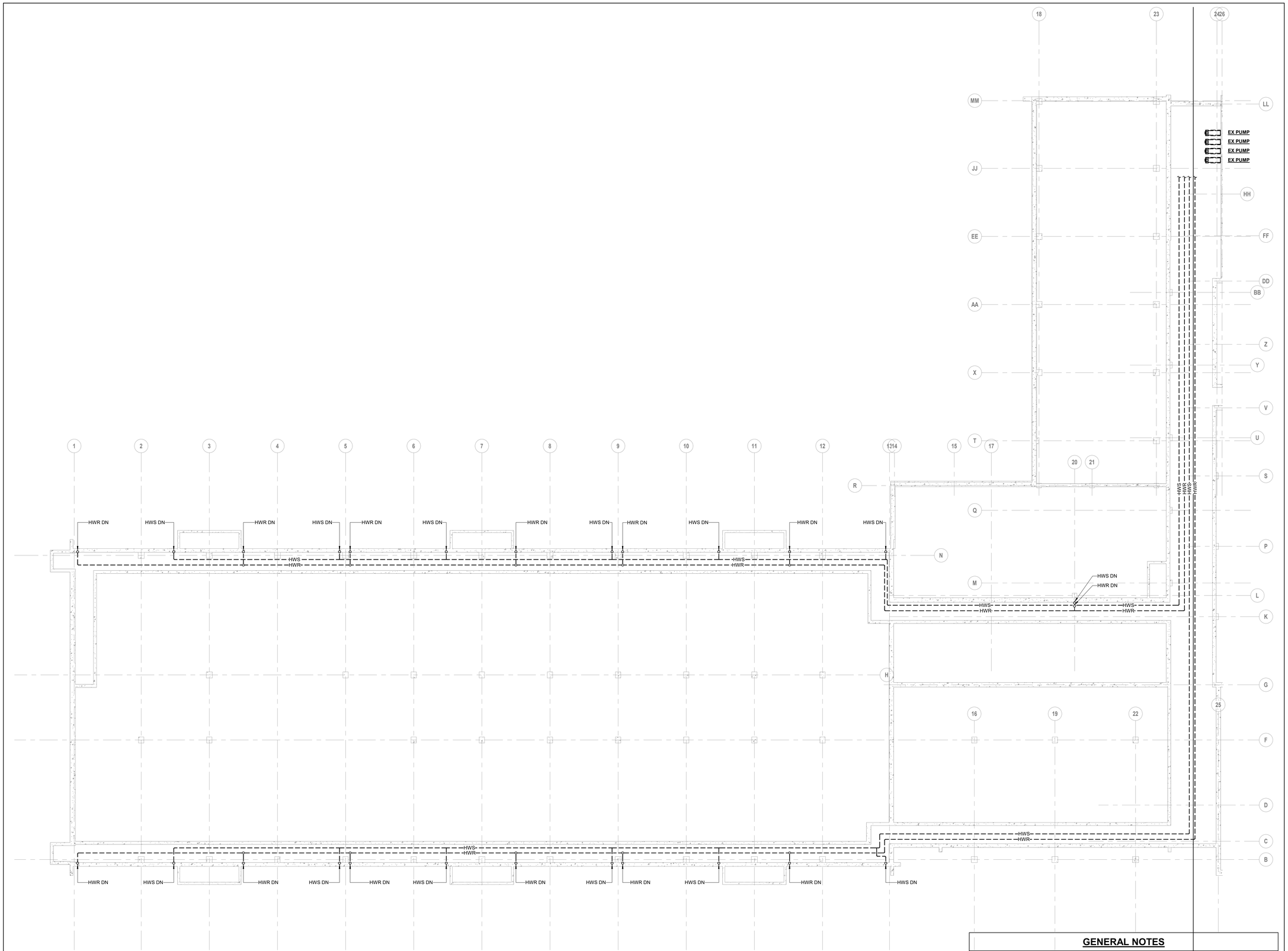

1 BASEMENT MECHANICAL DEMOLITION PLAN - AREA A
1/8" = 1'-0"

GENERAL NOTES

1. DRAWINGS ARE BASED ON AVAILABLE AS BUILT AND RECORD DRAWINGS FROM PREVIOUS PROJECTS AND MAY NOT SHOW ALL MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK.
2. CONTRACTOR SHALL REMOVE ALL HVAC SYSTEMS, INCLUDING ALL ASSOCIATED CONTROLS DEVICES, EQUIPMENT, PIPING, DUCTWORK, AND APPURTENANCES, IN THEIR ENTIRETY.
3. ALL PERIMETER UNIT VENTILATOR AND FAN COIL OUTDOOR AIR DUCTWORK AND LOUVERS SHALL BE REMOVED IN THEIR ENTIRETY. COORDINATE PATCHING OF EXTERIOR WALL PENETRATIONS WITH THE G.C.
4. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT MECHANICAL DEMO PLAN - AREA A

MD1.0A

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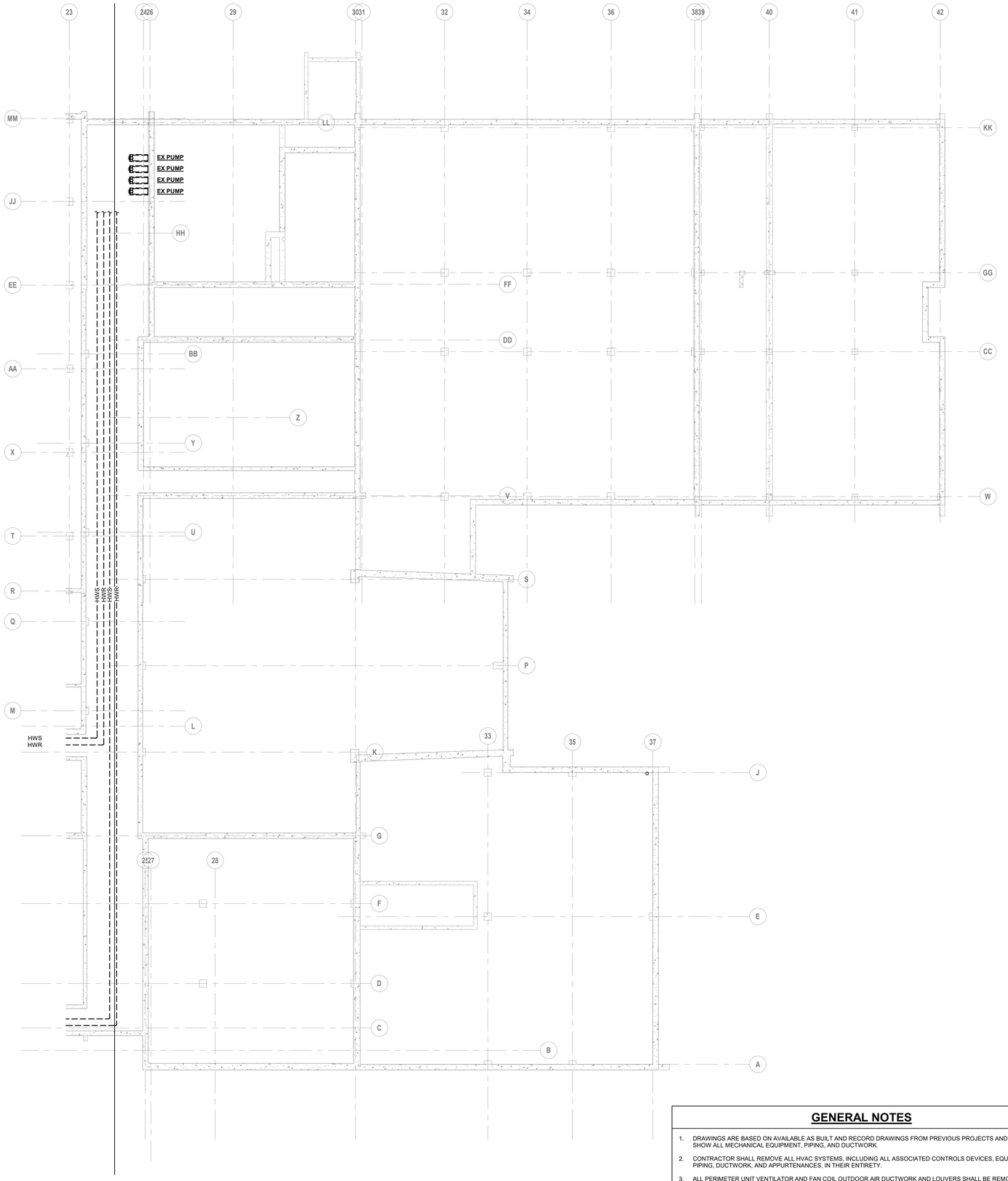

1 BASEMENT MECHANICAL DEMOLITION PLAN - AREA B
1/8" = 1'-0"

GENERAL NOTES

1. DRAWINGS ARE BASED ON AVAILABLE AS BUILT AND RECORD DRAWINGS FROM PREVIOUS PROJECTS AND MAY NOT SHOW ALL MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK.
2. CONTRACTOR SHALL REMOVE ALL HVAC SYSTEMS, INCLUDING ALL ASSOCIATED CONTROLS DEVICES, EQUIPMENT, PIPING, DUCTWORK, AND APPURTENANCES, IN THEIR ENTIRETY.
3. ALL PERIMETER UNIT VENTILATOR AND FAN COIL OUTDOOR AIR DUCTWORK AND LOUVERS SHALL BE REMOVED IN THEIR ENTIRETY. COORDINATE PATCHING OF EXTERIOR WALL PENETRATIONS WITH THE G.C.
4. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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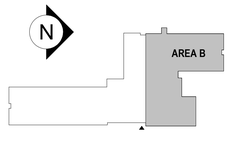

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT MECHANICAL DEMO PLAN - AREA B

MD1.0B

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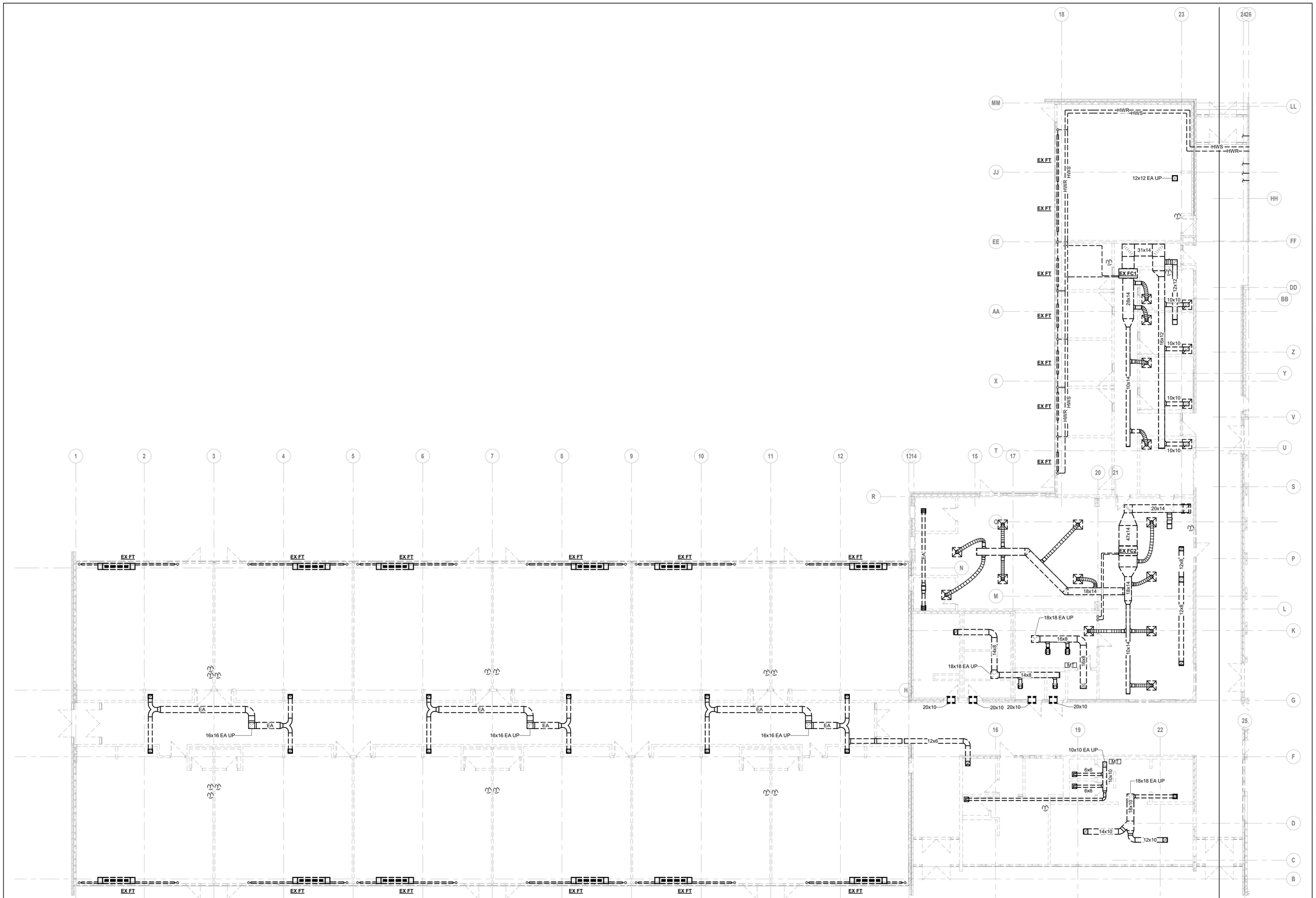

1 FIRST FLOOR MECHANICAL DEMOLITION PLAN - AREA A
1/8" = 1'-0"

GENERAL NOTES

1. DRAWINGS ARE BASED ON AVAILABLE AS BUILT AND RECORD DRAWINGS FROM PREVIOUS PROJECTS AND MAY NOT SHOW ALL MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK.
2. CONTRACTOR SHALL REMOVE ALL HVAC SYSTEMS, INCLUDING ALL ASSOCIATED CONTROLS DEVICES, EQUIPMENT, PIPING, DUCTWORK, AND APPURTENANCES, IN THEIR ENTIRETY.
3. ALL PERIMETER UNIT VENTILATOR AND FAN COIL OUTDOOR AIR DUCTWORK AND LOUVERS SHALL BE REMOVED IN THEIR ENTIRETY. COORDINATE PATCHING OF EXTERIOR WALL PENETRATIONS WITH THE G.C.
4. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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Project #:25064

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AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR MECHANICAL DEMO PLAN - AREA A

MD1.1A

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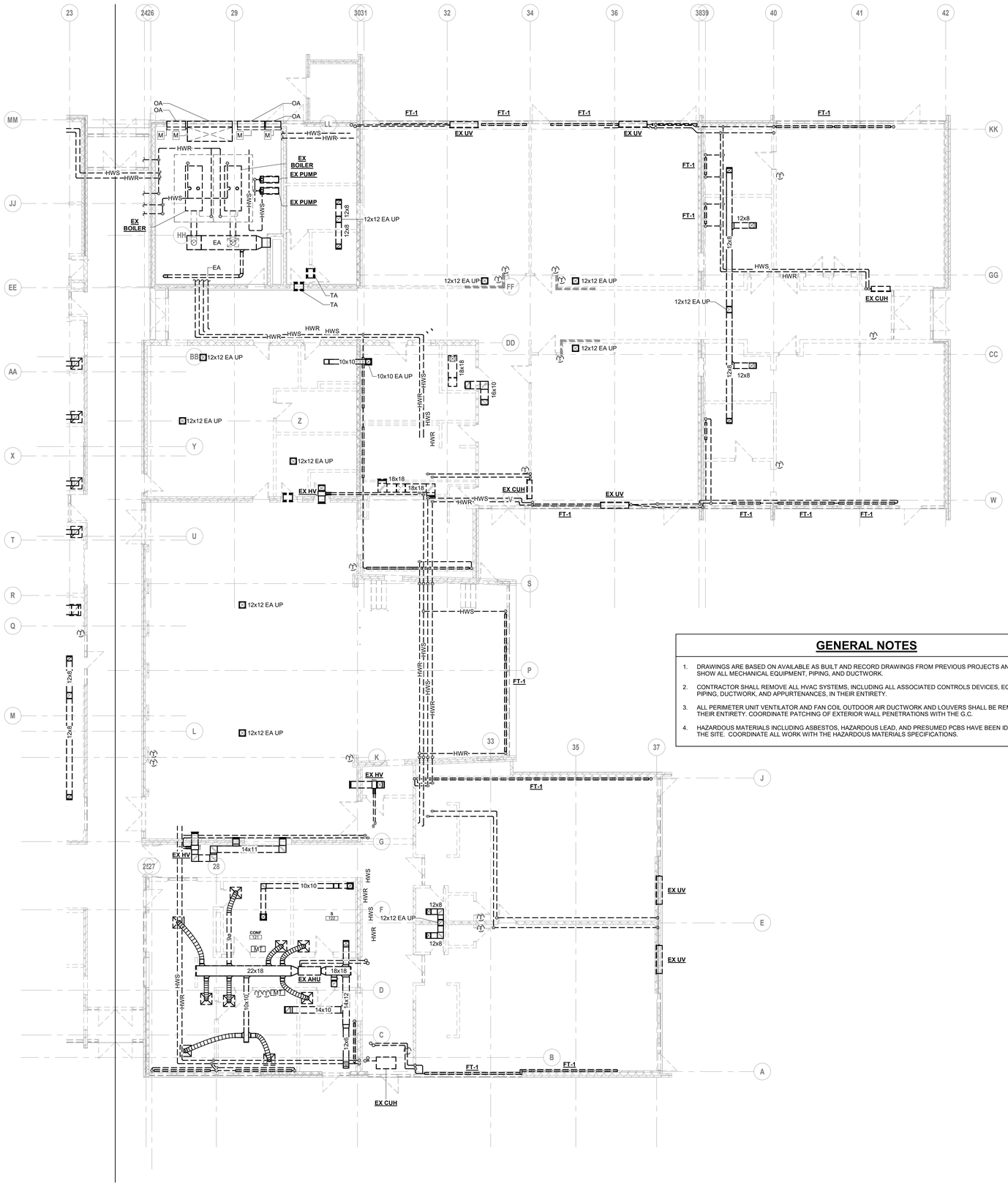

1 FIRST FLOOR MECHANICAL DEMOLITION PLAN - AREA B
1/8" = 1'-0"

GENERAL NOTES

1. DRAWINGS ARE BASED ON AVAILABLE AS BUILT AND RECORD DRAWINGS FROM PREVIOUS PROJECTS AND MAY NOT SHOW ALL MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK.
2. CONTRACTOR SHALL REMOVE ALL HVAC SYSTEMS, INCLUDING ALL ASSOCIATED CONTROLS DEVICES, EQUIPMENT, PIPING, DUCTWORK, AND APPURTENANCES, IN THEIR ENTIRETY.
3. ALL PERIMETER UNIT VENTILATOR AND FAN COIL OUTDOOR AIR DUCTWORK AND LOUVERS SHALL BE REMOVED IN THEIR ENTIRETY. COORDINATE PATCHING OF EXTERIOR WALL PENETRATIONS WITH THE G.C.
4. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.

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MICHAEL J. PERSICHETTI
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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR MECHANICAL DEMO PLAN - AREA B

MD1.1B

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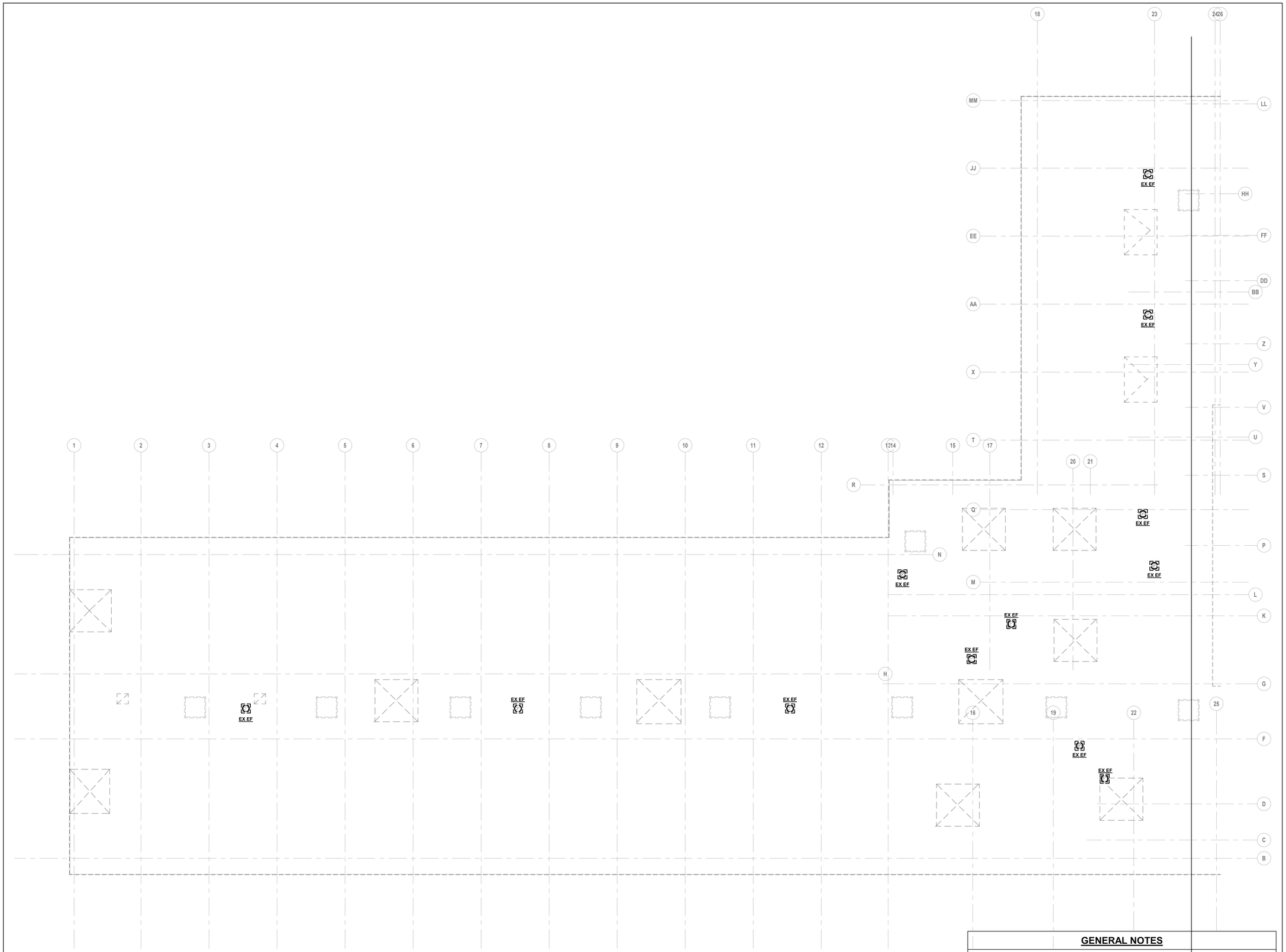

1 ROOF MECHANICAL DEMOLITION PLAN - AREA A
1/8" = 1'-0"

GENERAL NOTES

1. DRAWINGS ARE BASED ON AVAILABLE AS BUILT AND RECORD DRAWINGS FROM PREVIOUS PROJECTS AND MAY NOT SHOW ALL MECHANICAL EQUIPMENT, PIPING, AND DUCTWORK.
2. CONTRACTOR SHALL REMOVE ALL HVAC SYSTEMS, INCLUDING ALL ASSOCIATED CONTROLS DEVICES, EQUIPMENT, PIPING, DUCTWORK, AND APPURTENANCES, IN THEIR ENTIRETY.
3. ALL PERIMETER UNIT VENTILATOR AND FAN COIL OUTDOOR AIR DUCTWORK AND LOUVERS SHALL BE REMOVED IN THEIR ENTIRETY. COORDINATE PATCHING OF EXTERIOR WALL PENETRATIONS WITH THE G.C.
4. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.

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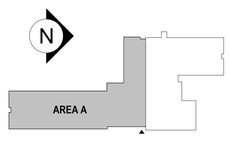
GM2

STATE OF CONNECTICUT · JOSEPH A. PASSUTTI · No. 21720 · LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF MECHANICAL DEMOLITION PLAN - AREA A

MD1.2A

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1 ROOF MECHANICAL DEMOLITION PLAN - AREA B
1/8" = 1'-0"

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4. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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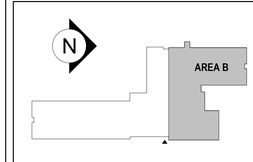
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF MECHANICAL DEMOLITION PLAN - AREA B

MD1.2B

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DEMO GENERAL NOTES

1. DEMOLITION DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF WORK ONLY. THIS PROJECT IS A FULL GUT RENOVATION; REMOVE ALL EXISTING PLUMBING SYSTEMS, PIPING, FIXTURES, AND ASSOCIATED COMPONENTS UNLESS SPECIFICALLY NOTED TO REMAIN. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO DEMOLITION. REMOVE SYSTEMS BACK TO THE NEAREST ACTIVE MAIN, RISER, OR SOURCE AND PROPERLY CAP OR SEAL.
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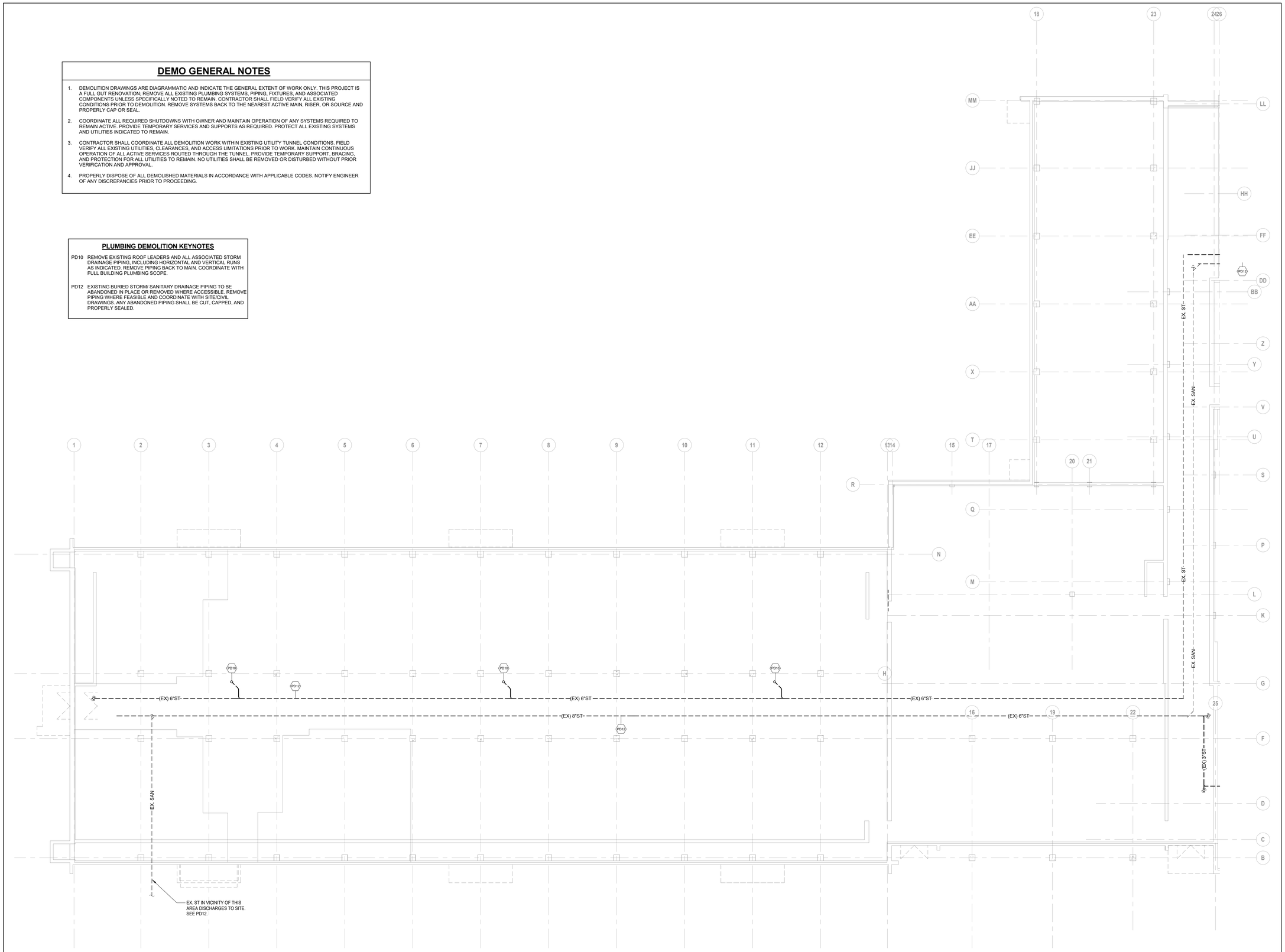
4. PROPERLY DISPOSE OF ALL DEMOLISHED MATERIALS IN ACCORDANCE WITH APPLICABLE CODES. NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO PROCEEDING.

PLUMBING DEMOLITION KEYNOTES

PD10 REMOVE EXISTING ROOF LEADERS AND ALL ASSOCIATED STORM DRAINAGE PIPING, INCLUDING HORIZONTAL AND VERTICAL RUNS AS INDICATED. REMOVE PIPING BACK TO MAIN. COORDINATE WITH FULL BUILDING PLUMBING SCOPE.

PD12 EXISTING BURIED STORM/ SANITARY DRAINAGE PIPING TO BE ABANDONED IN PLACE OR REMOVED WHERE ACCESSIBLE. REMOVE PIPING WHERE FEASIBLE AND COORDINATE WITH SITE/CIVIL DRAWINGS. ANY ABANDONED PIPING SHALL BE CUT, CAPPED, AND PROPERLY SEALED.



1 BASEMENT PLUMBING DEMOLITION PLAN - AREA A
1/8" = 1'-0"

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GM2

RENOVATIONS TO:
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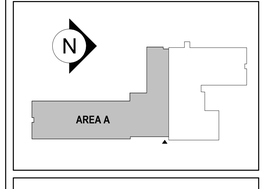
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT PLUMBING DEMO PLAN - AREA A

PD1.0A

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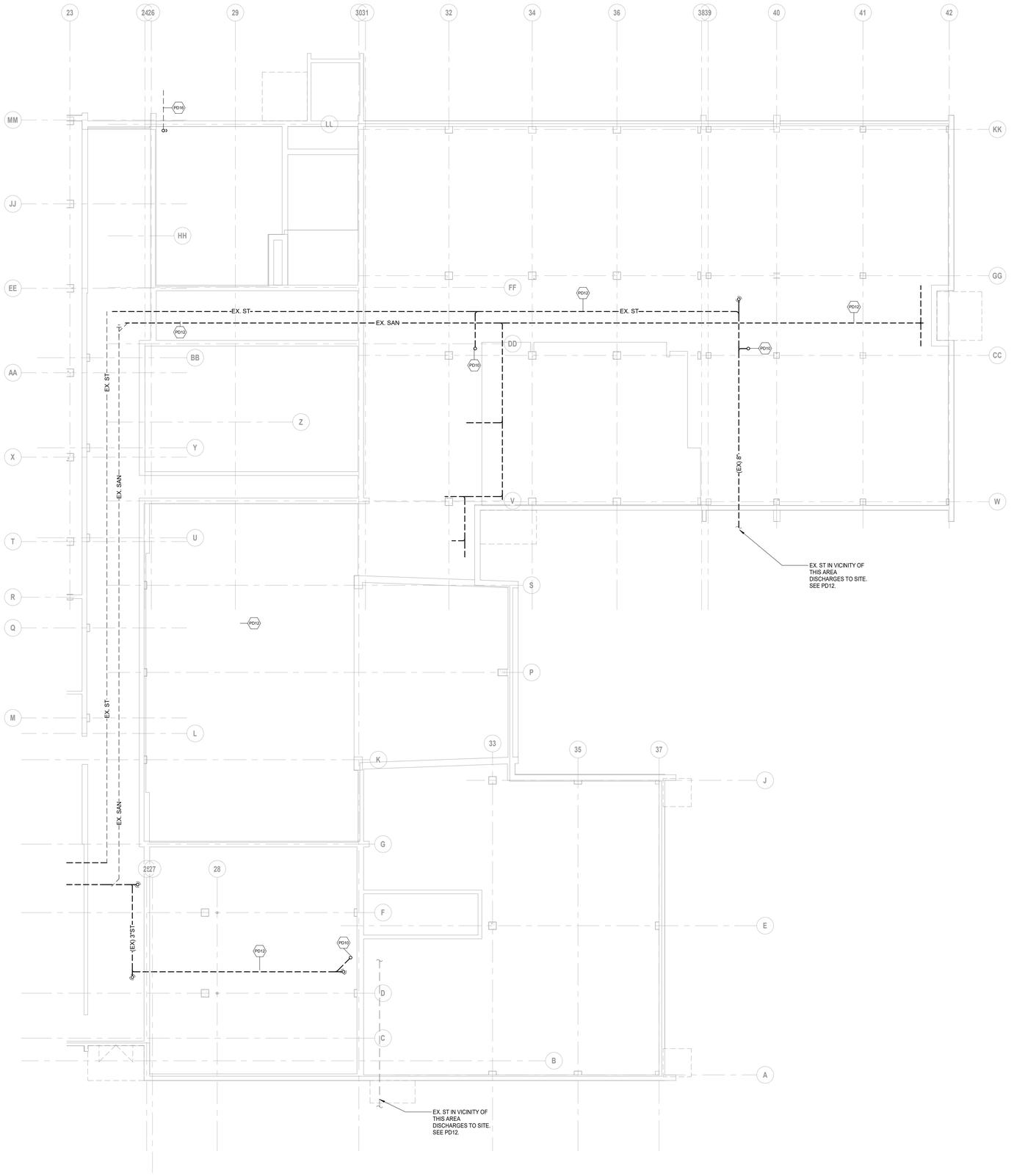
4. PROPERLY DISPOSE OF ALL DEMOLISHED MATERIALS IN ACCORDANCE WITH APPLICABLE CODES. NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO PROCEEDING.

PLUMBING DEMOLITION KEYNOTES

PD10 REMOVE EXISTING ROOF LEADERS AND ALL ASSOCIATED STORM DRAINAGE PIPING, INCLUDING HORIZONTAL AND VERTICAL RUNS AS INDICATED. REMOVE PIPING BACK TO MAIN. COORDINATE WITH FULL BUILDING PLUMBING SCOPE.

PD12 EXISTING BURIED STORM/ SANITARY DRAINAGE PIPING TO BE ABANDONED IN PLACE OR REMOVED WHERE ACCESSIBLE. REMOVE PIPING WHERE FEASIBLE AND COORDINATE WITH SITE/CIVIL DRAWINGS. ANY ABANDONED PIPING SHALL BE CUT, CAPPED, AND PROPERLY SEALED.

PD16 REMOVE EXISTING DOMESTIC WATER METER ASSEMBLY INCLUDING METER, BYPASS PIPING, PRESSURE REDUCING VALVES, STRAINERS, SHUTOFF VALVES, UNIONS, AND ALL ASSOCIATED PIPING AND APPURTENANCES DOWNSTREAM OF THE EXISTING GATE VALVE AS INDICATED. CAP PIPING AT THE EXISTING GATE VALVE AND MAKE READY FOR FUTURE CONNECTION TO THE NEW DOMESTIC METER ASSEMBLY.



1 BASEMENT PLUMBING DEMOLITION PLAN - AREA B
1/8" = 1'-0"

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GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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State Project #: 017-0090 RNV
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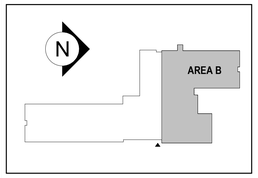

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT PLUMBING DEMO PLAN - AREA B

PD1.0B

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PLUMBING DEMOLITION KEYNOTES

PD01 REMOVE EXISTING BATHROOM FIXTURES, INCLUDING WATER CLOSETS, LAVATORIES FLOOR DRAINS, URINALS AND ALL ASSOCIATED DOMESTIC WATER, SANITARY, AND VENT PIPING BACK TO MAIN. CAP AND SEAL AS REQUIRED. COORDINATE WITH ARCHITECTURAL DEMOLITION AND FULL BUILDING PLUMBING DEMOLITION SCOPE. ALL PIPING SYSTEMS SHALL BE REPLACED UNDER THIS RENOVATION.

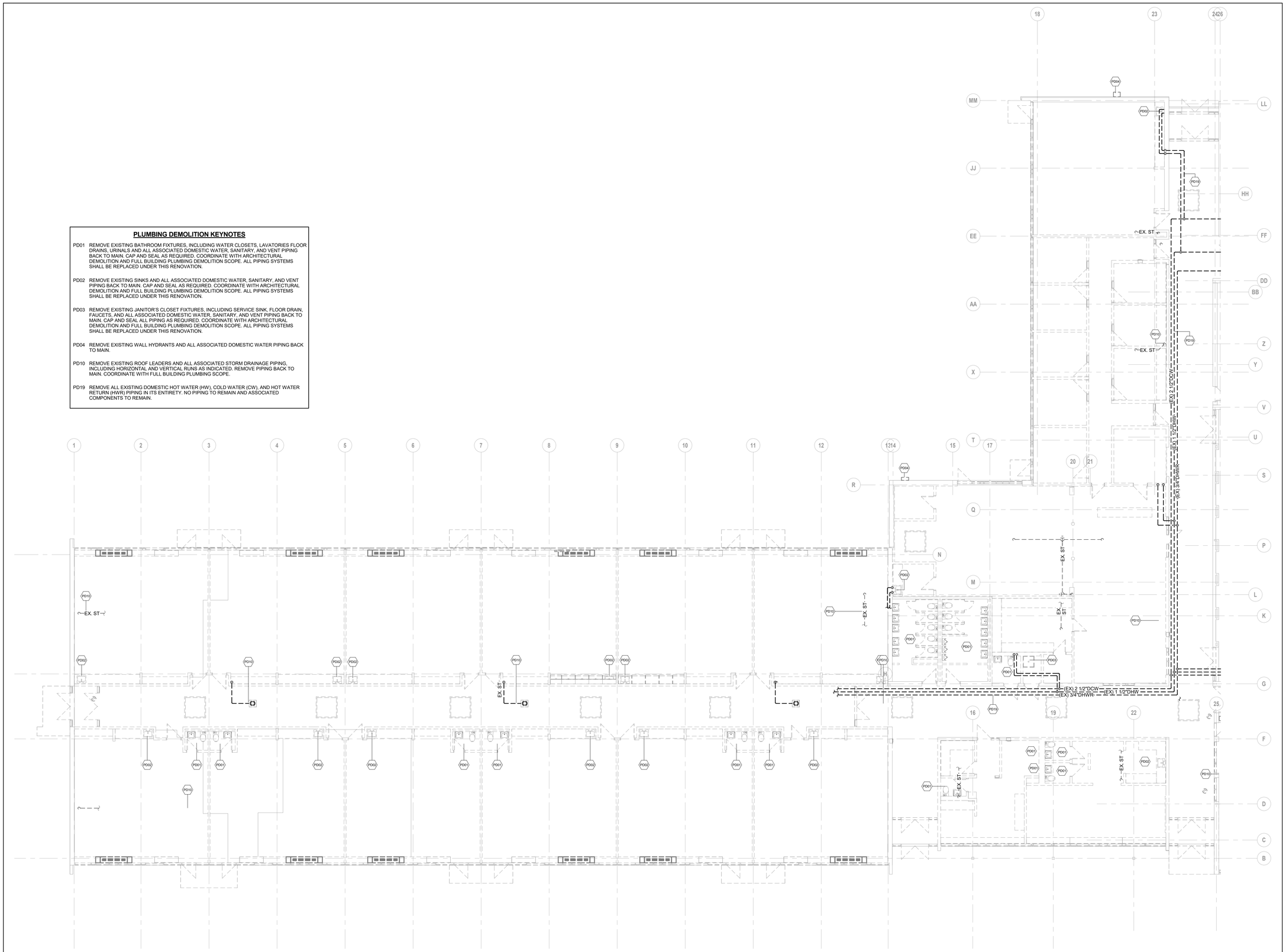
PD02 REMOVE EXISTING SINKS AND ALL ASSOCIATED DOMESTIC WATER, SANITARY, AND VENT PIPING BACK TO MAIN. CAP AND SEAL AS REQUIRED. COORDINATE WITH ARCHITECTURAL DEMOLITION AND FULL BUILDING PLUMBING DEMOLITION SCOPE. ALL PIPING SYSTEMS SHALL BE REPLACED UNDER THIS RENOVATION.

PD03 REMOVE EXISTING JANITOR'S CLOSET FIXTURES, INCLUDING SERVICE SINK, FLOOR DRAIN, FAUCETS, AND ALL ASSOCIATED DOMESTIC WATER, SANITARY, AND VENT PIPING BACK TO MAIN. CAP AND SEAL ALL PIPING AS REQUIRED. COORDINATE WITH ARCHITECTURAL DEMOLITION AND FULL BUILDING PLUMBING DEMOLITION SCOPE. ALL PIPING SYSTEMS SHALL BE REPLACED UNDER THIS RENOVATION.

PD04 REMOVE EXISTING WALL HYDRANTS AND ALL ASSOCIATED DOMESTIC WATER PIPING BACK TO MAIN.

PD10 REMOVE EXISTING ROOF LEADERS AND ALL ASSOCIATED STORM DRAINAGE PIPING, INCLUDING HORIZONTAL AND VERTICAL RUNS AS INDICATED. REMOVE PIPING BACK TO MAIN. COORDINATE WITH FULL BUILDING PLUMBING SCOPE.

PD19 REMOVE ALL EXISTING DOMESTIC HOT WATER (HW), COLD WATER (CW), AND HOT WATER RETURN (HWR) PIPING IN ITS ENTIRETY. NO PIPING TO REMAIN AND ASSOCIATED COMPONENTS TO REMAIN.



1 FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA A
1/8" = 1'-0"

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GM2

RENOVATIONS TO:
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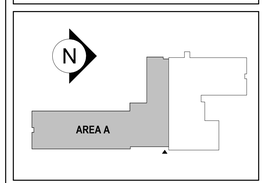

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR PLUMBING DEMO PLAN - AREA A

PD1.1A

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PLUMBING DEMOLITION KEYNOTES

PD01 REMOVE EXISTING BATHROOM FIXTURES, INCLUDING WATER CLOSETS, LAVATORIES FLOOR DRAINS, URINALS AND ALL ASSOCIATED DOMESTIC WATER, SANITARY, AND VENT PIPING BACK TO MAIN. CAP AND SEAL AS REQUIRED. COORDINATE WITH ARCHITECTURAL DEMOLITION AND FULL BUILDING PLUMBING DEMOLITION SCOPE. ALL PIPING SYSTEMS SHALL BE REPLACED UNDER THIS RENOVATION.

PD02 REMOVE EXISTING SINKS AND ALL ASSOCIATED DOMESTIC WATER, SANITARY, AND VENT PIPING BACK TO MAIN. CAP AND SEAL AS REQUIRED. COORDINATE WITH ARCHITECTURAL DEMOLITION AND FULL BUILDING PLUMBING DEMOLITION SCOPE. ALL PIPING SYSTEMS SHALL BE REPLACED UNDER THIS RENOVATION.

PD04 REMOVE EXISTING WALL HYDRANTS AND ALL ASSOCIATED DOMESTIC WATER PIPING BACK TO MAIN.

PD05 REMOVE EXISTING 120-GALLON GAS-FIRED WATER HEATER AND ALL ASSOCIATED DOMESTIC WATER, GAS, FLUE/VENT, TEMPERATURE AND PRESSURE RELIEF, AND DRAIN PIPING BACK TO MAIN. COORDINATE WITH FULL BUILDING PLUMBING AND MECHANICAL DEMOLITION SCOPE.

PD06 REMOVE EXISTING SUMP PUMP, INCLUDING BASIN, DISCHARGE PIPING, CHECK VALVE, ELECTRICAL CONNECTIONS, AND ALL ASSOCIATED APPURTENANCES. CAP AND SEAL DISCHARGE PIPING BACK TO MAIN AS REQUIRED. COORDINATE WITH PLUMBING AND ELECTRICAL DEMOLITION SCOPE.

PD07 REMOVE EXISTING THERMOSTATIC MIXING VALVE INCLUDING ALL ASSOCIATED HOT WATER, COLD WATER, AND MIXED WATER PIPING, ISOLATION VALVES, CHECK VALVES, AND APPURTENANCES BACK TO MAIN AS INDICATED. COORDINATE WITH FULL BUILDING PLUMBING DEMOLITION SCOPE.

PD08 REMOVE ALL EXISTING GAS PIPING, INCLUDING PIPING, VALVES, HANGERS, REGULATORS AND ALL ASSOCIATED APPURTENANCES BACK TO THE GAS METER ASSEMBLY AS INDICATED. CAP AND SEAL GAS PIPING AT METER LOCATION AS REQUIRED.

PD09 EXISTING GAS METER ASSEMBLY. DISCONNECTION AND REMOVAL SHALL BE COORDINATED DIRECTLY WITH THE SERVING UTILITY COMPANY.

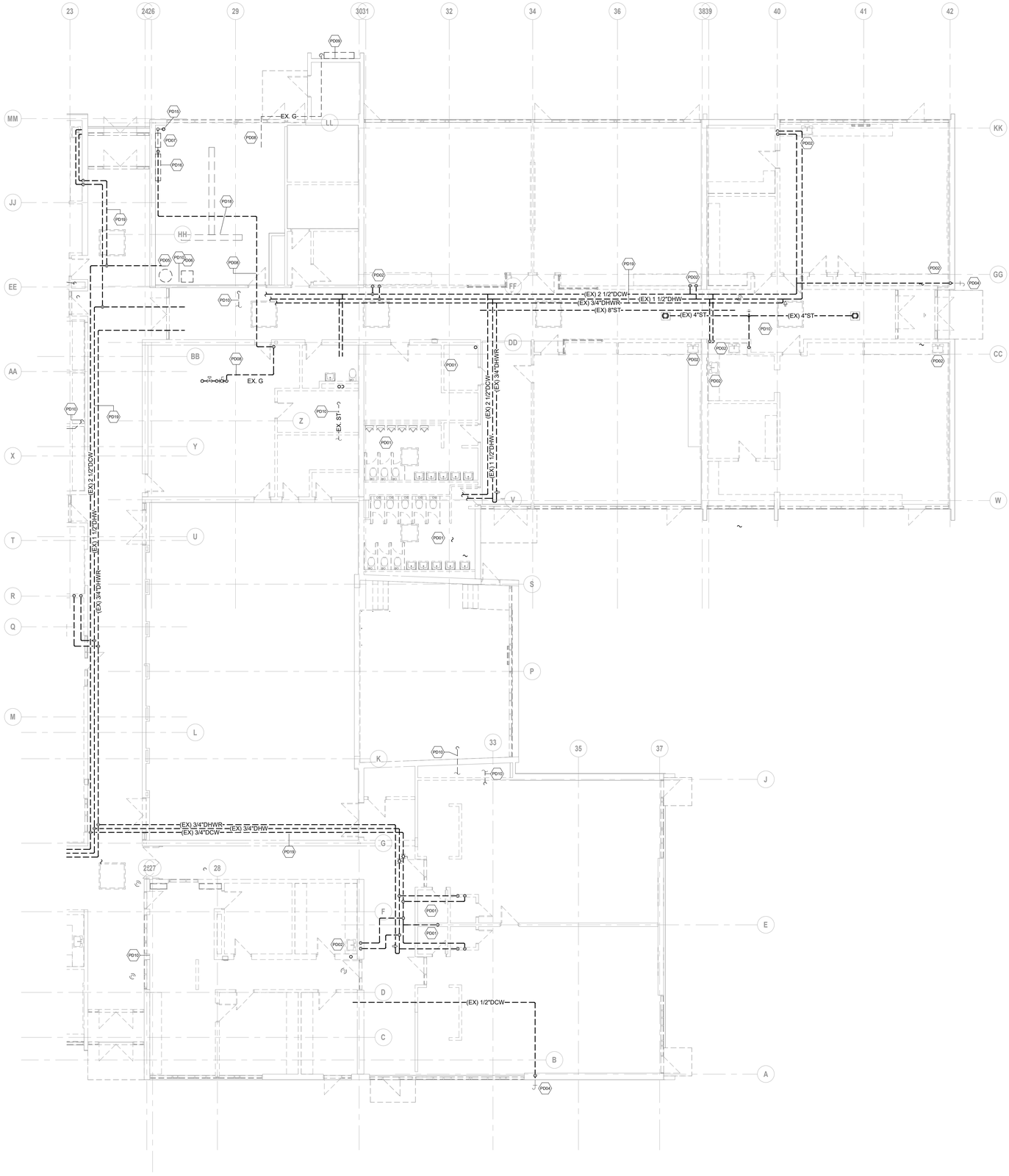
PD10 REMOVE EXISTING ROOF LEADERS AND ALL ASSOCIATED STORM DRAINAGE PIPING, INCLUDING HORIZONTAL AND VERTICAL RUNS AS INDICATED. REMOVE PIPING BACK TO MAIN. COORDINATE WITH FULL BUILDING PLUMBING SCOPE.

PD15 EXISTING 4" DOMESTIC WATER SERVICE TO REMAIN. WATER SERVICE RISES TO EXISTING GATE VALVE. REMOVE ALL DOWNSTREAM PIPING BACK TO THE GATE VALVE AS INDICATED AND PROVIDE CAP FOR TEMPORARY TERMINATION. PROTECT AND MAINTAIN EXISTING SERVICE DURING DEMOLITION. CONTRACTOR SHALL FIELD VERIFY SERVICE SIZE, LOCATION, AND CONDITION PRIOR TO PROCEEDING WITH WORK.

PD16 REMOVE EXISTING DOMESTIC WATER METER ASSEMBLY INCLUDING METER, BYPASS PIPING, PRESSURE REDUCING VALVES, STRAINERS, SHUTOFF VALVES, UNIONS, AND ALL ASSOCIATED PIPING AND APPURTENANCES DOWNSTREAM OF THE EXISTING GATE VALVE AS INDICATED. CAP PIPING AT THE EXISTING GATE VALVE AND MAKE READY FOR FUTURE CONNECTION TO THE NEW DOMESTIC METER ASSEMBLY.

PD18 EXISTING FLOOR DRAIN AND TRENCH WITHIN MECHANICAL ROOM SHALL BE INFILLED AND PATCHED. REMOVE ASSOCIATED GRATES AND PIPING AS REQUIRED. INFILL WITH SUITABLE MATERIAL AND RESTORE FLOOR TO MATCH ADJACENT FINISH, FLUSH AND LEVEL. COORDINATE WITH STRUCTURAL REQUIREMENTS AND EXISTING SLAB CONDITIONS PRIOR TO INSTALLATION.

PD19 REMOVE ALL EXISTING DOMESTIC HOT WATER (HW), COLD WATER (CW), AND HOT WATER RETURN (HWR) PIPING IN ITS ENTIRETY. NO PIPING TO REMAIN AND ASSOCIATED COMPONENTS TO REMAIN.



1 FIRST FLOOR PLUMBING DEMOLITION PLAN - AREA B
1/8" = 1'-0"

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GM2

STATE OF CONNECTICUT
JOSEPH R. SMITH
No. 21720
REGISTERED
PROFESSIONAL ENGINEER

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JUNE 5, 2026

FIRST FLOOR
PLUMBING DEMO
PLAN - AREA B

PD1.1B

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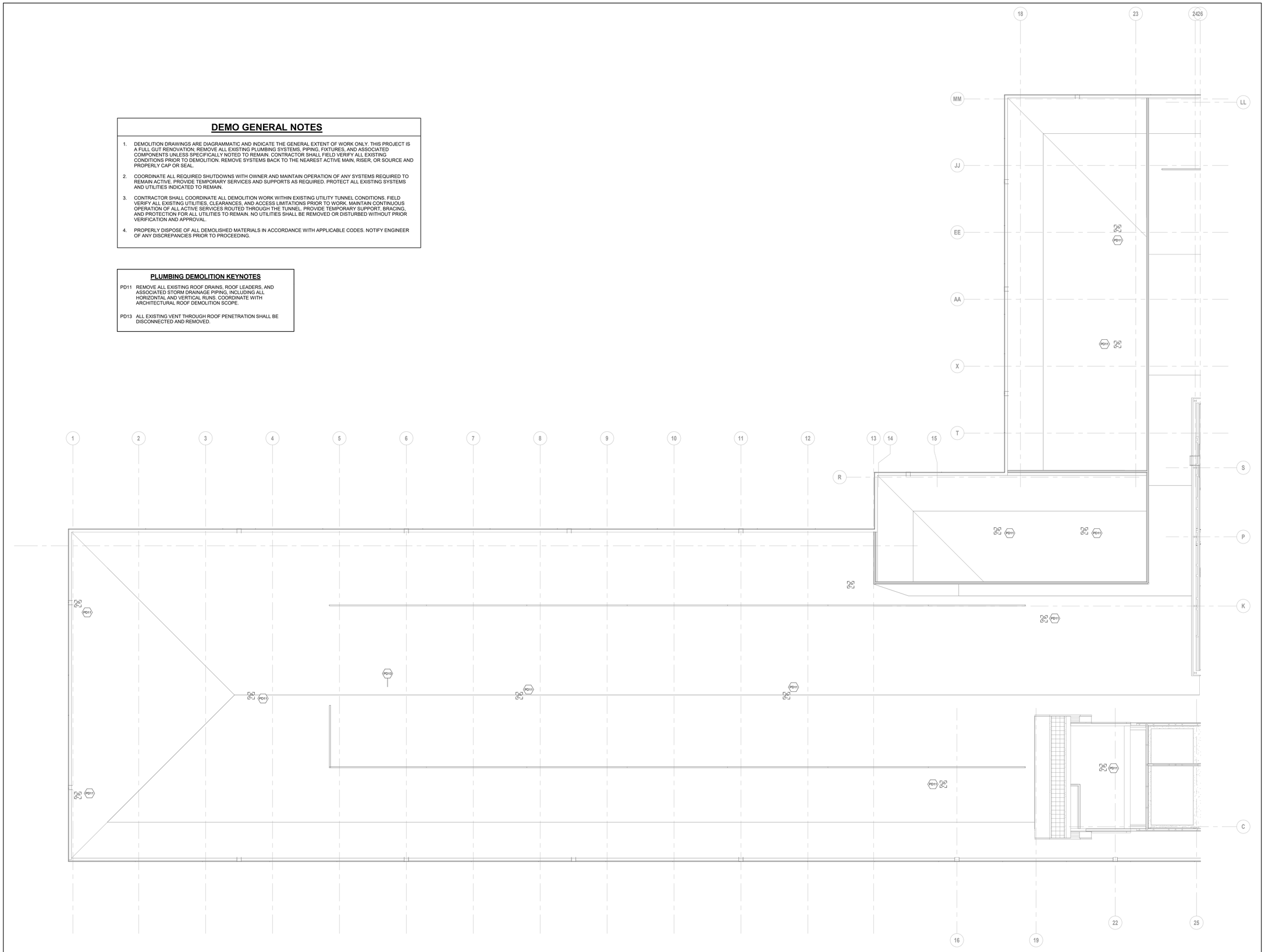
PLUMBING DEMOLITION KEYNOTES

PD11 REMOVE ALL EXISTING ROOF DRAINS, ROOF LEADERS, AND ASSOCIATED STORM DRAINAGE PIPING, INCLUDING ALL HORIZONTAL AND VERTICAL RUNS. COORDINATE WITH ARCHITECTURAL ROOF DEMOLITION SCOPE.

PD13 ALL EXISTING VENT THROUGH ROOF PENETRATION SHALL BE DISCONNECTED AND REMOVED.



1 ROOF PLUMBING DEMOLITION PLAN - AREA A
1/8" = 1'-0"

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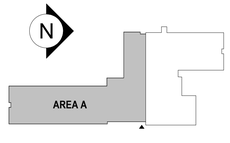

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF PLUMBING DEMOLITION PLAN - AREA A

PD1.2A

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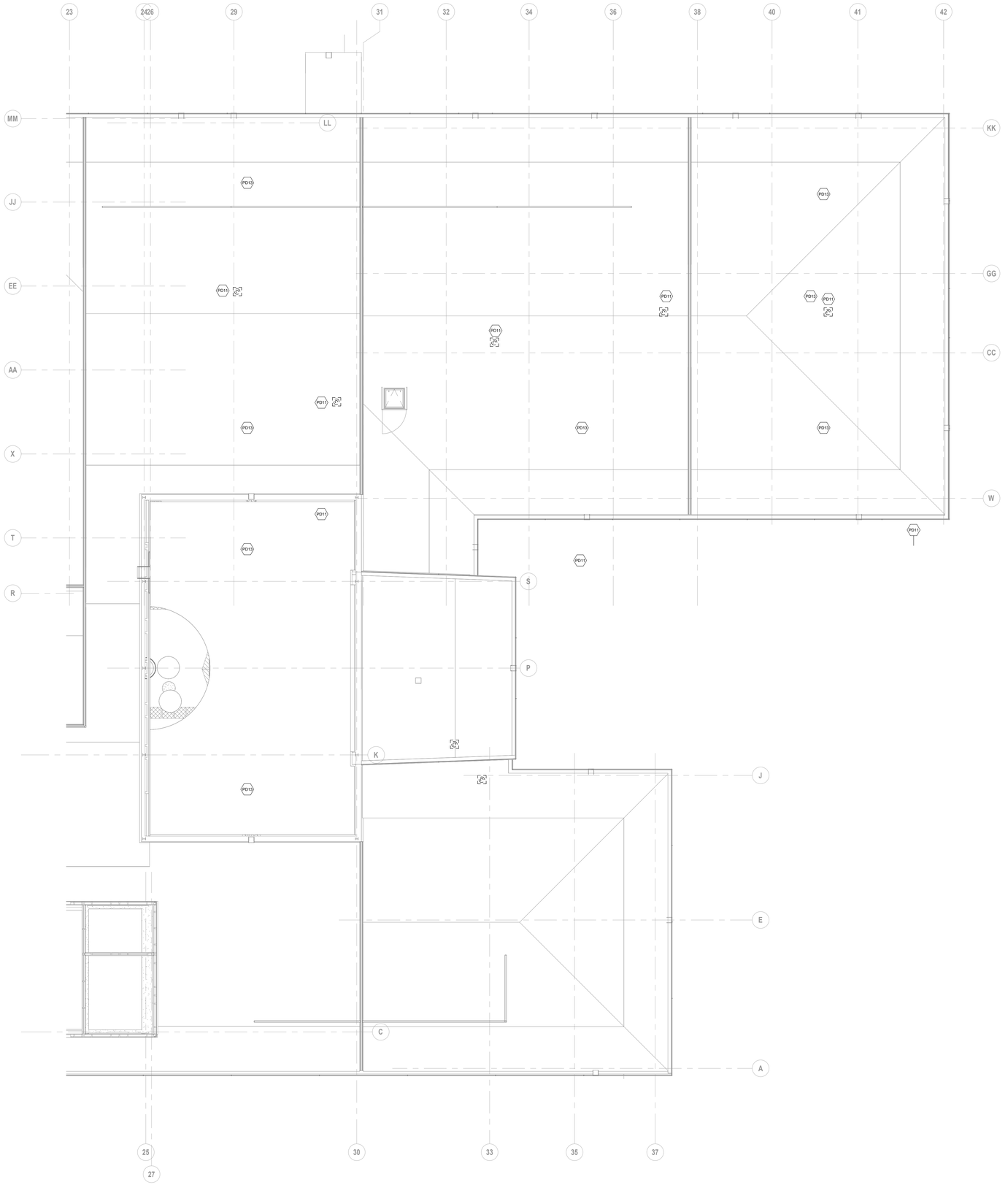
PLUMBING DEMOLITION KEYNOTES

PD 11 REMOVE ALL EXISTING ROOF DRAINS, ROOF LEADERS, AND ASSOCIATED STORM DRAINAGE PIPING, INCLUDING ALL HORIZONTAL AND VERTICAL RUNS. COORDINATE WITH ARCHITECTURAL ROOF DEMOLITION SCOPE.

PD 13 ALL EXISTING VENT THROUGH ROOF PENETRATION SHALL BE DISCONNECTED AND REMOVED.



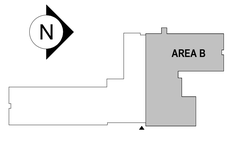
1 ROOF PLUMBING DEMOLITION PLAN - AREA B
1/8" = 1'-0"

QA+M architecture
Quisenberry Arcan Malik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF PLUMBING DEMOLITION PLAN - AREA B

PD1.2B

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GENERAL DEMOLITION NOTES

1. HAZARDOUS MATERIALS INCLUDING ASBESTOS, HAZARDOUS LEAD, AND PRESUMED PCBS HAVE BEEN IDENTIFIED AT THE SITE. COORDINATE ALL WORK WITH THE HAZARDOUS MATERIALS SPECIFICATIONS.
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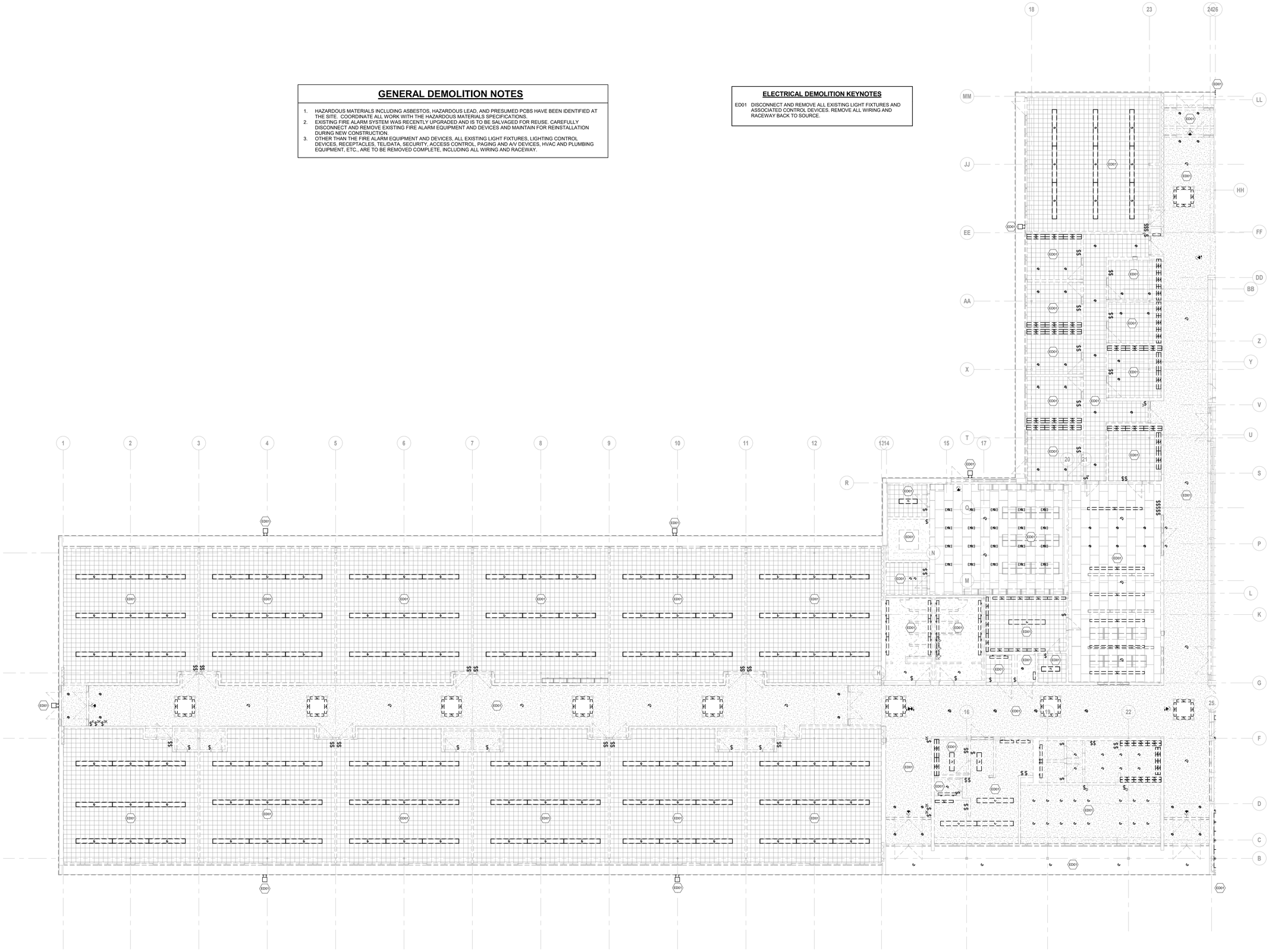
ELECTRICAL DEMOLITION KEYNOTES

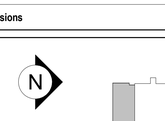
ED01 DISCONNECT AND REMOVE ALL EXISTING LIGHT FIXTURES AND ASSOCIATED CONTROL DEVICES. REMOVE ALL WIRING AND RACEWAY BACK TO SOURCE.



1 FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
QuinnBerryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2



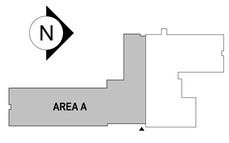
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR LIGHTING DEMO PLAN - AREA A

ED1.1A

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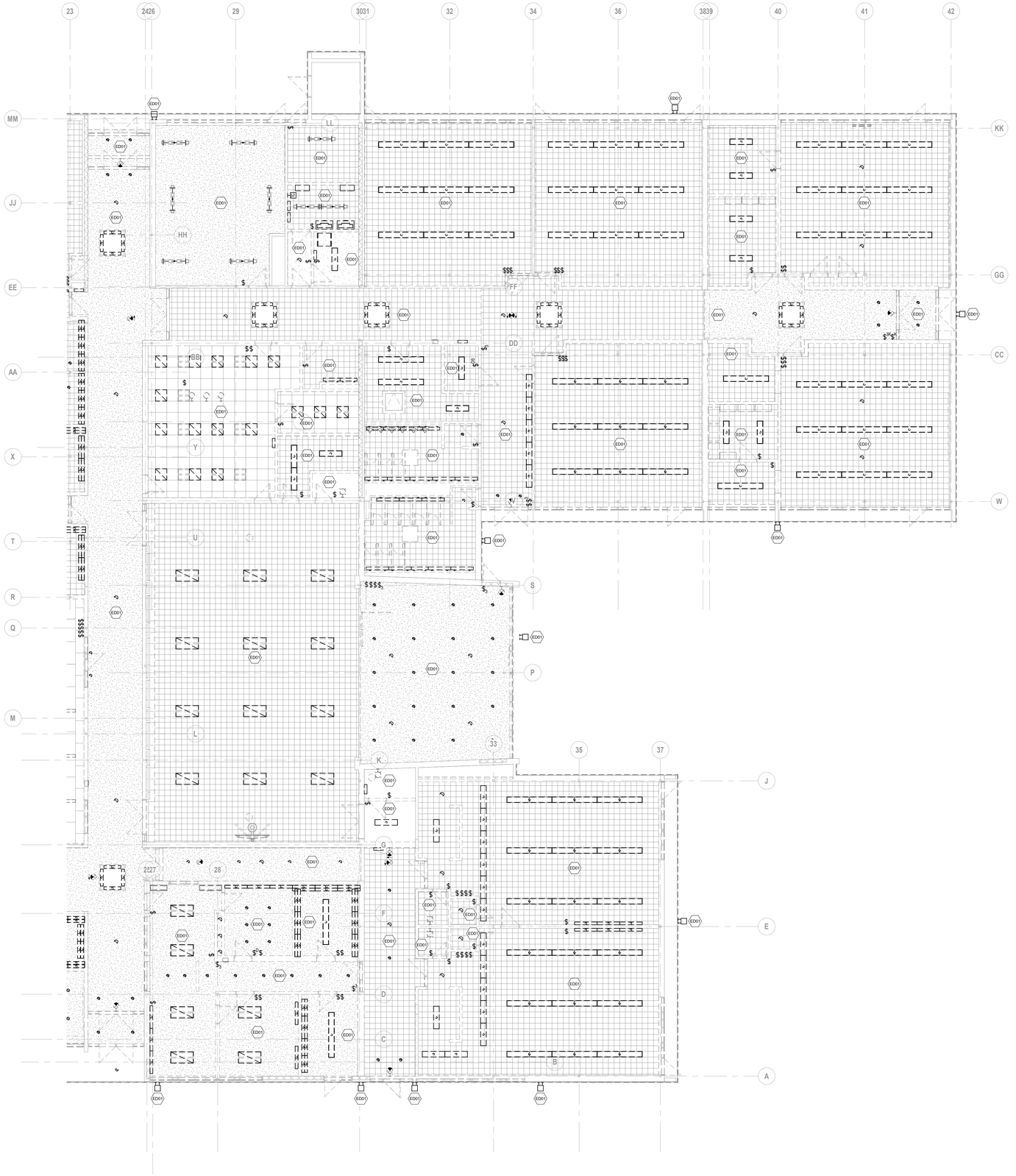


1 FIRST FLOOR LIGHTING DEMOLITION PLAN - AREA B
1/8" = 1'-0"

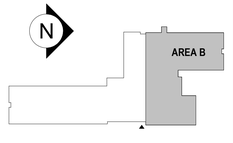
QA+M architecture
QuinebaugArcamMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

STATE OF CONNECTICUT — MICHAEL J. MALIK — No. 27229 — LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR
LIGHTING DEMO
PLAN - AREA B

ED1.1B

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ELECTRICAL DEMOLITION KEYNOTES

ED02 DISCONNECT AND REMOVE ALL EXISTING POWER DEVICES. REMOVE ALL WIRING AND RACEWAY BACK TO SOURCE.

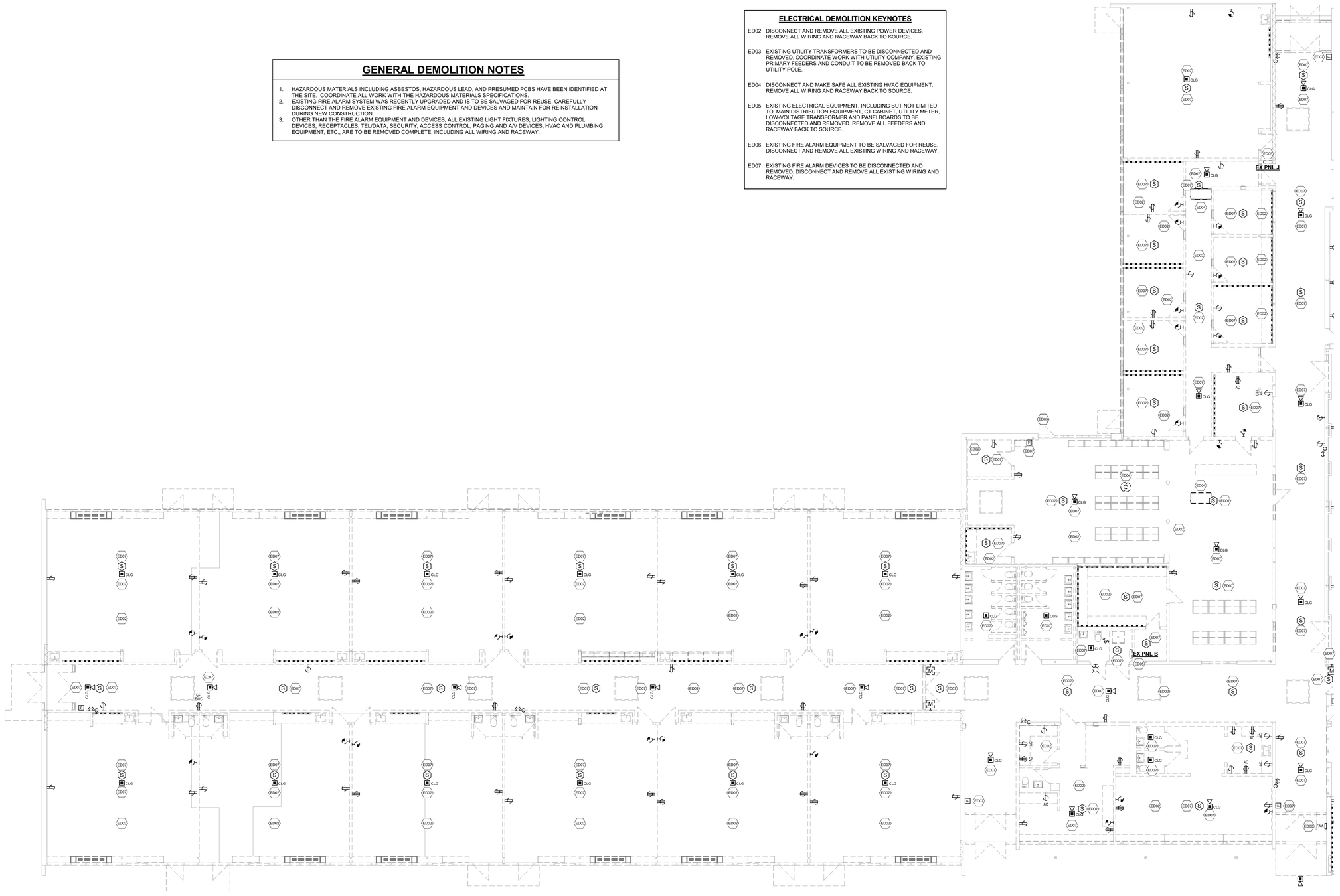
ED03 EXISTING UTILITY TRANSFORMERS TO BE DISCONNECTED AND REMOVED. COORDINATE WORK WITH UTILITY COMPANY. EXISTING PRIMARY FEEDERS AND CONDUIT TO BE REMOVED BACK TO UTILITY POLE.

ED04 DISCONNECT AND MAKE SAFE ALL EXISTING HVAC EQUIPMENT. REMOVE ALL WIRING AND RACEWAY BACK TO SOURCE.

ED05 EXISTING ELECTRICAL EQUIPMENT, INCLUDING BUT NOT LIMITED TO, MAIN DISTRIBUTION EQUIPMENT, CT CABINET, UTILITY METER, LOW-VOLTAGE TRANSFORMER AND PANELBOARDS TO BE DISCONNECTED AND REMOVED. REMOVE ALL FEEDERS AND RACEWAY BACK TO SOURCE.

ED06 EXISTING FIRE ALARM EQUIPMENT TO BE SALVAGED FOR REUSE. DISCONNECT AND REMOVE ALL EXISTING WIRING AND RACEWAY.

ED07 EXISTING FIRE ALARM DEVICES TO BE DISCONNECTED AND REMOVED. DISCONNECT AND REMOVE ALL EXISTING WIRING AND RACEWAY.



1 FIRST FLOOR POWER DEMOLITION PLAN - AREA A
1/8" = 1'-0"

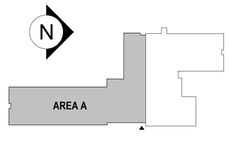
QA+M architecture
QuinnBerryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

STATE OF CONNECTICUT — REGISTERED — No. 27729 — LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR POWER DEMOLITION PLAN - AREA A

ED2.1A

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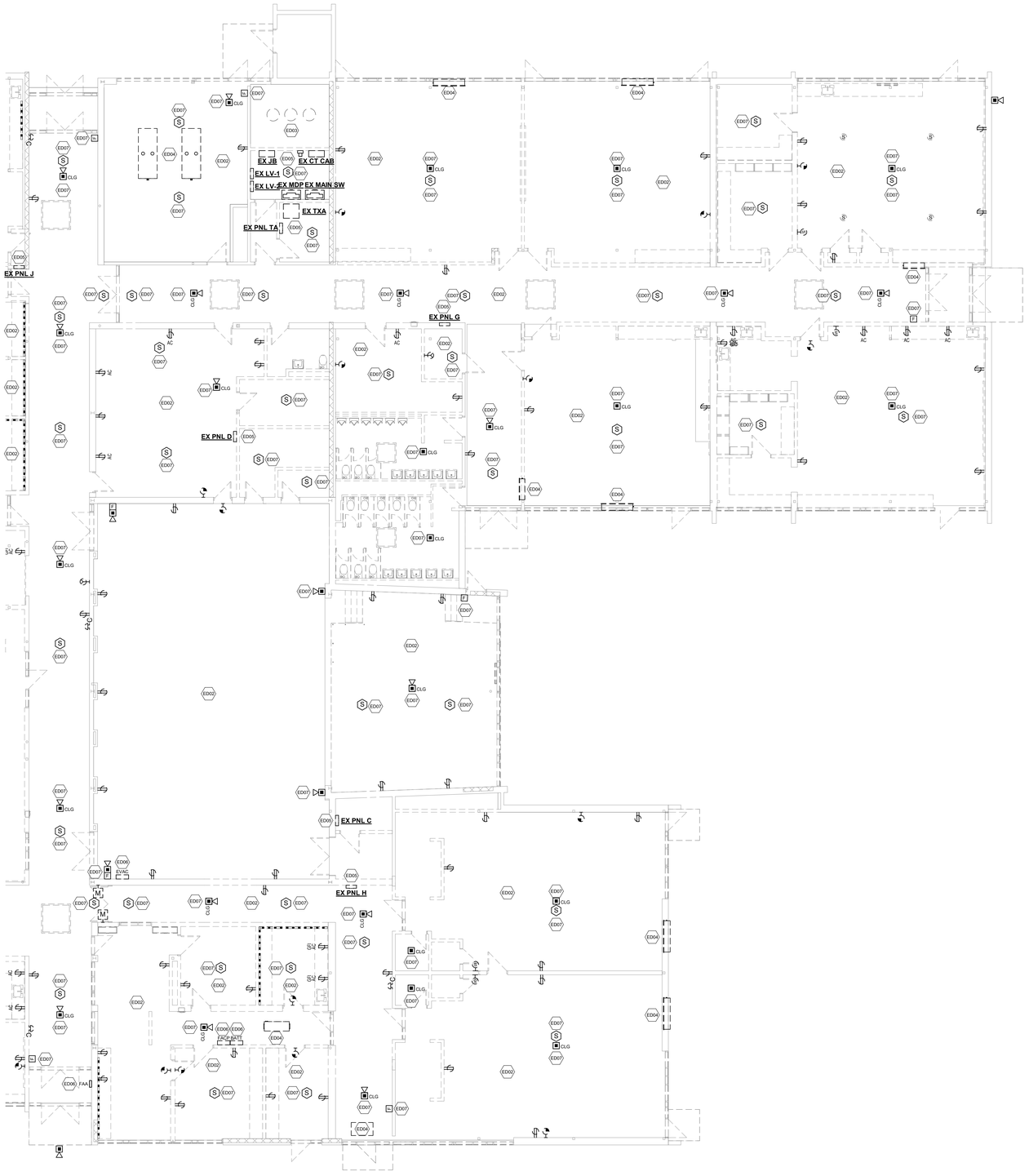

1 FIRST FLOOR POWER DEMOLITION PLAN - AREA B
1/8" = 1'-0"

QA+M architecture
QuinebaugArcanMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

STATE OF CONNECTICUT
ANDREW J. MALIK
No. 27229
LICENSED
PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR POWER DEMOLITION PLAN - AREA B

ED2.1B

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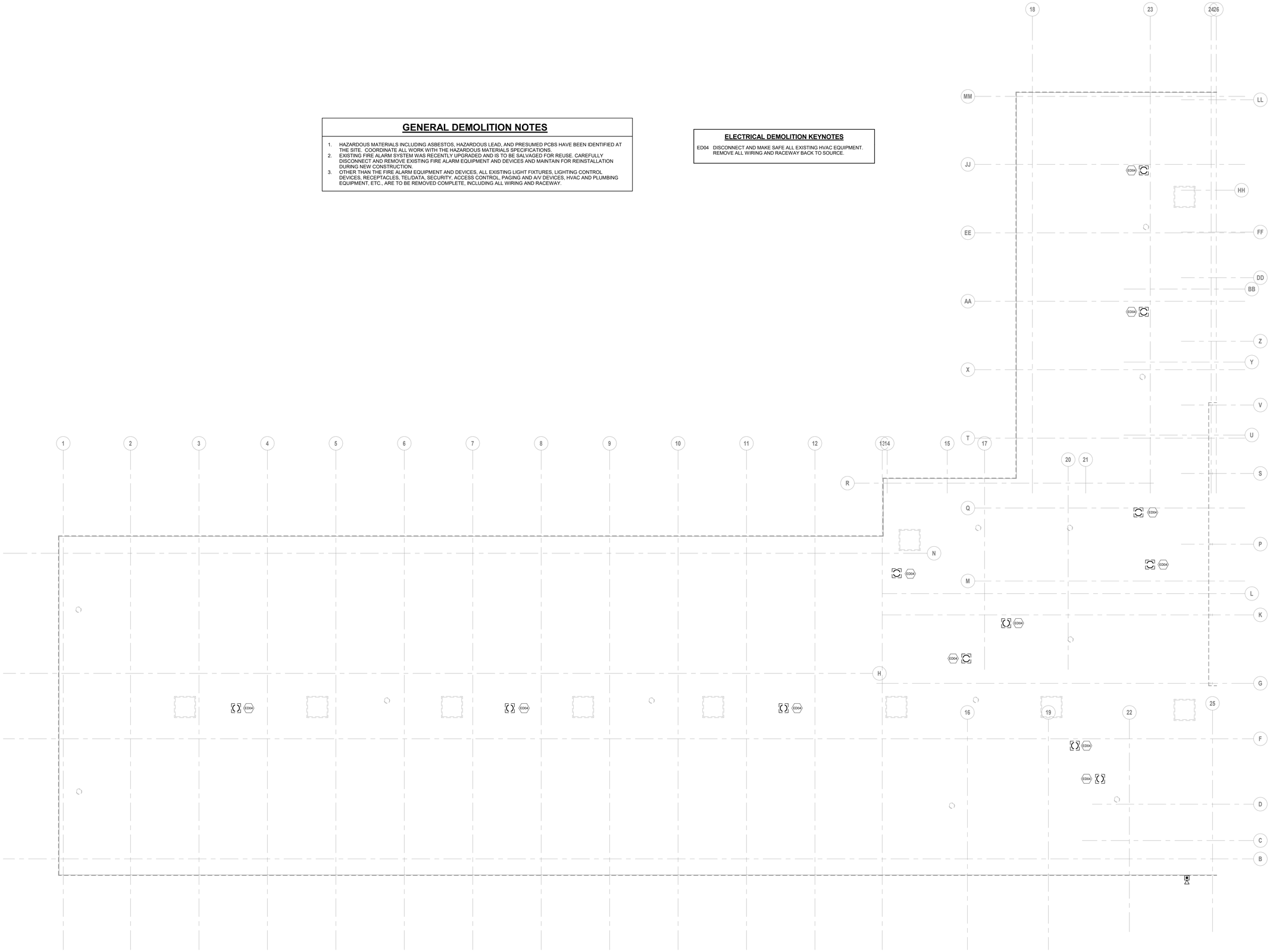


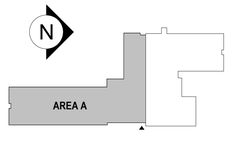
1 ROOF POWER DEMOLITION PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
QuisenberryArcanMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF POWER DEMOLITION PLAN - AREA A

ED2.2A

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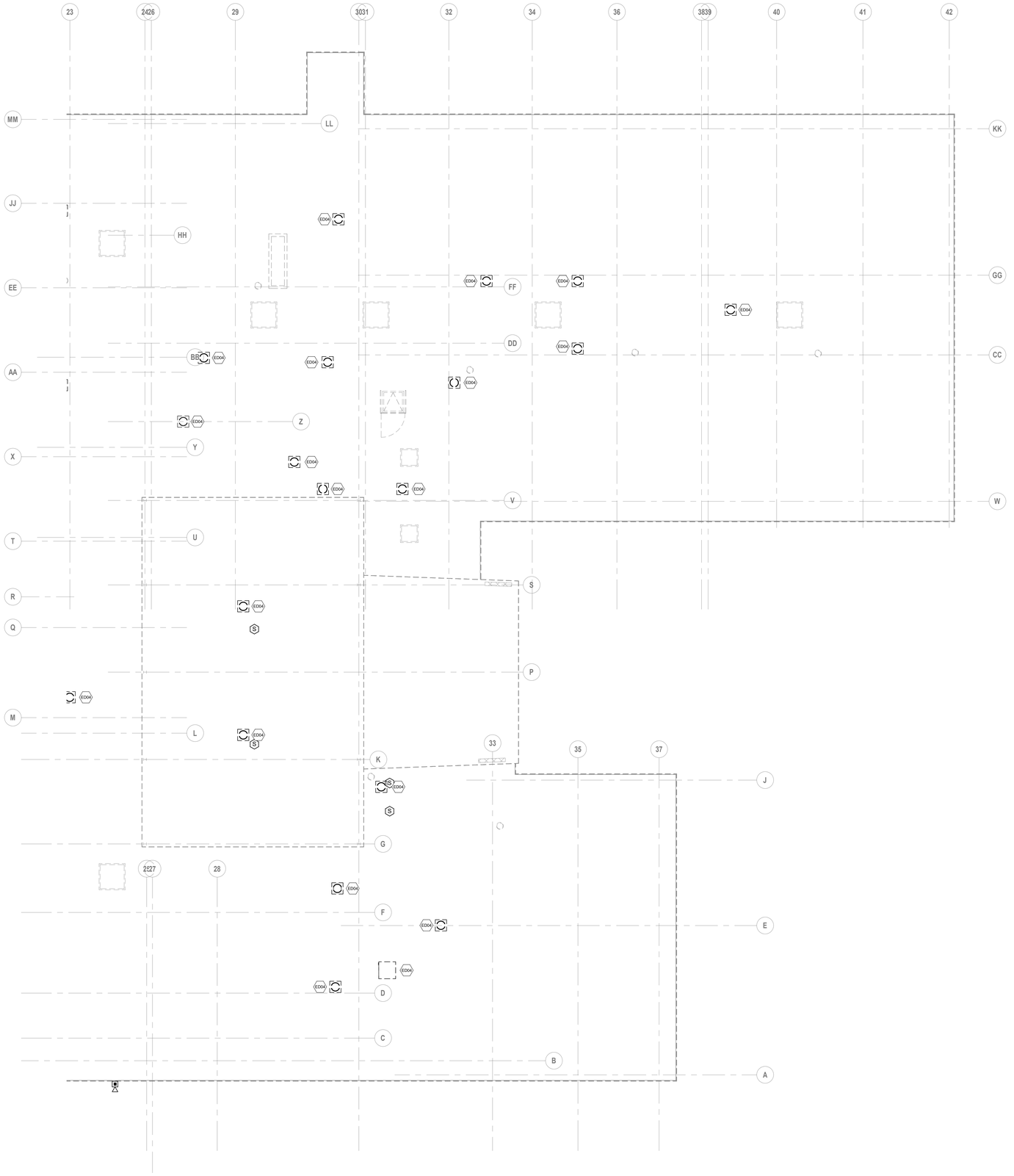

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1/8" = 1'-0"

QA+M architecture
Quisenberry Arcan Malik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

STATE OF CONNECTICUT
ANNETH A. HIPSKY
No. E1720
LICENSED
PROFESSIONAL ENGINEER

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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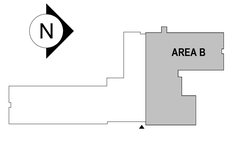
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF POWER DEMOLITION PLAN - AREA B

ED2.2B

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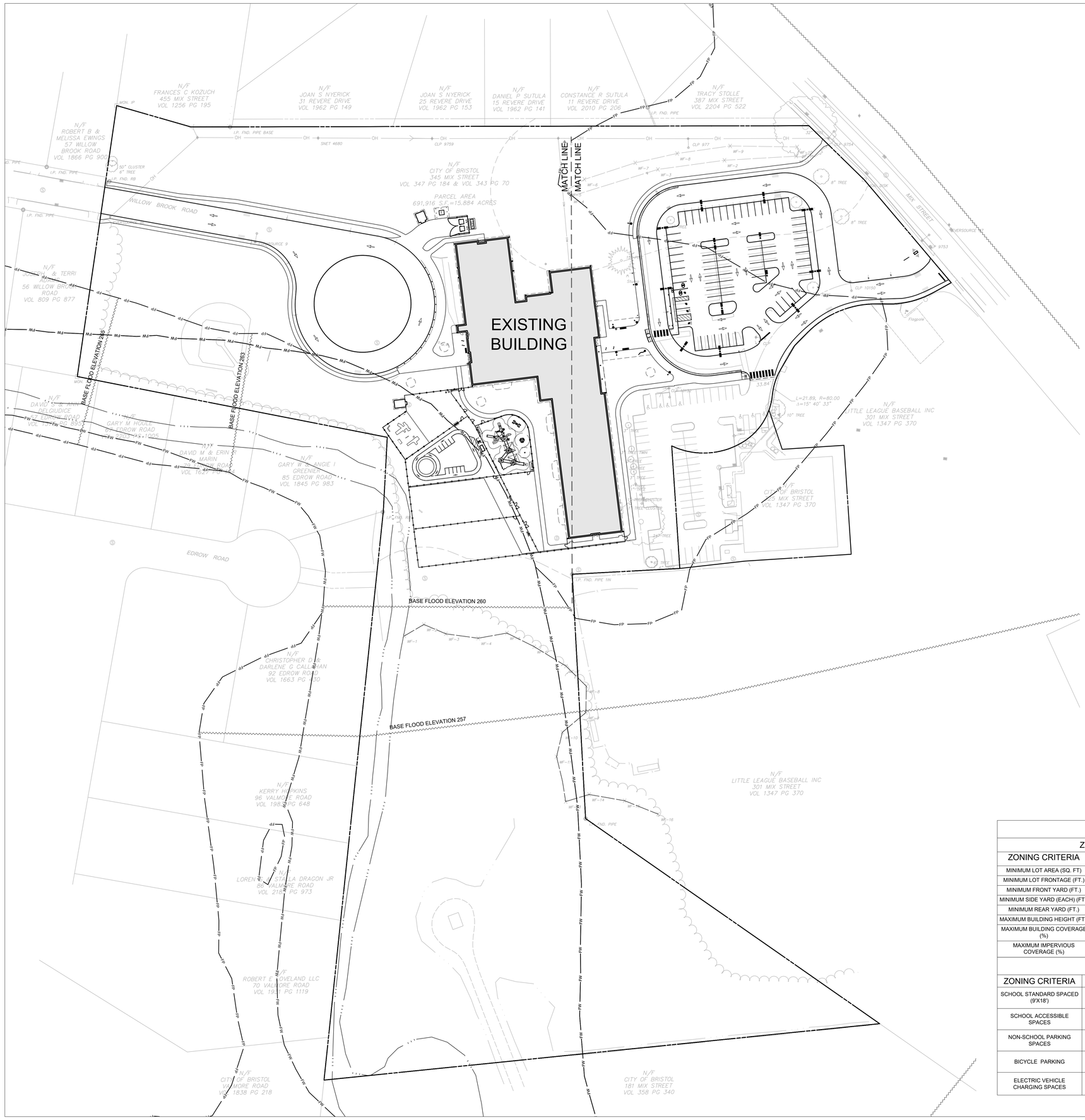


ZONING DATA

ZONE: R-15 SINGLE-FAMILY RESIDENTIAL ZONE

ZONING CRITERIA	REQUIRED:	EXISTING:	PROPOSED:
MINIMUM LOT AREA (SQ. FT)	15,000	691,916	UNCHANGED
MINIMUM LOT FRONTAGE (FT.)	100	273.85	UNCHANGED
MINIMUM FRONT YARD (FT.)	25	68.90	UNCHANGED
MINIMUM SIDE YARD (EACH) (FT.)	10	46.30	UNCHANGED
MINIMUM REAR YARD (FT.)	25	N/A	UNCHANGED
MAXIMUM BUILDING HEIGHT (FT.)	35		UNCHANGED
MAXIMUM BUILDING COVERAGE (%)	30	5.82	UNCHANGED
MAXIMUM IMPERVIOUS COVERAGE (%)	70	28.8	25.5

PARKING DATA

ZONING CRITERIA	REQUIRED	EXISTING	PROPOSED
SCHOOL STANDARD SPACED (9'X18')	1.5 PER KSF PER SCHOOL 57 SPACES REQUIRED	80 SPACES	73 SPACES
SCHOOL ACCESSIBLE SPACES	76-100 SPACES (MIN. 4 SPACES, INCL. 1 VAN SPACE)	0 SPACES*	4 SPACES (2 VAN ACCESSIBLE, 2 STANDARD)
NON-SCHOOL PARKING SPACES	N/A	38 SPACES	NO CHANGE
BICYCLE PARKING	1 BICYCLE PARKING SPACE PER 10 AUTOMOBILE SPACES	0 SPACES	8 SPACES
ELECTRIC VEHICLE CHARGING SPACES	10% OF TOTAL PARKING SPACES	0 SPACES	1 ADA SPACE 1 STANDARD SPACE (6 EV CAPABLE SPACES)

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

benesch
Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

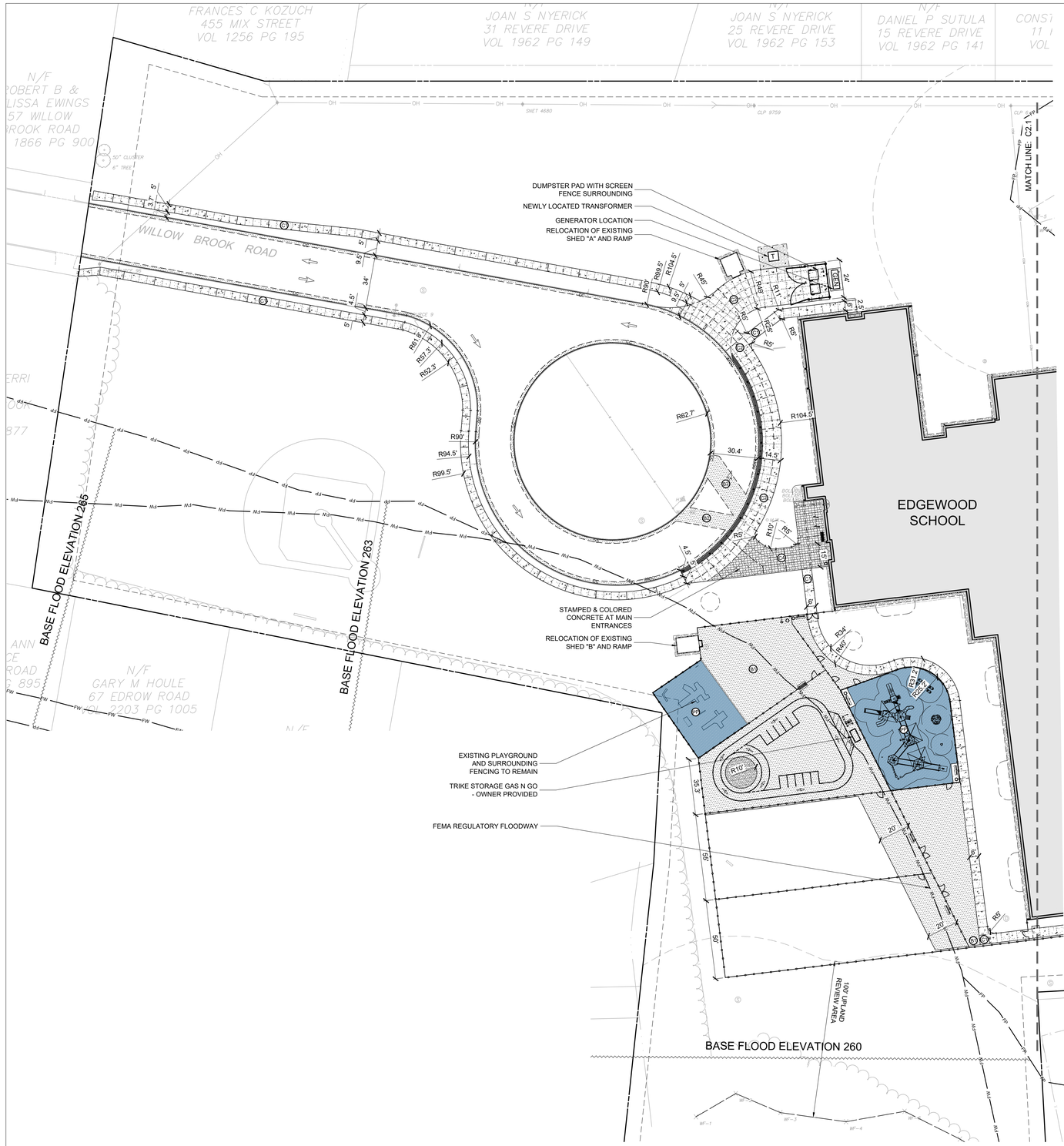
STATE OF CONNECTICUT
LICENSED PROFESSIONAL ENGINEER
28064

0 50' 100'
SCALE: 1" = 50'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

OVERALL SITE PLAN

C0.0



TRAFFIC SIGNAGE SCHEDULE

KEY	NAME	IMAGE	SIZE
A	STOP (CTDOT: 31-0552)	STOP	18 X 18"
B	ACCESSIBLE PARKING SPACE	RESERVED PARKING	12" X 18"
C	ACCESSIBLE VAN PARKING SPACE	RESERVED PARKING / VAN ACCESSIBLE	12" X 18" / 12" X 6"
D	DO NOT ENTER (CTDOT: 31-1119)	DO NOT ENTER	18" X 18"
E	BEGIN ONE WAY	BEGIN ONE WAY	12" X 18"
F	EV CHARGING	ELECTRIC VEHICLE PARKING / ONLY WHILE CHARGING	12" X 18"
G	YIELD TO PEDESTRIAN (CTDOT: 31-0510)		24" X 24"
H	R7-107 - NO PARKING FIRE LANE W/ ARROW (CTDOT: 31-0650)	FIRE LANE	12" X 18"

LAYOUT & MATERIALS LEGEND

- PAINTED ACCESSIBLE SYMBOL
- PAINTED CROSSWALK
- EV — LEVEL II DUAL ELECTRIC VEHICLE CHARGING STATION
- A — ACCESSIBLE RAMP TYPE A
- B — ACCESSIBLE RAMP TYPE B
- C — ACCESSIBLE RAMP TYPE C
- D — ACCESSIBLE RAMP TYPE D
- E — ACCESSIBLE RAMP TYPE E
- TRAFFIC SIGN (SEE TRAFFIC SIGNAGE SCHEDULE)
- CC — CONCRETE CURB
- FICC — FLUSH INTEGRAL CONCRETE CURB
- ICC — INTEGRAL CONCRETE CURB
- MCC — MOUNTABLE CONCRETE CURB
- GC — GRANITE CURB
- BCC — BITUMINOUS CONCRETE CURB
- B1 — BITUMINOUS CONCRETE (LIGHT DUTY)
- B2 — BITUMINOUS CONCRETE (HEAVY DUTY)
- C1 — CONCRETE PAVEMENT (LIGHT DUTY)
- C2 — CONCRETE PAVEMENT (HEAVY DUTY)
- C3 — COLORED CONCRETE PAVEMENT (LIGHT DUTY)
- C4 — STAMPED/COLORED CONCRETE PAVEMENT (HEAVY DUTY)
- S1 — STONE MULCH (RIVER WASHED)
- S2 — STONE MULCH (CRUSHED)
- PP — POURED IN PLACE RUBBER PLAYGROUND SURFACING
- M — BARK MULCH
- G — GRAVEL SURFACING
- CHAIN LINK FENCE
- 12 — PARKING SPACE QUANTITY
- FW — FEMA FLOODWAY
- FP — FEMA 100-YR FLOODPLAIN (AE)

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
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qamarch.com

benesch
Alfred Benesch & Company
200 Glastonbury Boulevard, Suite 201
Glastonbury, Connecticut 06033
860-633-8341

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

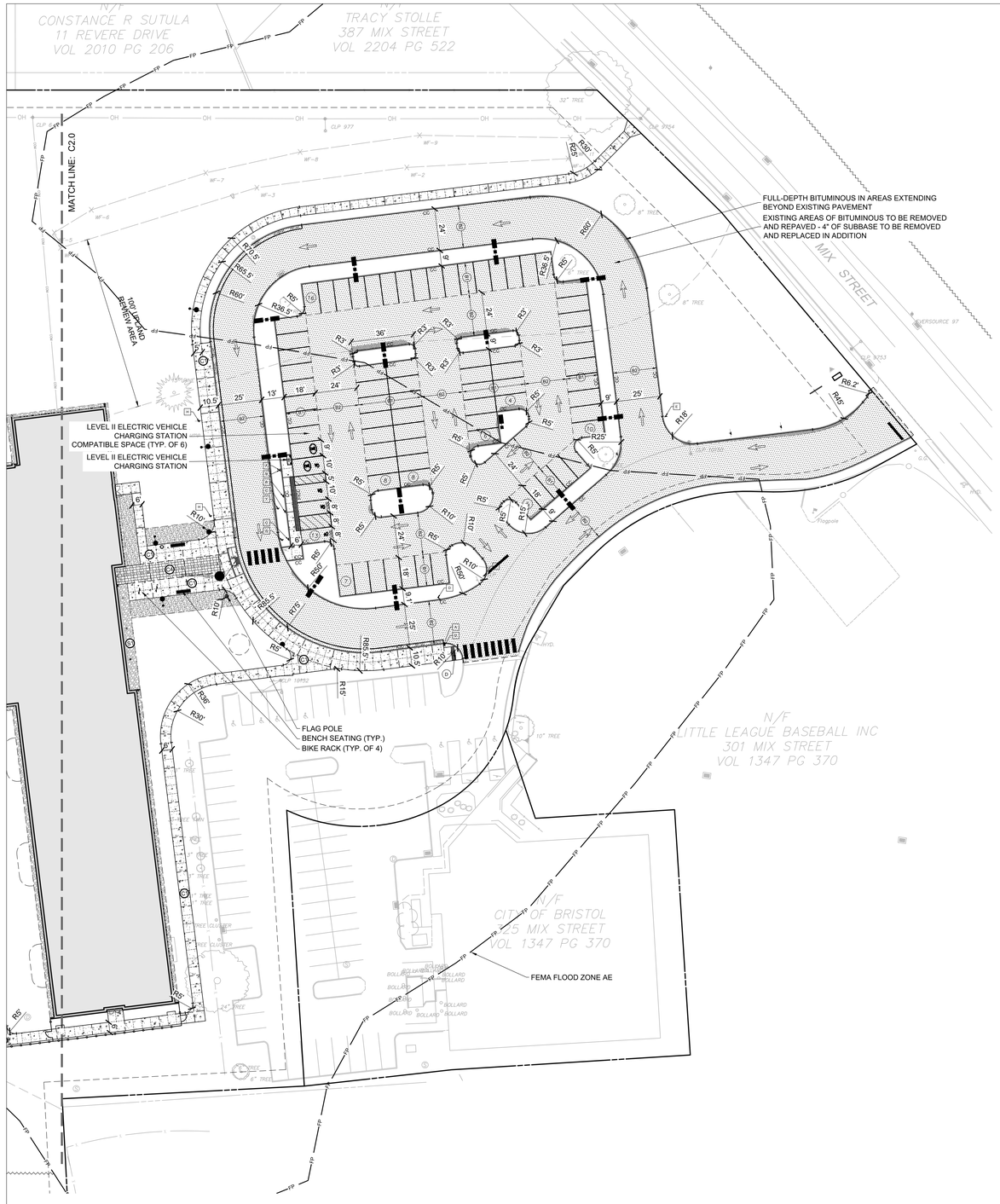
STATE OF CONNECTICUT
JAMES G. SCRITTON
28064
LICENSED PROFESSIONAL ENGINEER

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

LAYOUT & MATERIALS PLAN (WEST)

C2.0



TRAFFIC SIGNAGE SCHEDULE

KEY	NAME	IMAGE	SIZE
A	STOP (CTDOT: 31-0552)	STOP	18 X 18"
B	ACCESSIBLE PARKING SPACE	RESERVED PARKING	12" X 18"
C	ACCESSIBLE VAN PARKING SPACE	RESERVED PARKING / VAN ACCESSIBLE	12" X 18" / 12" X 6"
D	DO NOT ENTER (CTDOT: 31-1119)	DO NOT ENTER	18" X 18"
E	BEGIN ONE WAY	BEGIN ONE WAY	12" X 18"
F	EV CHARGING	ELECTRIC VEHICLE PARKING / ONLY WHILE CHARGING	12" X 18"
G	YIELD TO PEDESTRIAN (CTDOT: 31-0510)		24" X 24"
H	R7-107 - NO PARKING FIRE LANE W/ ARROW (CTDOT: 31-0650)	FIRE LANE	12" X 18"

LAYOUT & MATERIALS LEGEND

- PAINTED ACCESSIBLE SYMBOL
- PAINTED CROSSWALK
- EV — LEVEL II DUAL ELECTRIC VEHICLE CHARGING STATION
- A — ACCESSIBLE RAMP TYPE A
- B — ACCESSIBLE RAMP TYPE B
- C — ACCESSIBLE RAMP TYPE C
- D — ACCESSIBLE RAMP TYPE D
- E — ACCESSIBLE RAMP TYPE E
- TRAFFIC SIGN (SEE TRAFFIC SIGNAGE SCHEDULE)
- CC — CONCRETE CURB
- FICC — FLUSH INTEGRAL CONCRETE CURB
- ICC — INTEGRAL CONCRETE CURB
- MCC — MOUNTABLE CONCRETE CURB
- GC — GRANITE CURB
- BCC — BITUMINOUS CONCRETE CURB
- B1 — BITUMINOUS CONCRETE (LIGHT DUTY)
- B2 — BITUMINOUS CONCRETE (HEAVY DUTY)
- C1 — CONCRETE PAVEMENT (LIGHT DUTY)
- C2 — CONCRETE PAVEMENT (HEAVY DUTY)
- C3 — COLORED CONCRETE PAVEMENT (LIGHT DUTY)
- C4 — STAMPED/COLORED CONCRETE PAVEMENT (HEAVY DUTY)
- S1 — STONE MULCH (RIVER WASHED)
- S2 — STONE MULCH (CRUSHED)
- PP — POURED IN PLACE RUBBER PLAYGROUND SURFACING
- M — BARK MULCH
- G — GRAVEL SURFACING
- CHAIN LINK FENCE
- 12 — PARKING SPACE QUANTITY
- FW — FEMA FLOODWAY
- FP — FEMA 100-YR FLOODPLAIN (AE)

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

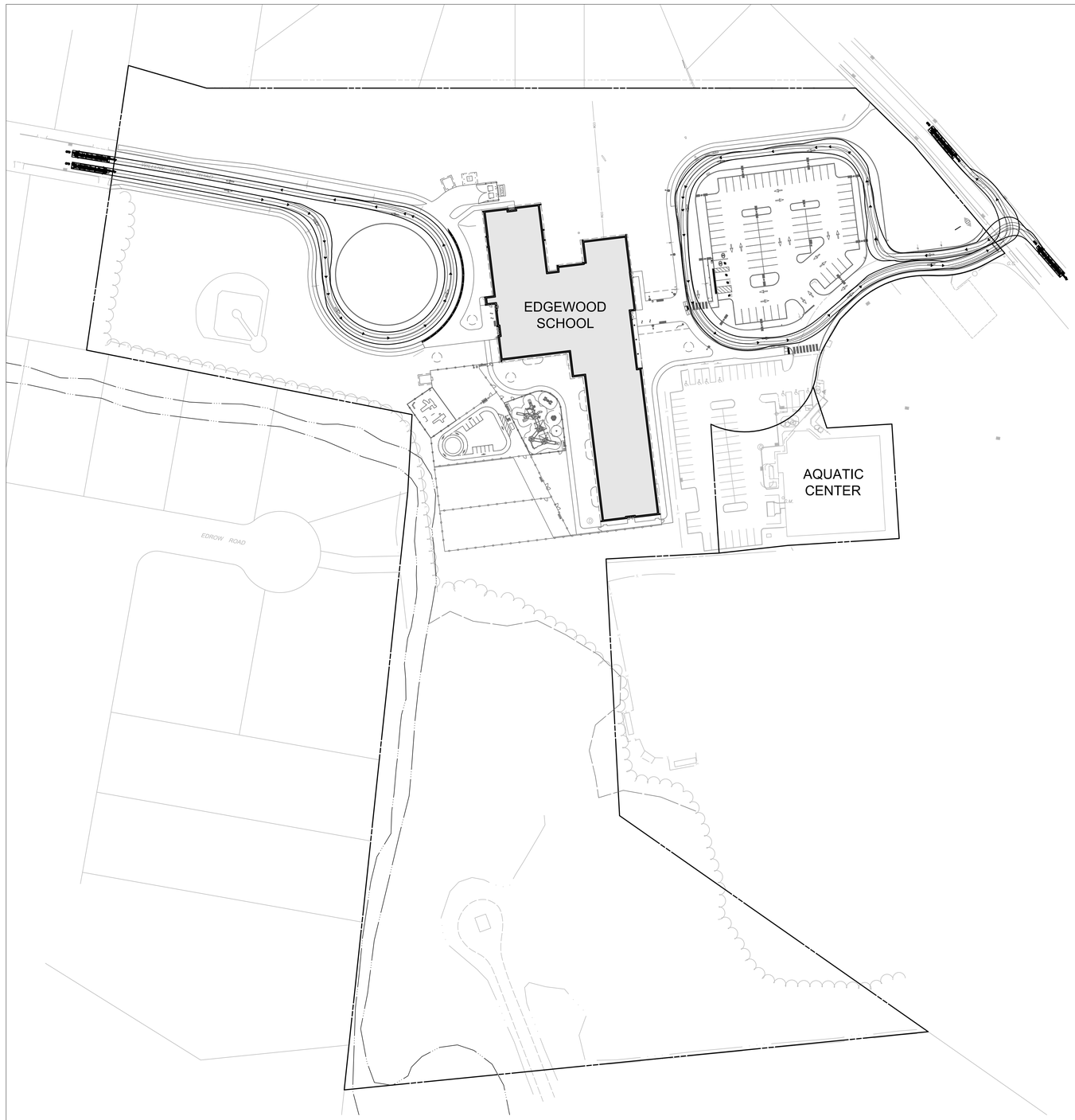
STATE OF CONNECTICUT
LICENSED PROFESSIONAL ENGINEER
28064

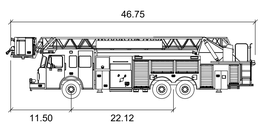
0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

LAYOUT & MATERIALS PLAN (EAST)

C2.1





CFD 100' Aerial Platform Pierce Velocity

	feet
Width	: 8.00
Track	: 8.00
Lock to Lock Time	: 6.0
Steering Angle	: 45.0

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

0 60' 120'
SCALE: 1" = 60'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

TURNING MOVEMENT PLAN

C2.2

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

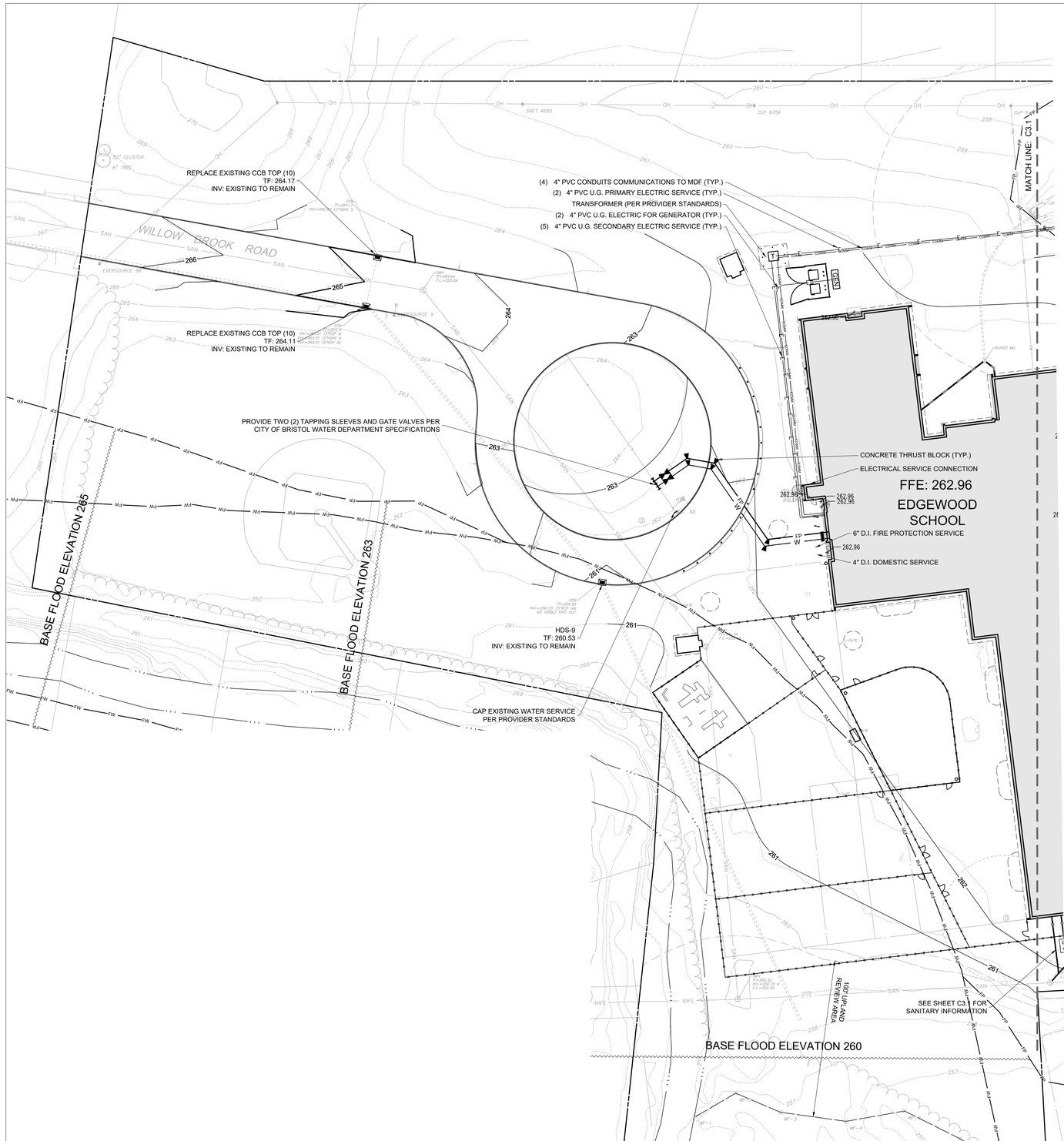
STATE OF CONNECTICUT
JOHN G. SCRITTON
28064
LICENSED
PROFESSIONAL ENGINEER

0 60' 120'
SCALE: 1" = 60'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BUS & PARENT DROP OFF PLAN

C2.3



DRAINAGE NOTES

1. CONTRACTOR IS RESPONSIBLE TO ENSURE THAT PROPER STORM DRAINAGE IS MAINTAINED THROUGHOUT CONSTRUCTION AND SHALL MAINTAIN ALL EXISTING AND NEW UTILITIES IN GOOD WORKING ORDER AND SHALL PROTECT THEM AT ALL TIMES UNTIL THE WORK IS COMPLETED AND ACCEPTED.
2. FUNCTIONAL COMPLETION OF STORM WATER STRUCTURES SHALL PRECEDE SITE DEVELOPMENT OF AREAS, ROADS, OR LOTS CONTRIBUTING TO THESE SYSTEMS.
3. CERTIFIED 'AS-BUILTS' VS 'AS-APPROVED' PLANS OF THE STORM WATER SYSTEM SHALL BE SUBMITTED FOLLOWING ITS CONSTRUCTION AND PRIOR TO BOND RELEASE.

STORM SEWER

1. ALL PIPES ARE TO BE 12" HDPE WITH A MINIMUM 1.0% SLOPE AND 2 FT OF COVER UNLESS OTHERWISE NOTED.
2. CONTRACTOR IS RESPONSIBLE TO ENSURE ADEQUATE SIZING OF MANHOLES TO ACCEPT PROPOSED PIPES.
3. ALL EXISTING UTILITY LINES TO BE ABANDONED SHALL BE ABANDONED ACCORDING TO UTILITY COMPANY REQUIREMENTS.
4. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH APPLICABLE STANDARDS.
5. DAMAGE TO EXISTING UTILITIES AS A RESULT OF THE CONTRACTOR'S OR ANY OF HIS SUBCONTRACTOR'S ACTIVITIES DURING THE CONSTRUCTION PROCESS SHALL BE REPAIRED AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
6. THE LOCATION OF EXISTING UNDERGROUND UTILITIES IS DEVELOPED FROM THE BEST AVAILABLE INFORMATION. THE ACTUAL LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF EXCAVATION ACTIVITIES.
7. ACCESS AND UTILITIES TO EXISTING FACILITIES MUST BE MAINTAINED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE CONTRACTOR MUST MAINTAIN SUFFICIENT TRAVEL LANE(S), APPROVED BY THE OWNER, TO ENABLE ALL EMERGENCY VEHICLES TO ACCESS THE ENTIRE PROJECT SITE.
8. CONTRACTOR TO VERIFY THAT ALL EXISTING UTILITIES TO BE REUSED ARE FUNCTIONAL. TV INSPECTION SHALL BE PERFORMED ON EXISTING UTILITIES TO BE REUSED AND REPORT TO BE GIVEN TO ENGINEER PRIOR TO ORDERING STRUCTURES TO ENSURE DESIGN. STORM DRAINS SHALL BE CLEANED/VACUUMED BEFORE AND AFTER CONSTRUCTION TO ENSURE FUNCTIONALITY.
9. CARE IS TO BE TAKEN WHEN EXCAVATING NEAR EXISTING DRAINAGE PIPES TO REMAIN. CONTRACTOR TO SUPPORT PIPE AS NEEDED/HAND EXCAVATE TO ENSURE PIPE FUNCTIONALITY IS MAINTAINED.
10. PRESERVED EXISTING MANHOLE COVERS AND FRAMES SHALL BE ADJUSTED TO PROPOSED GRADE AS REQUIRED.

ACCESSIBILITY NOTES

1. SLOPES ALONG THE ACCESSIBLE ROUTE SHALL BE LESS THAN 1:20 (5%) AND THE CROSS SLOPES SHALL NOT EXCEED 1:50 (2%). CHANGES IN LEVELS SHALL NOT BE GREATER THAN ¼ INCH.
2. SLOPES ALONG THE ACCESSIBLE ACCESSIBLE RAMP SHALL NOT EXCEED 1:12 (8.3%) AND THE CROSS SLOPE SHALL NOT EXCEED 1:50 (2%). CHANGES IN LEVEL SHALL NOT BE GREATER THAN ¼ INCH.
3. LANDINGS SHALL NOT HAVE A SLOPE GREATER THAN 1:50 (2%) IN ANY DIRECTION.
4. SLOPES WITHIN THE ACCESSIBLE PARKING SPACE SHALL NOT EXCEED 1:50 (2%) IN ANY DIRECTION.

ADDITIONAL NOTES

1. ALL STORM STRUCTURES TO HAVE TOP, FRAMES, AND GRATES/COVER REPLACED IN KIND UNLESS OTHERWISE NOTED.
2. ALL SANITARY STRUCTURES TO HAVE FRAMES AND COVERS REMOVED AND REPLACED IN KIND UNLESS OTHERWISE NOTED.
3. ALL STORM AND SANITARY PIPING TO REMAIN IS TO BE INSPECTED AND REPORT TO BE PROVIDED TO ENGINEER FOR REVIEW.
4. EXISTING WATER SERVICE TO BE REMOVED BACK TO GATE VALVE AT MAIN.
5. EXISTING ELECTRICAL SERVICE TO BE REMOVED BACK TO CONNECTION POINT.
6. GAS SERVICE TO REMAIN AND BE PROTECTED AT ALL TIMES DURING CONSTRUCTION.

AQUIFER PROTECTION AREA NOTES

TEMPORARY CONSTRUCTION MEASURES

1. SIGNIFICANT FUEL, CHEMICAL OR OTHER HAZARDOUS MATERIALS STORAGE AND HANDLING, INCLUDING FUELING OF CONSTRUCTION VEHICLES, SHOULD BE LOCATED OUTSIDE WELL FIELD AREA AND AQUIFER PROTECTION AREA.
2. NO REPAIR OR MAINTENANCE OF CONSTRUCTION VEHICLES OR WASHING OF CONSTRUCTION VEHICLES IS PERMITTED WITHIN THE AQUIFER PROTECTION AREA.
3. ANY NECESSARY TEMPORARY STORAGE SHOULD BE ABOVEGROUND, PROTECTED FROM RAINFALL, AND ON AN IMPERVIOUS CONTAINMENT SURFACE.
4. AN EMERGENCY SPILL AND RESPONSE PLAN SHOULD BE DEVELOPED, INCLUDING COORDINATION WITH THE WATER SUPPLIER.
5. THE SITE ACCESS SHOULD BE ADEQUATELY SECURED AT ALL TIMES TO PROHIBIT ANY UNAUTHORIZED DISPOSAL OF WASTE MATERIALS.

STORMWATER POLLUTION PREVENTION MEASURES:

1. DEICING MANAGEMENT AREAS SHOULD BE ESTABLISHED INCLUDING LOW SALT USE AREAS, ALTERNATIVE CHEMICAL OR SAND METHODS.
2. WELLHEAD PROTECTION SIGNS SHALL BE POSTED IN CLEAR VISIBILITY AT THE ENTRANCE AND EXIT POINTS OF THE AQUIFER PROTECTION AREA.

GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED INDEX CONTOUR
- PROPOSED SPOT ELEVATION
- MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- SOIL BORING LOCATION

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- ROOF LEADER
- SANITARY MANHOLE
- SANITARY SEWER
- VENT LINE
- CLEANOUT
- WATER LINE / FIRE LINE
- WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WATER METER
- ELECTRIC / COMM. DUCT BANK
- GAS LINE
- GAS METER
- COMMUNICATION CONDUITS

SEE SHEET C3.1 FOR UTILITY NOTES AND CONTACTS

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

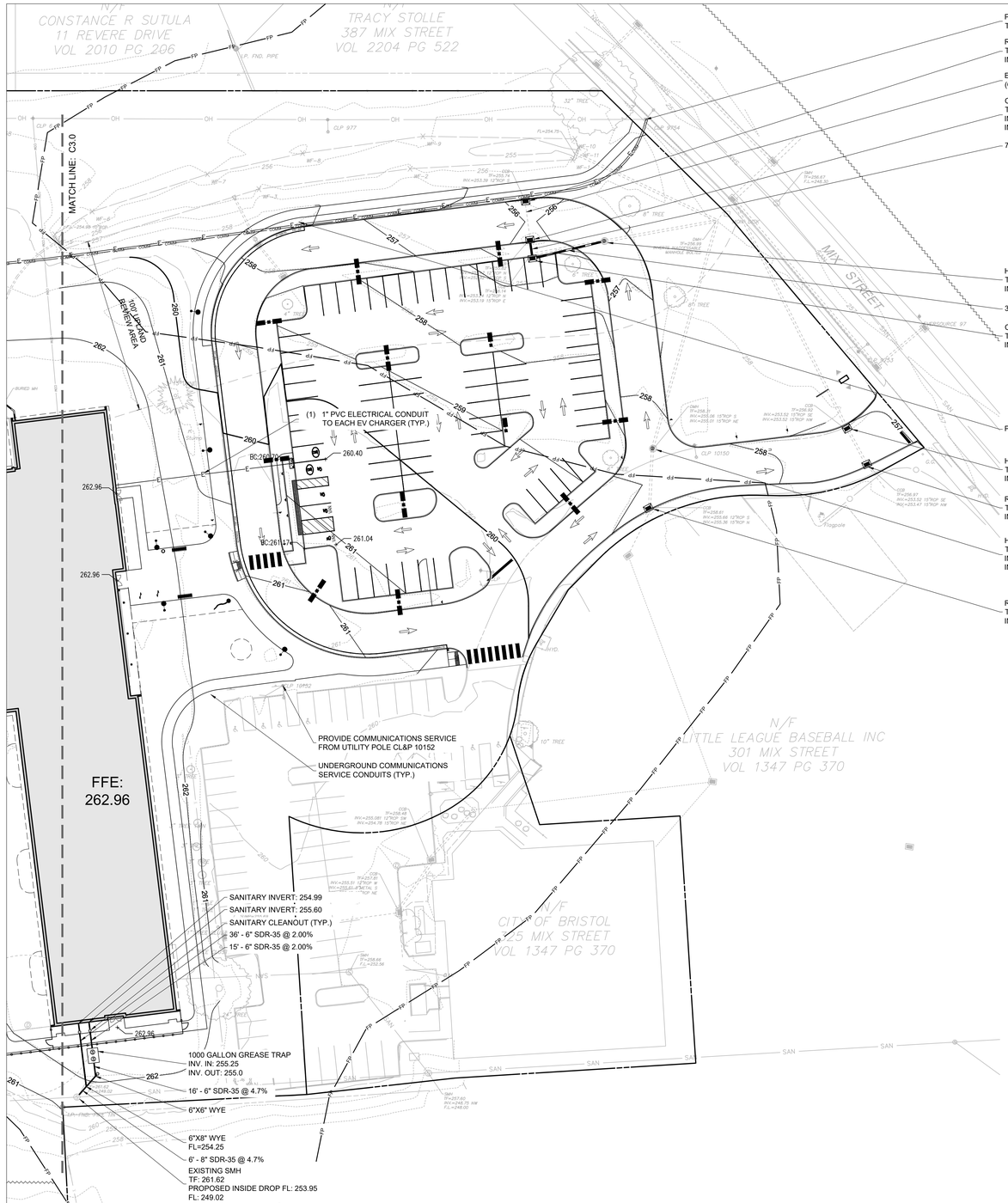
STATE OF CONNECTION
CHRISTOPHER G. SCRITTORE
29004
LICENSED PROFESSIONAL ENGINEER

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

GRADING, DRAINAGE & UTILITY PLAN (WEST)

C3.0



UTILITY NOTES

SANITARY SEWER (CITY OF BRISTOL WATER & SEWER DEPARTMENT)

1. ALL SANITARY SEWER WORK TO COMPLY WITH CITY OF BRISTOL WATER & SEWER DEPARTMENT STANDARDS AND SPECIFICATIONS.
2. ALL SANITARY LATERALS ARE TO BE 6" SDR-35 WITH A MIN. PITCH OF 2% AND 3.5 FT OF COVER UNLESS OTHERWISE NOTED.
3. ALL SANITARY LATERALS ARE TO HAVE INTERNAL CLEANOUTS WITH INLINE BACKFLOW PREVENTER A CLEANOUT WITHIN 10 FT OF BUILDING FOOTPRINT.
4. LOCATION OF SANITARY LATERALS AT BUILDING TO BE COORDINATED WITH PLUMBING DRAWINGS.

WATER SERVICE (CITY OF BRISTOL WATER & SEWER DEPARTMENT)

1. ALL WATER SERVICE WORK TO COMPLY WITH CITY OF BRISTOL WATER & SEWER DEPARTMENT STANDARDS AND SPECIFICATIONS.
2. ALL DOMESTIC WATER SERVICES ARE TO BE 4" D.I. WITH 4.5 FT OF COVER.
3. ALL FIRE SERVICES ARE TO BE 6" D.I. WITH 4.5 FT OF COVER.
4. ALL WATER SERVICES ARE TO BE A MIN. 10 FT FROM ANY SANITARY SERVICE (UNLESS SHELVED IN THE SAME TRENCH) AND A MINIMUM OF 18" OF VERTICAL CLEARANCE FROM ANY OTHER UTILITY LINE.
5. LOCATION OF WATER SERVICES AT BUILDINGS TO BE COORDINATED WITH PLUMBING DRAWINGS.
6. ANY UNUSED WATER MAINS OR WATER SERVICES MUST BE DISCONNECTED AT THE WATER MAIN PRIOR TO DEMOLITION.
7. ALL TAPS ARE TO BE PERFORMED BY THE BRISTOL WATER DEPARTMENT, CONTRACTOR TO COORDINATE.
8. THRUST BLOCKS WILL BE REQUIRED AT EACH CUT AND CAP.
9. EACH CUT AND CAP REQUIRES TWO (2) JOINTS PRIOR TO CUT AND CAP.
10. ALL FITTINGS WILL REQUIRE JOINT RESTRAINTS BEFORE AND AFTER EACH FITTING.

ELECTRICAL SERVICES (EVERSOURCE)

1. ALL ELECTRICAL SERVICES ARE TO CONFORM TO EVERSOURCE CURRENT STANDARDS AND REGULATIONS.
2. FINAL DESIGN TO BE COORDINATED WITH EVERSOURCE.
3. METER LOCATIONS TO BE COORDINATED WITH ELECTRICAL DRAWINGS.
4. CONDUITS ARE FOR REFERENCE ONLY. REFER TO ELECTRIC SITE UTILITY PLAN FOR EXACT NUMBER OF CONDUITS, MATERIAL AND WIRING.

TELEPHONE SERVICES (FRONTIER/SNET)

1. ALL TELEPHONE SERVICES ARE TO CONFORM TO FRONTIER/SNET MOST CURRENT STANDARDS AND REGULATIONS.
2. FINAL DESIGN TO BE COORDINATED WITH FRONTIER/SNET.
3. SERVICE LOCATIONS TO BE COORDINATED WITH M.E.P. DRAWINGS.
4. CONDUITS ARE FOR REFERENCE ONLY. REFER TO ELECTRIC SITE UTILITY PLAN FOR EXACT NUMBER OF CONDUITS, MATERIAL AND WIRING.

CABLE TELEVISION SERVICES (COMCAST)

1. ALL CABLE TELEVISION SERVICES ARE TO CONFORM TO MOST CURRENT STANDARDS AND REGULATIONS.
2. FINAL DESIGN TO BE COORDINATED WITH COMCAST.
3. SERVICE LOCATIONS TO BE COORDINATED WITH M.E.P. DRAWINGS.
4. CONDUITS ARE FOR REFERENCE ONLY. REFER TO ELECTRIC SITE UTILITY PLAN FOR EXACT NUMBER OF CONDUITS, MATERIAL, AND WIRING.

UTILITY COMPANY CONTACTS

WATER: CITY OF BRISTOL WATER & SEWER DEPARTMENT - (860) 582-7431

SANITARY SEWER: CITY OF BRISTOL WATER & SEWER DEPARTMENT - (860) 584-6125

GAS: EVERSOURCE - (203) 317-4445

ELECTRIC: EVERSOURCE - (203) 271-4735

TELEPHONE: FRONTIER/SNET - (877) 308-8822

CATV: COMCAST - (800) 391-3000

GRADING LEGEND

- DIRECTION OF SURFACE DRAINAGE FLOW
- 123 — PROPOSED INTERMEDIATE CONTOUR
- 120 — PROPOSED INDEX CONTOUR
- 123.45 / TW 123.45 BW 122.45 — PROPOSED SPOT ELEVATION
- 123.45 (ME) — MATCH EXISTING SPOT ELEVATION
- FLUSH CONDITION
- ACCESSIBLE ROUTE
- B-# — SOIL BORING LOCATION

DRAINAGE AND UTILITIES LEGEND

- STORM DRAINAGE PIPE
- CATCH BASIN
- DRAINAGE MANHOLE
- AREA/YARD DRAIN
- TREATMENT UNIT
- ROOF LEADER
- SANITARY MANHOLE
- S — SANITARY SEWER
- VENT — VENT LINE
- CLEANOUT
- W — WATER LINE / FIRE LINE
- W — WATER LINE DOMESTIC
- WATER GATE VALVE
- WATER TAPPING SLEEVE
- WATER METER
- ELECTRIC / COMM. DUCT BANK
- G — GAS LINE
- GAS METER
- COMM — COMMUNICATION CONDUITS

SEE SHEET C3.0 FOR DRAINAGE, ACCESSIBILITY AND AQUIFER PROTECTION AREA NOTES.

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860-633-8341

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

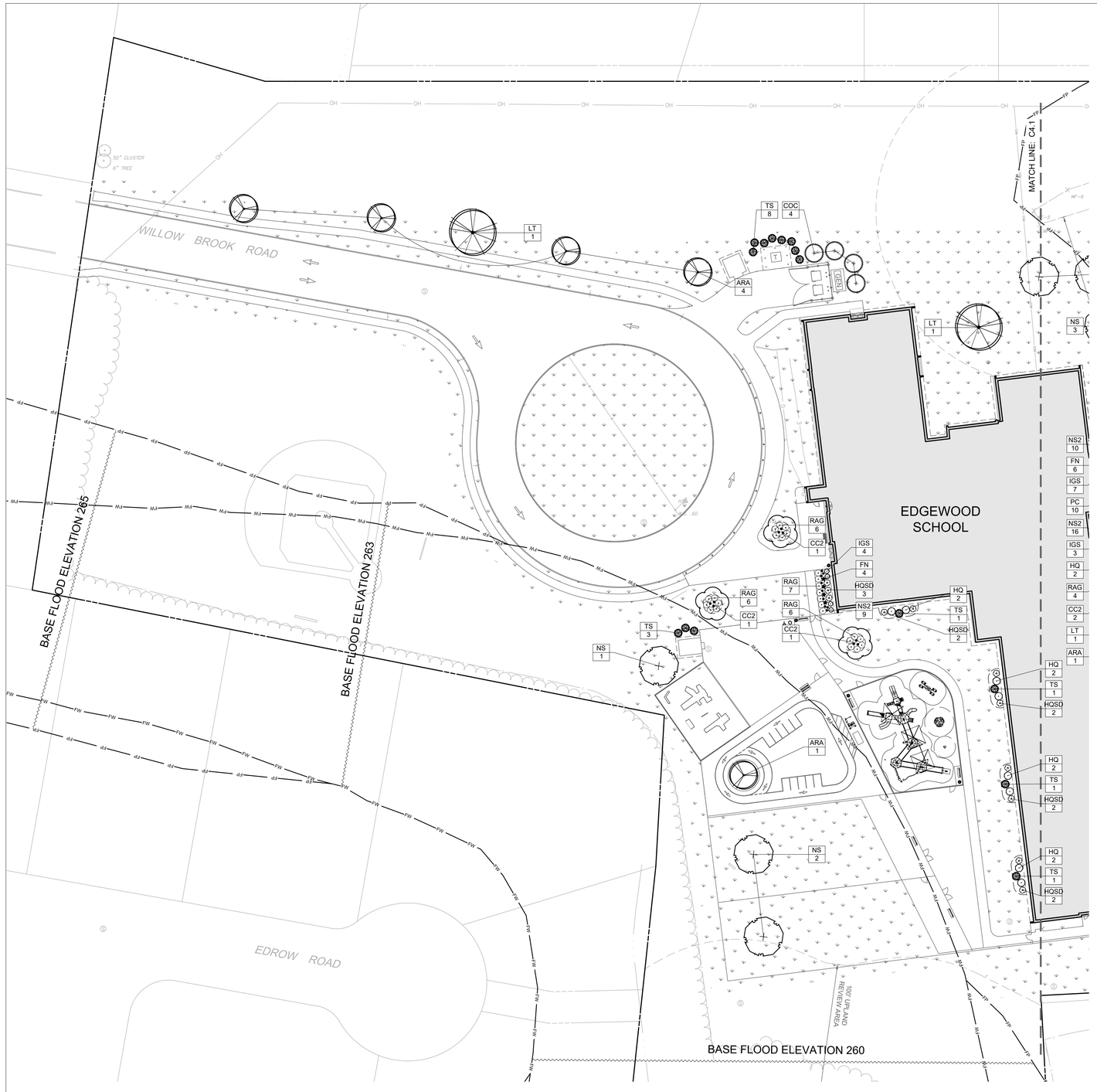
STATE OF CONNECTICUT — ALEXIS SCRITTORE — 28064 — LICENSED PROFESSIONAL ENGINEER

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

GRADING, DRAINAGE & UTILITY PLAN (EAST)

C3.1



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BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

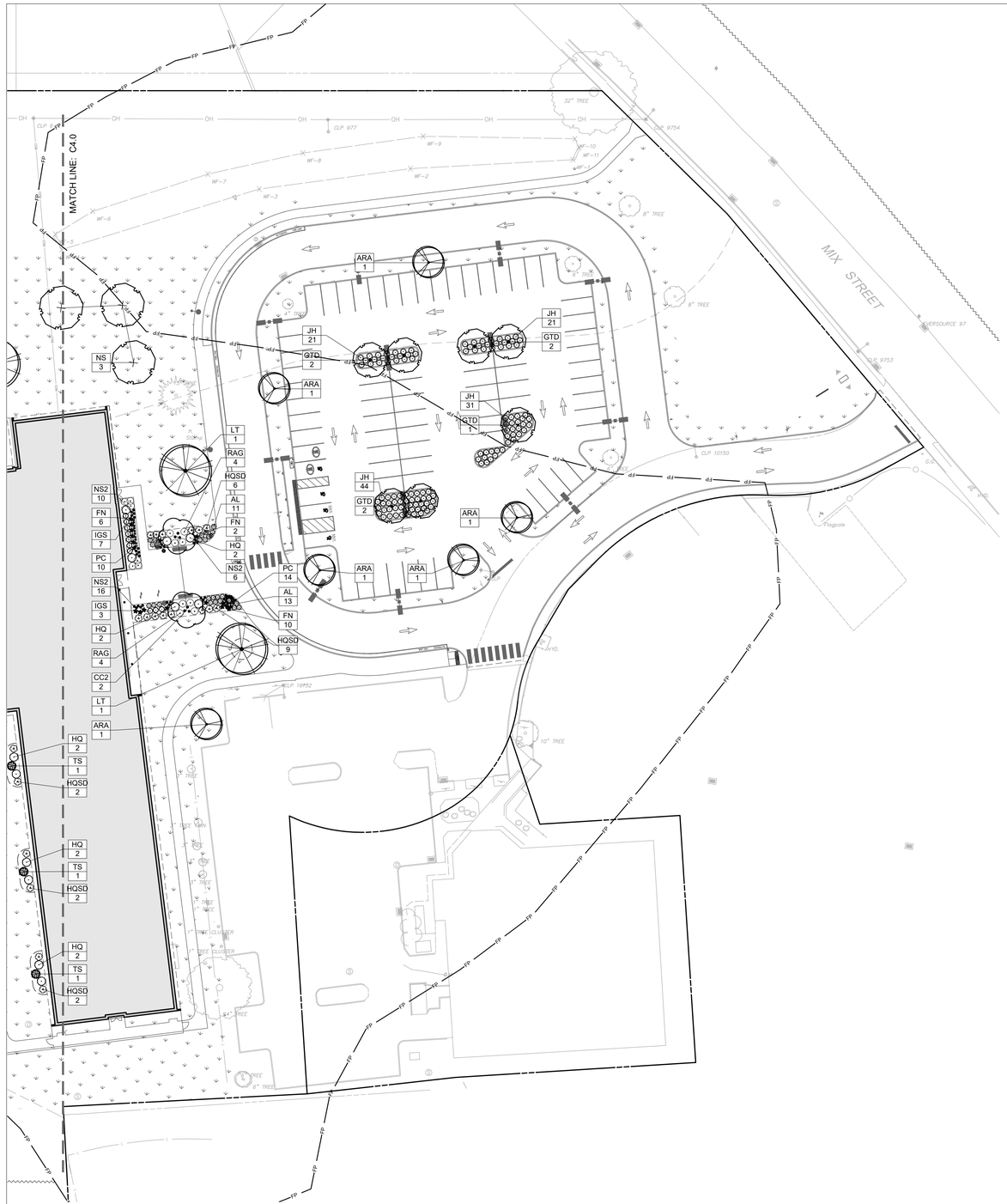
STATE OF CONNECTICUT · RYAN C. DEANE · LICENSED LANDSCAPE ARCHITECT · NO. 1085

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLANTING
PLAN (WEST)

C4.0



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Revisions

STATE OF CONNECTICUT · RYAN C. DEGNE · NO. 1085 · LICENSED LANDSCAPE ARCHITECT

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

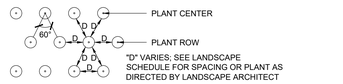
PLANTING
PLAN (EAST)

C4.1

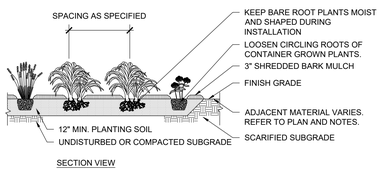
PLANT SCHEDULE

SYMBOL	CODE	BOTANICAL / COMMON NAME	CONT	CAL	SIZE		QTY
DECIDUOUS TREES							
	ARA	ACER RUBRUM 'ARMSTRONG' / ARMSTRONG RED MAPLE	B & B	3"CAL	12-16' HT.		11
	GTD	GLEDITSIA TRIACANTHOS `DRAVES` / STREET KEEPER HONEY LOCUST	B & B	2.5-3" CAL.	14-16' HT.		7
	LT	LIRIODENDRON TULIPIFERA / TULIP TREE	B & B	2.5-3" CAL.	12-16' HT.		4
	NS	NYSSA SYLVATICA / SOUR GUM	B & B	4-4.5" CAL.	10-12' HT.		6
EVERGREEN TREES							
	COC	CHAMAECYPARIS OBTUSA `CRIPPSII` / CRIPPS FALSE CYPRESS	B & B	CONIFER	8-10' HT.		4
	TS	THUJA OCCIDENTALIS 'SUNKIST' / SUNKIST ARBORVITAE	B&B OR CONT.	CONIFER	6 - 8' HT.		15
ORNAMENTAL TREES							
	CC2	CERCIS CANADENSIS / EASTERN REDBUD	B & B	MULTI-TRUNK	8-10' HT.		5
SYMBOL	*CODE*	*BOTANICAL / COMMON NAME*	*SIZE*	*HEIGHT*	*SPREAD*		*QTY*
ANNUALS/PERENNIALS							
	NS2	NEPETA X FAASSENII 'CAT'S PAJAMAS' / CAT'S PAJAMAS CATMINT	#2 CONT.	12-15" HT.	12-15" SPR.		41
	PC	PHLOX STOLONIFERA / CREEPING PHLOX	1 GAL	6-8" HT.			24
DECIDUOUS SHRUBS							
	AL	ARONIA MELANOCARPA 'UCONNAM165' / LOW SCAPE MOUND® BLACK CHOKEBERRY	3 GAL	1-2' HT.			24
	FN	FORSYTHIA X INTERMEDIA 'NIMBUS' / SHOW OFF® SUGAR BABY® DWARF FORSYTHIA	#2 CONT.	1-2' HT.	1-1.5' SPR.		22
	HQ	HYDRANGEA QUERCIFOLIA / OAKLEAF HYDRANGEA	#7 CONT.	36-42" HT.	36-42" SPR.		14
	HQSD	HYDRANGEA QUERCIFOLIA `SIKE'S DWARF` / SIKE'S DWARF OAKLEAF HYDRANGEA	#5 CONT.	18-24" HT.	18-24" SPR.		25
	RAG	RHUS AROMATICA `GRO-LOW` / GRO-LOW FRAGRANT SUMAC	#3 CONT.	8-12" HT.	12-15" SP.		39
EVERGREEN SHRUBS							
	IGS	ILEX GLABRA `SHAMROCK` / SHAMROCK INKBERRY	#5 CONT.	24-30" HT.	24-30" SPR.		14
	JH	JUNIPERUS HORIZONTALIS / CREEPING JUNIPER	#3 CONT.	9-12" HT.	12-15" SPR.		117
SYMBOL	*CODE*	*BOTANICAL / COMMON NAME*	*CONT*	*HEIGHT*	*SPREAD*	*SPACING*	*QTY*
GROUND COVERS							
	TH	TURF SEED MIX	SEED				98,647 SF

	PLANT CATEGORY
TURF SEED MIX (TH)	SEED MIXES
	LAWN SEED MIX (HART'S ELITE LAWN SEED MIXTURE) 30.00% Quartz Kentucky Bluegrass 30.00% Rockstar Kentucky Bluegrass 20.00% Ambrose Chewing Fescue 20% Molalla Perennial Ryegrass Seeding Rate: 75-150 lb per acre, or 3-5 lb per 1,000 sq ft

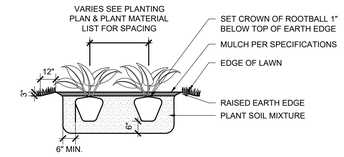


PLAN VIEW

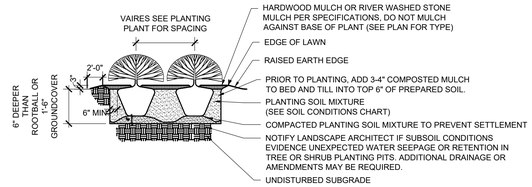


SECTION VIEW

5 GROUNDCOVER PLANTING
1/4" = 1'-0"



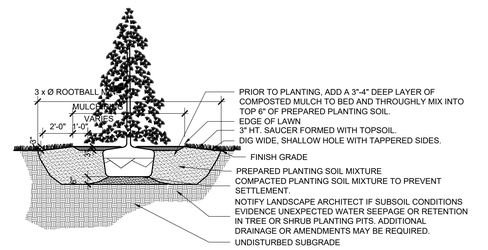
4 PERENNIAL PLANTING (CONTINUOUS PLANTING BED)
1/4" = 1'-0"



NOTES:
1. FOR CONTAINER GROWN SHRUBS, GENTLY PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF CONTAINER.
2. FOR B&b SHRUBS, FOLD BURLAP FROM TOP OF ROOT BALL DOWN TO GROUND.
3. INCORPORATE COMMERCIALLY PREPARED MYCORRHIZA SPORES IN THE SOIL IMMEDIATELY AROUND THE ROOT BALL AT RATES SPECIFIED BY MANUFACTURER.
4. CONFIRM THE WATER DRAINS OUT OF THE SOIL DURING THE DESIGN PHASE, DESIGN ALTERNATIVE DRAINAGE SYSTEMS, AS REQUIRED.

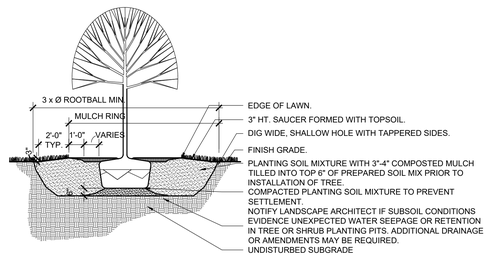
3 SHRUB PLANTING BED
1/4" = 1'-0"

NOTE: INCORPORATE COMMERCIALLY PREPARED MYCORRHIZA SPORES IN THE SOIL IMMEDIATELY AROUND THE ROOT BALL AT RATES SPECIFIED BY THE MANUFACTURER.



2 EVERGREEN TREE PLANTING
1/4" = 1'-0"

NOTE: INCORPORATE COMMERCIALLY PREPARED MYCORRHIZA SPORES IN THE SOIL IMMEDIATELY AROUND THE ROOT BALL AT RATES SPECIFIED BY THE MANUFACTURER.



1 DECIDUOUS TREE PLANTING
1/4" = 1'-0"

QA+M architecture
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qamarch.com

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Glastonbury, Connecticut 06033
860-633-8341

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

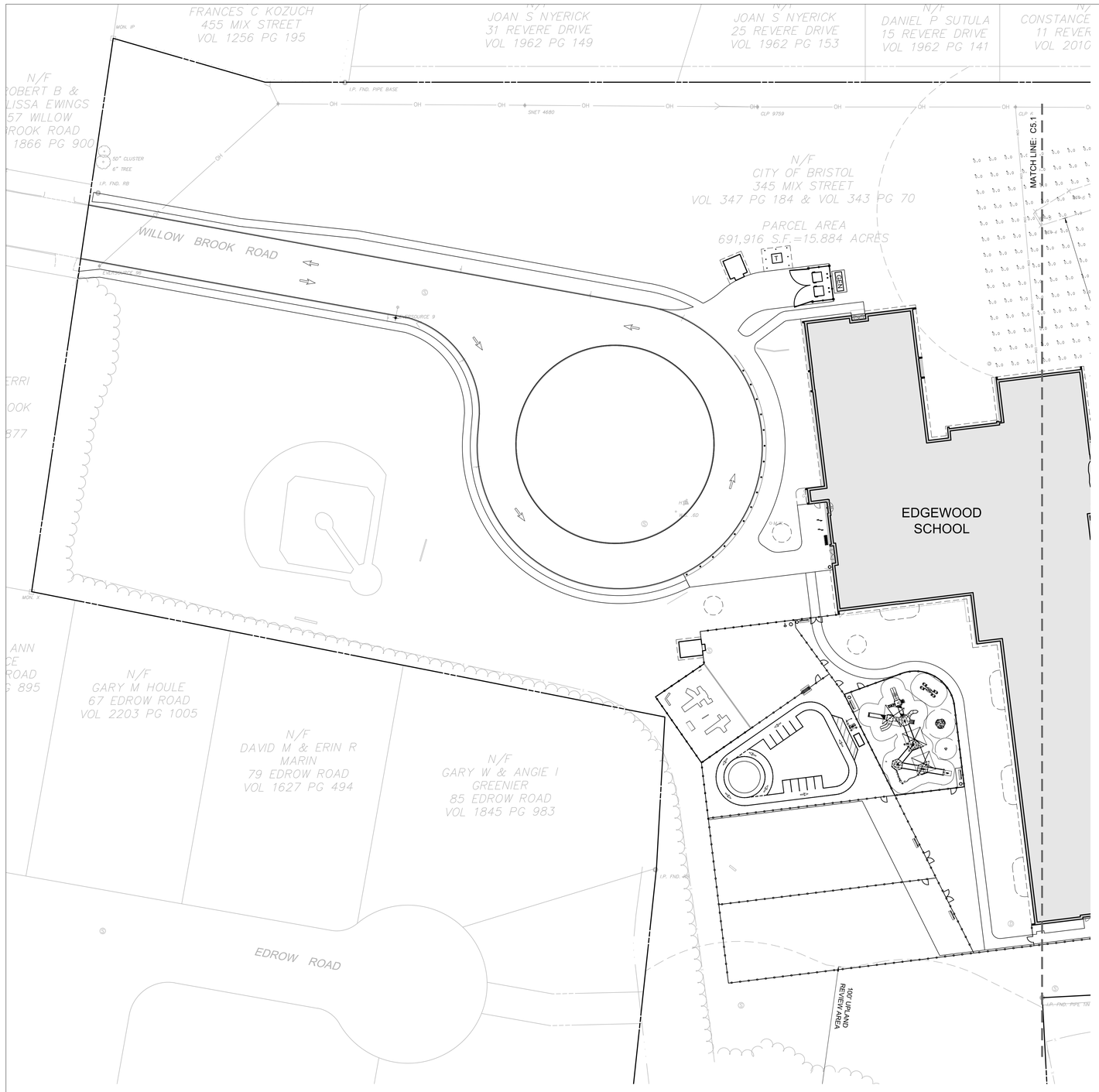
Revisions

STATE OF CONNECTICUT · RYAN C. DEFANT · LICENSED LANDSCAPE ARCHITECT · NO. 1098

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLANTING DETAILS

C4.2



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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

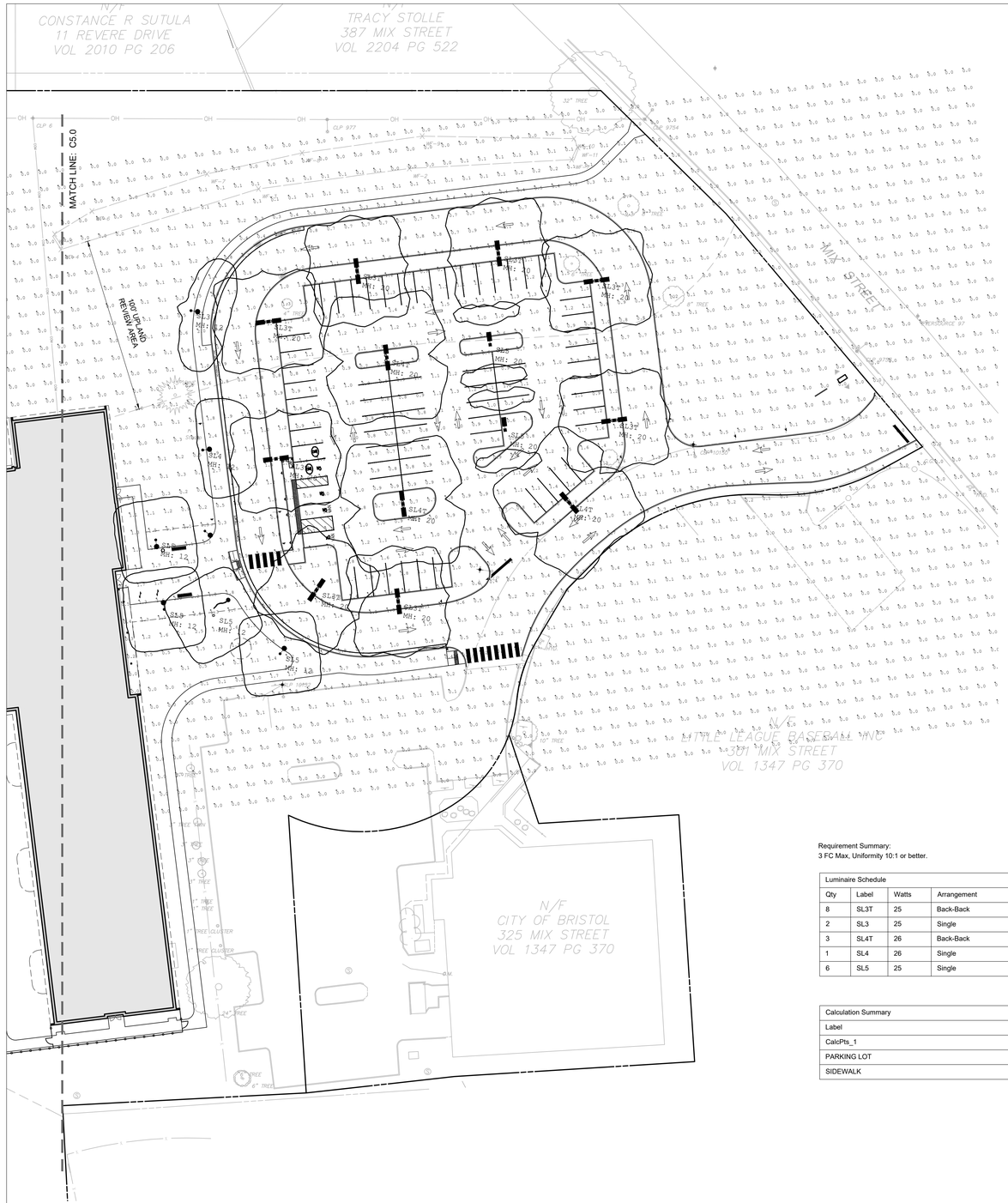
Revisions

SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PHOTOMETRIC
PLAN (WEST)

C5.0



KIM LIGHTING

UR20 - Post Top

ARCHITECTURAL AREA/SITE

DATE: LOCATION:

TYPE: PROJECT:

CATALOG #:

FEATURES

- 20" size in single/dual arm post top, pole and wall mount
- High performance optics up to 16,874 delivered lumens
- Elegant form factor
- Diffusion lens option
- UL/cUL listed for wet locations, IP66 and 4G/1.5G vibration rated

Ouro

CONTROL TECHNOLOGY

LIGHTGRID

SPECIFICATIONS

CONSTRUCTION
- Die-cast aluminum alloy die-casting is standard on luminaire.
- Molded silicone gasket throughout insures the sealing between the two compartments and provides ingress protection.
- All external fasteners are stainless steel.
- Cover is secured to Lens frame by the latch and hinge.

OPTICS
- LEDs mount to a metal printed circuit board assembly (MCPCB).
- Optical lenses are clear injection molded PMMA acrylic.
- Optional Backlight Control on each LED module to completely control unwanted backlight.
- Optional fixture finish optical surfaces will not affect the IES ratings of the standard white finish.

LENS
- Standard lens (CLR) IK08
- Clear Polycarbonate Lens (CP) IK10

INSTALLATION
- Fixtures must be grounded in accordance with national, state and/or local electrical codes. Failure to do so may result in serious personal injury.

FM33

FMA32LEDTEA53, FMA34L, FT34L4, FT34L6

	Weight	EPA
UR20	39 lbs / 18.0 kg	0.052 ft²

ELECTRICAL
- Universal voltage, 120 through 277V with a ±10% tolerance. Driver is Underwriters Laboratories listed.
- High voltage configurations, 347/480, Driver is 347/480V with a tolerance of ±10% and Driver illumination options. Driver is Underwriters Laboratories listed.
- "Thermal Shield", secondary side, thermistor provides protection for the sustainable life of LED module and electronic components
- Drivers shall have greater than a 0.9 power factor (PF) and less than 20% total harmonic and be suitable for operation in -40°C to 40°C ambient environments.
- Luminaire shall be capable of operating at 100% brightness in a 40°C environment. Both driver and LED module shall have thermal protection that will dim the luminaire upon detection of temperatures in excess of 85°C.
- Surge protection 10,000k in parallel, 20,000k in series
- Wiring: No. 18AWM rated 105°C, wet rating.

CONTROLS

2PW
- Fully gasketed and wired 7-pin receptacle (ANSI C136.41) standard. Provides a low voltage electrical compartment. 7-pin construction allows for a user-defined interface and provides a controlled definition of operational performance. ANSI twist-lock control module by others.

Standard customer operation modes:
- Traditional on/off photoelectric control.
- 5-pin wireless photoelectric control for added dimming feature.
- 7-pin wireless photoelectric control for added dimming and additional I/O connections for customer use.

(Specifications continued on page 5)

Current

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Requirement Summary:
3 FC Max, Uniformity 10:1 or better.

Luminaire Schedule					
Qty	Label	Watts	Arrangement	LLF	Description
8	SL3T	25	Back-Back	0.900	UR20-24L-25-3K7-3-CLR-PT
2	SL3	25	Single	0.900	Kim UR20-24L-25-3K7-3-UNV-PTtbd-finishTBD-CLR
3	SL4T	26	Back-Back	0.900	UR20-24L-25-3K7-4W-CLR-PT
1	SL4	26	Single	0.900	Kim UR20-24L-25-3K7-4W-UNV-PTtbd-finishTBD-CLR
6	SL5	25	Single	0.900	Kim UR20-24L-25-3K7-5QM-UNV-PTtbd-finishTBD-CLR

Calculation Summary						
Label	Units	Avg	Max	Min	Avg/Min	Max/Min
CalcPts_1	Fc	0.39	2.8	0.0	N.A.	N.A.
PARKING LOT	Fc	1.10	1.9	0.6	1.83	3.17
SIDEWALK	Fc	1.33	2.8	0.3	4.43	9.33

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

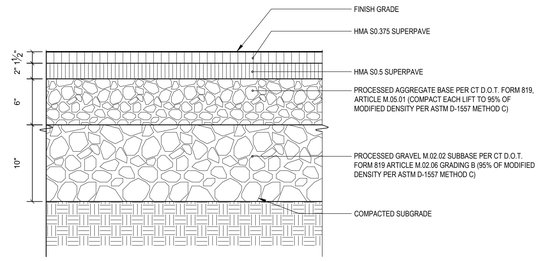
STATE OF CONNECTICUT
IAN D. SCRITCHFIELD
28064
LICENSED
PROFESSIONAL ENGINEER

0 30' 60'
SCALE: 1" = 30'

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

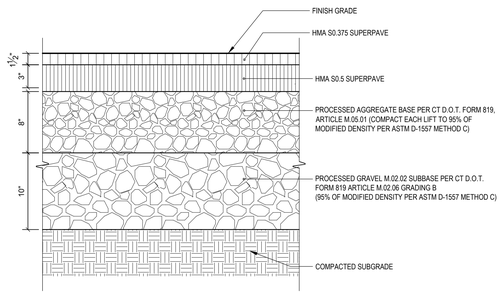
PHOTOMETRIC PLAN (EAST)

C5.1



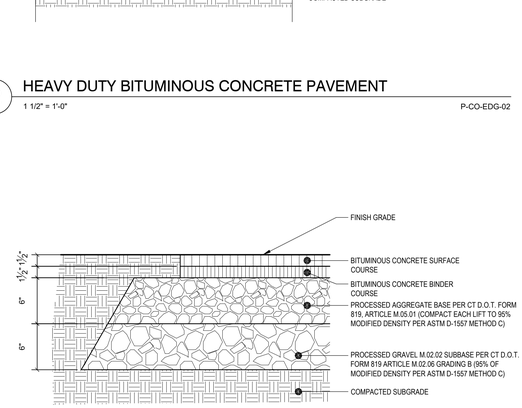
1 STANDARD DUTY BITUMINOUS CONCRETE PAVEMENT

1 1/2" = 1'-0" P-CO-EDG-01



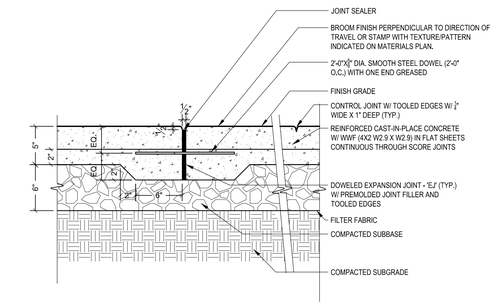
2 HEAVY DUTY BITUMINOUS CONCRETE PAVEMENT

1 1/2" = 1'-0" P-CO-EDG-02



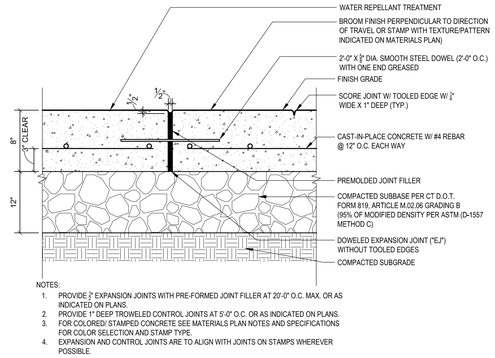
3 BITUMINOUS CONCRETE WALK

1 1/2" = 1'-0" P-CO-MEM-22



4 LIGHT DUTY CONCRETE PAVEMENT (REGULAR/COLOR/STAMPED)

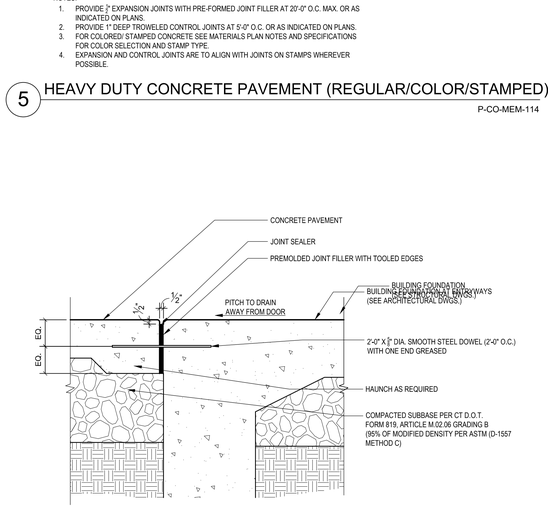
1 1/2" = 1'-0" P-CO-MEM-123



NOTES:
1. PROVIDE ¾" EXPANSION JOINTS WITH PRE-FORMED JOINT FILLER AT 20'-0" O.C. MAX. OR AS INDICATED ON PLANS.
2. PROVIDE 1" DEEP TROWELED CONTROL JOINTS AT 5'-0" O.C. OR AS INDICATED ON PLANS.
3. FOR COLORED/ STAMPED CONCRETE SEE MATERIALS PLAN NOTES AND SPECIFICATIONS FOR COLOR SELECTION AND STAMP TYPE.
4. EXPANSION AND CONTROL JOINTS ARE TO ALIGN WITH JOINTS ON STAMPS WHEREVER POSSIBLE.

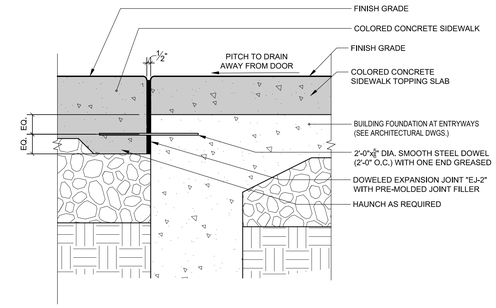
5 HEAVY DUTY CONCRETE PAVEMENT (REGULAR/COLOR/STAMPED)

P-CO-MEM-114



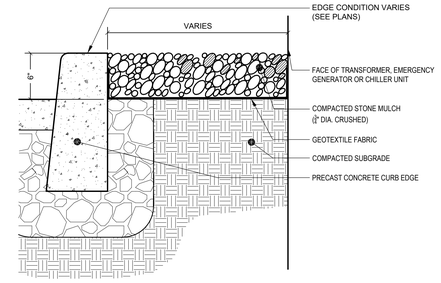
6 DOWELED EXPANSION JOINT AT BUILDING CONNECTION (EJ-1)

1 1/2" = 1'-0" P-CO-MEM-22



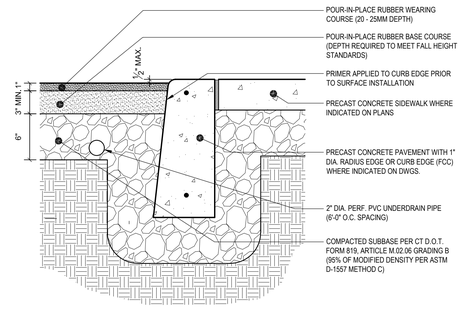
7 DOWELED EXPANSION JOINT AT DEPRESSED BUILDING CONNECTION (EJ-2)

1 1/2" = 1'-0"



8 STONE MULCH AT UTILITIES

1 1/2" = 1'-0" P-CO-MEM-30



9 RESILIENT RUBBER PLAYGROUND SURFACING

1 1/2" = 1'-0" P-CO-EDG-31

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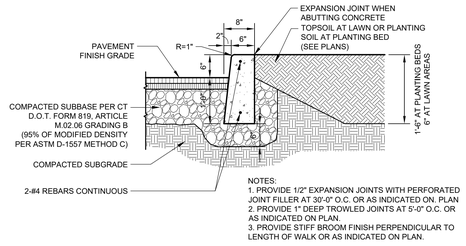
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE DETAILS

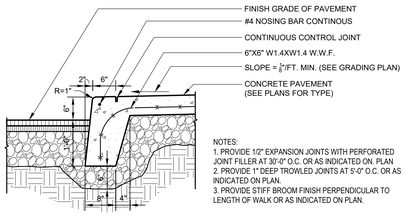
C6.0



NOTES:
1. PROVIDE 1/2" EXPANSION JOINTS WITH PERFORATED JOINT FILLER AT 30'-0" O.C. OR AS INDICATED ON. PLAN
2. PROVIDE 1" DEEP TROWLED JOINTS AT 5'-0" O.C. OR AS INDICATED ON PLAN.
3. PROVIDE STIFF BROOM FINISH PERPENDICULAR TO LENGTH OF WALK OR AS INDICATED ON PLAN.

1 CAST-IN-PLACE CONCRETE CURB (CC)

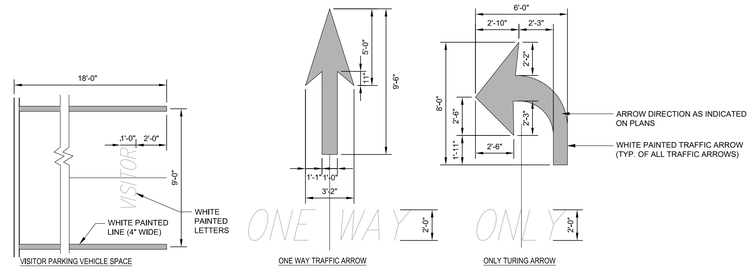
3/4" = 1'-0" P-CO-MEM-40

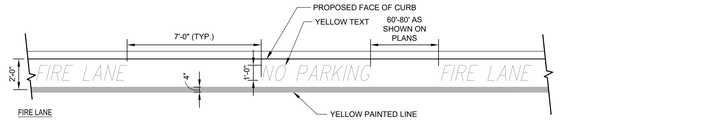


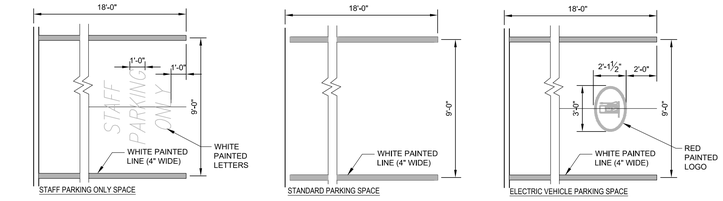
NOTES:
1. PROVIDE 1/2" EXPANSION JOINTS WITH PERFORATED JOINT FILLER AT 30'-0" O.C. OR AS INDICATED ON. PLAN
2. PROVIDE 1" DEEP TROWLED JOINTS AT 5'-0" O.C. OR AS INDICATED ON PLAN.
3. PROVIDE STIFF BROOM FINISH PERPENDICULAR TO LENGTH OF WALK OR AS INDICATED ON PLAN.

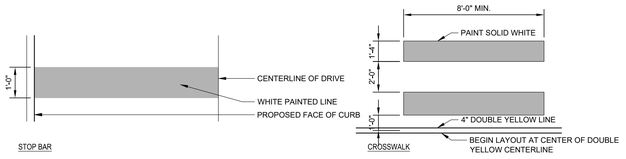
2 INTEGRAL CAST-IN-PLACE CONCRETE CURB (ICC)

3/4" = 1'-0" P-CO-MEM-41



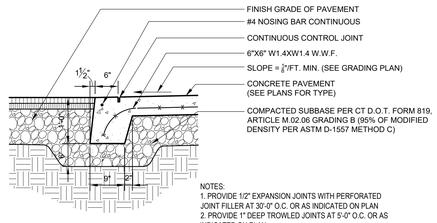






4 PAINTED PAVEMENT MARKINGS

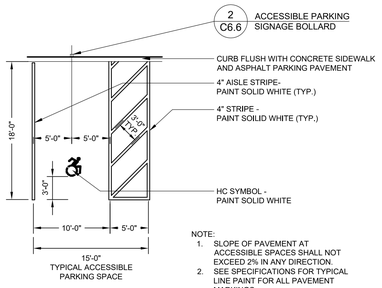
1/4" = 1'-0" P-CO-MEM-85



NOTES:
1. PROVIDE 1/2" EXPANSION JOINTS WITH PERFORATED JOINT FILLER AT 30'-0" O.C. OR AS INDICATED ON PLAN
2. PROVIDE 1" DEEP TROWLED JOINTS AT 5'-0" O.C. OR AS INDICATED ON PLAN.
3. PROVIDE STIFF BROOM FINISH PERPENDICULAR TO LENGTH OF WALK OR AS INDICATED ON PLAN.

3 FLUSH INTEGRAL CAST-IN-PLACE CONCRETE CURB (FICC)

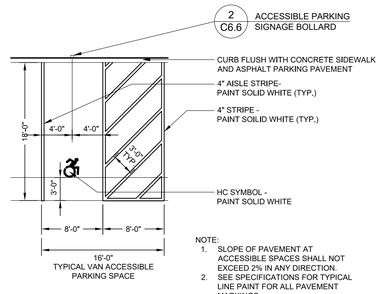
3/4" = 1'-0" P-CO-MEM-43



NOTE:
1. SLOPE OF PAVEMENT AT ACCESSIBLE SPACES SHALL NOT EXCEED 2% IN ANY DIRECTION.
2. SEE SPECIFICATIONS FOR TYPICAL LINE PAINT FOR ALL PAVEMENT MARKINGS.

5 ACCESSIBLE PARKING SPACE PLAN

1/8" = 1'-0"



NOTE:
1. SLOPE OF PAVEMENT AT ACCESSIBLE SPACES SHALL NOT EXCEED 2% IN ANY DIRECTION.
2. SEE SPECIFICATIONS FOR TYPICAL LINE PAINT FOR ALL PAVEMENT MARKINGS.

6 VAN ACCESSIBLE PARKING SPACE PLAN

1/8" = 1'-0"

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State Project #: 017-0090 RNV
Project #: 0726-500158.00

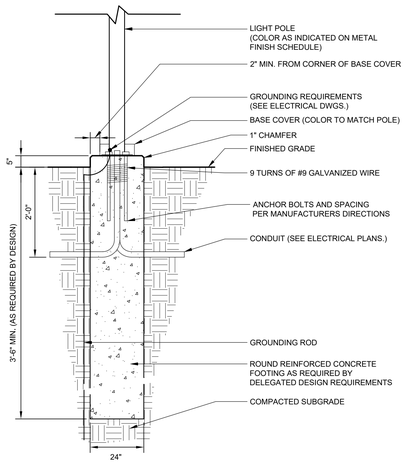
Revisions

STATE OF CONNECTICUT
SCRIFFIGNANO
28064
LICENSED PROFESSIONAL ENGINEER

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE DETAILS

C6.1

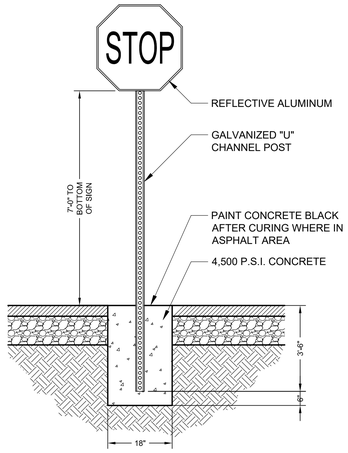


1 PEDESTRIAN LIGHT POLE CONCRETE BASE (12' HT.)

3/4" = 1'-0" P-CO-MEM-47

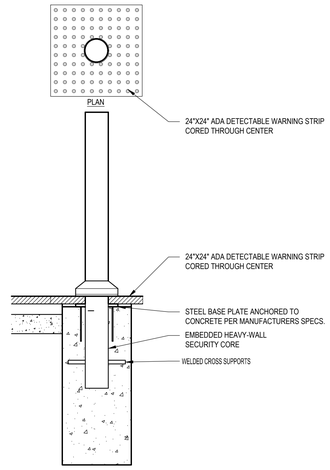
NOTES:

1. ALL POSTS SHALL BE OF ADEQUATE LENGTH TO MEET THE REQUIREMENTS FOR ERECTION AS STATED IN THE CURRENT "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS".
2. ALL POSTS SHALL BE EMBEDDED 3'-6" MINIMUM BELOW GRADE.
3. ALL STEEL POSTS AND BRACKETS SHALL BE CUT, BENT, AND HOLES PUNCHED AND DRILLED BEFORE GALVANIZING. GALVANIZING SHALL BE IN CONFORMANCE WITH CURRENT A.S.T.M. SPECIFICATION A123-78 (OR LATEST REVISED).
4. POSTS SHALL BE BREAKAWAY TYPE II TWO-PIECE U-POST OR OTHER BREAKAWAY STRUCTURAL SUPPORT HARDWARE AS NOTED IN THE LATEST EDITION OF AASHTO'S "SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS."
5. SIGN PANEL SIZES SHALL DETERMINE POST TYPE AND NUMBERS AS SHOWN ON THIS DETAIL AND DIRECTIONAL SIGN SHEET.
6. BOLTS SHALL NOT PROTRUDE MORE THAN 3/4" BEYOND THE NUT WHEN TIGHT BUT SHALL ENGAGE ALL THREADS IN THE NUT.
7. ALL TRAFFIC AND PEDESTRIAN SIGNAGE AND LOCATION SHALL BE IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND ALL CURRENT AMENDMENTS.



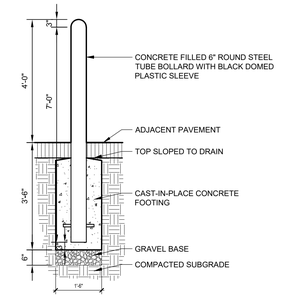
3 ON-SITE SIGNAGE

1/2" = 1'-0"



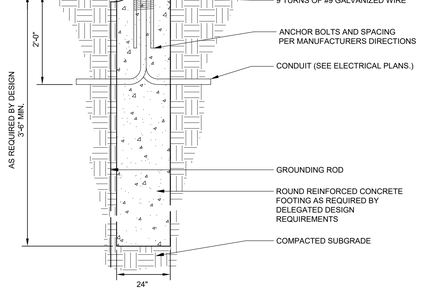
5 BOLLARD WITH SECURITY CORE

3/4" = 1'-0"



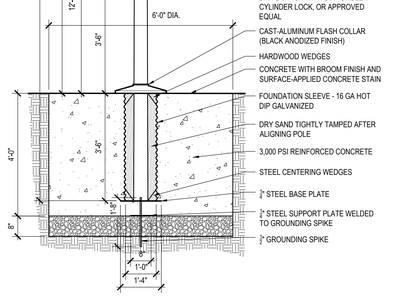
7 STEEL ROUND BOLLARD AT UTILITIES

1/2" = 1'-0" P-CO-MEM-34



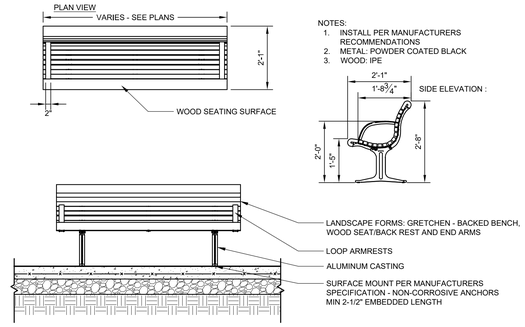
2 AREA LIGHT POLE CONCRETE BASE (14' HT.)

3/4" = 1'-0" P-CO-MEM-48



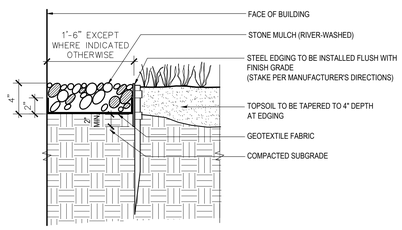
4 ALUMINUM FLAGPOLE

1/2" = 1'-0"



6 SITE BENCH - LANDSCAPE FORMS: GRETCHEN

1/2" = 1'-0"



8 STONE MULCH MAINTENANCE STRIP

1 1/2" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

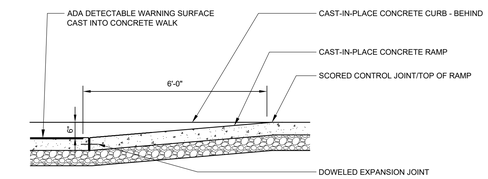
Revisions

STATE OF CONNECTION
CHRISTOPHER J. SCRITTORE
29564
LICENSED
PROFESSIONAL ENGINEER

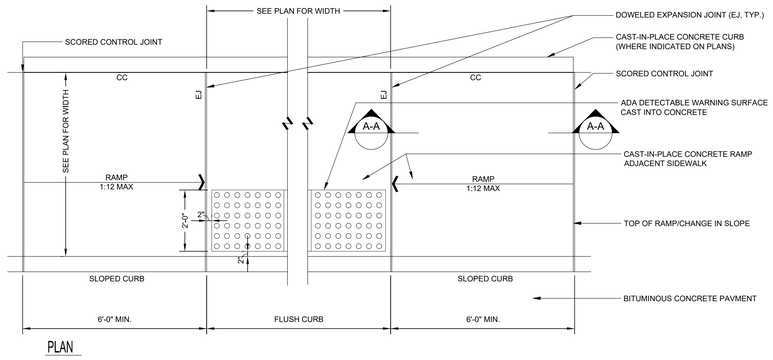
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE DETAILS

C6.2



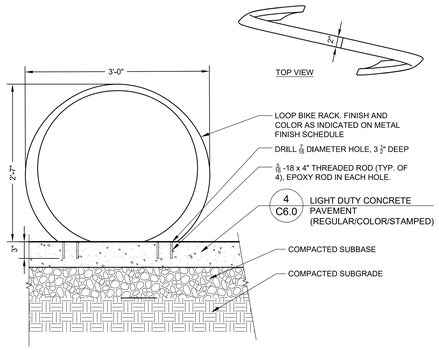
SECTION A-A



PLAN

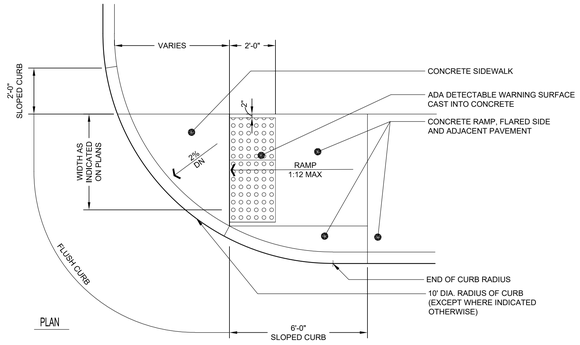
1 ACCESSIBLE CURB RAMP - TYPE B

1/2" = 1'-0" P-CO-EDG-35



3 LOOP BIKE RACK

1" = 1'-0" P-CO-MEM-125



PLAN

2 ACCESSIBLE CURB RAMP - TYPE D

3/8" = 1'-0" P-CO-MEM-37

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

STATE OF CONNECTICUT
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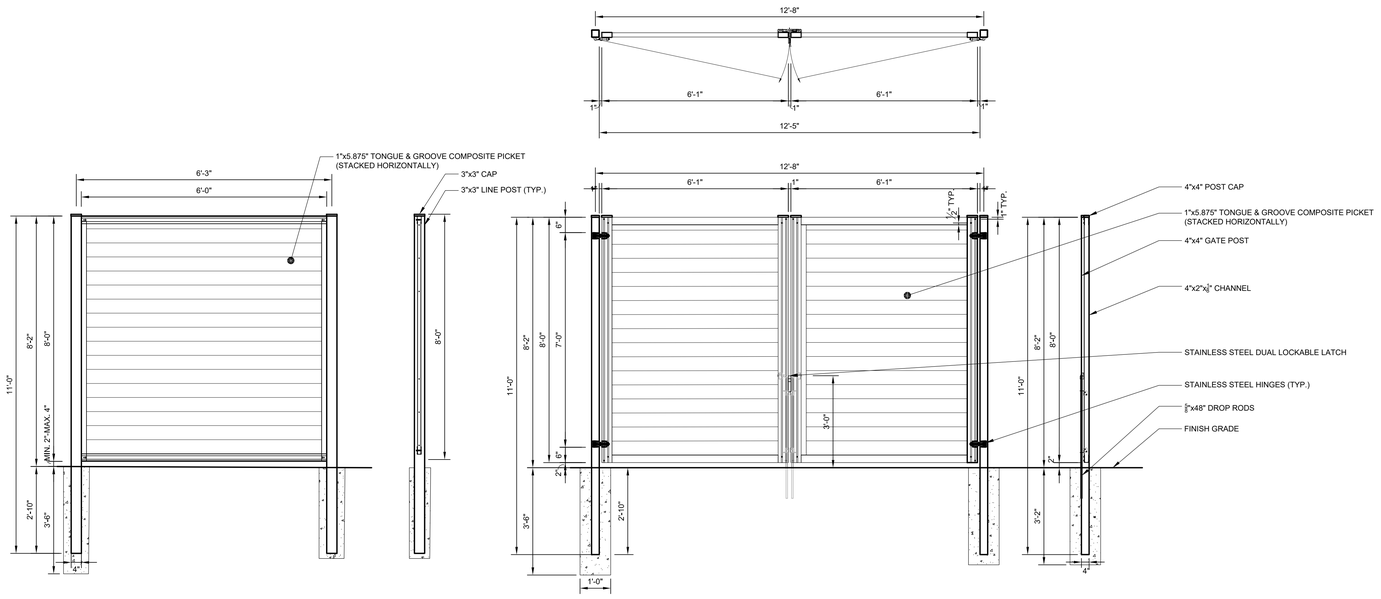
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE
DETAILS

C6.3



1 DUMPSTER ENCLOSURE AND GATE

1/2" = 1'-0"

P-CO-MEM-68

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

STATE OF CONNECTICUT
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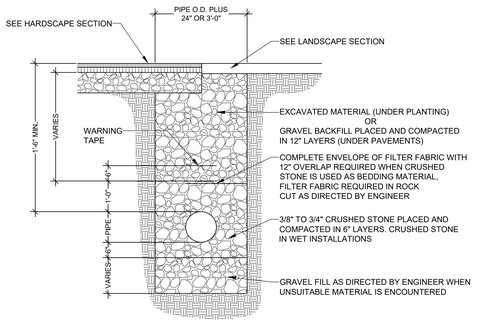
PROFESSIONAL ENGINEER

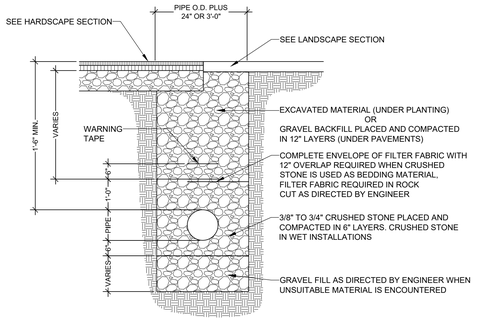
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE
DETAILS

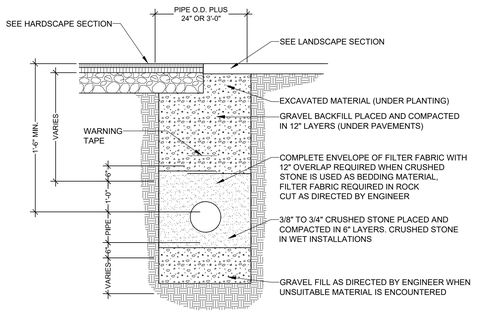
C6.4



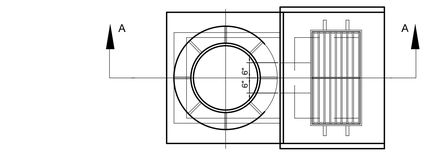
1 STORM TRENCH
1/2" = 1'-0"



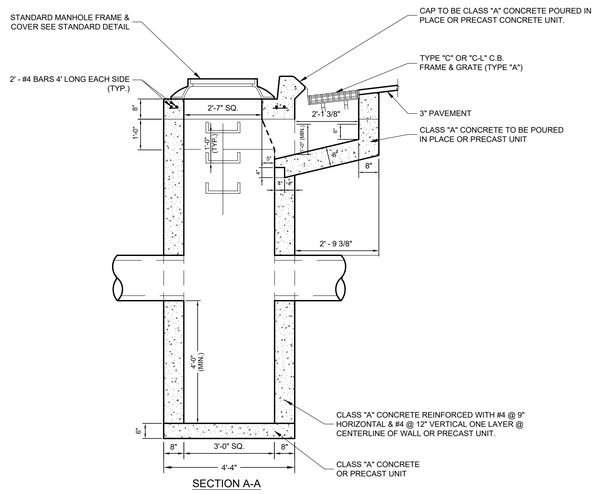
2 SANITARY TRENCH
1/2" = 1'-0"



3 WATER TRENCH
1/2" = 1'-0"

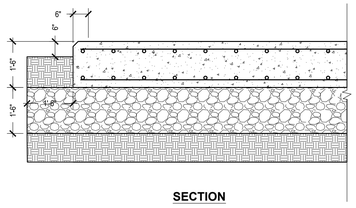


PLAN



SECTION A-A

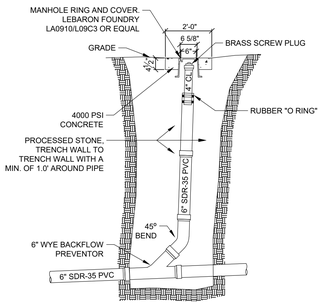
4 OFFSET CATCH BASIN
1/2" = 1'-0"



SECTION

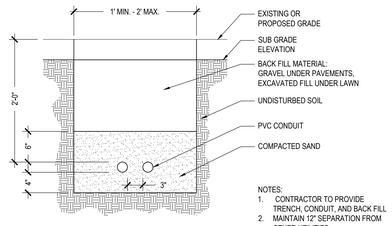
NOTES
1. DESIGN SPECIFICATIONS: 2021 INTERNATIONAL BUILDING CODE (IBC) WITH 2022 CT STATE BUILDING CODE.
2. PROCESSED AGGREGATE BASE PER CT D.O.T. FORM 819, ARTICLE M.05.01 (COMPACT EACH LIFT TO 95% OF MODIFIED DENSITY PER ASTM D-1557 METHOD C).
3. COMPACTED SUBGRADE (95% MAXIMUM DRY UNIT WEIGHT ACCORDING TO ASTM D-1557).
4. CAST-IN-PLACE CONCRETE SHALL ATTAIN A MINIMUM OF 28-STRENGTH OF 4400 PSI. PROVIDE 4% TO 7% AIR ENTRAINED WITH TYPE I/II PORTLAND CEMENT. MAXIMUM AGGREGATE SIZE 3/4". MAXIMUM SLUMP SHALL BE 4".
5. DEFORMED REBAR SHALL BE ASTM A615 GRADE 60.
6. PROVIDE 1'-6" THICK CONRETE PAD PLACED ON 1'-6" MIN LAYER OF ¾" CRUSHED STONE
7. THE PAD SHALL BE 1'-0" LARGER THAN EQUIPMENT ON ALL SIDES. COORDINATE FINAL DIMENSIONS WITH AS-FURNISHED SHOP DRAWINGS.
8. REINFORCE PAD WITH #5 @ 12" O.C. EACH WAY TOP & BOTTOM OF PAD WITH 3" OF CLEARANCE TO REINFORCING
9. TOP OF PAD SHALL BE 6" MINIMUM ABOVE FINISHED GRADE UNLESS OTHERWISE DETERMINED, AND BE SLIGHTLY CROWNED TO PREVENT PONDING OF WATER.
10. ALL EXPOSED EDGES SHALL BE CHAMFERED 1".
11. FOR SURROUNDING GRADE ELEVATIONS, SEE SITE DRAWINGS.

5 CONCRETE UTILITY PAD
1/2" = 1'-0"



PROFILE

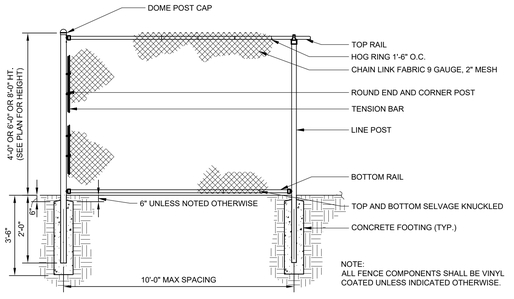
6 CLEANOUT TO GRADE
1/2" = 1'-0"



NOTES:
1. CONTRACTOR TO PROVIDE TRENCH, CONDUIT, AND BACK FILL
2. MAINTAIN 12" SEPARATION FROM OTHER UTILITIES

7 ELECTRICAL CONDUIT TRENCH
1" = 1'-0"

CHAIN LINK FRAMEWORK SIZES			
FENCE HEIGHT	END AND CORNER POST	LINE POST	TOP AND BOTTOM RAIL
4'-0" HEIGHT	2.375" O.D.	1.900" O.D.	1.660" O.D.
6'-0" HEIGHT	2.375" O.D.	1.900" O.D.	1.660" O.D.
8'-0" HEIGHT	2.875" O.D.	2.375" O.D.	1.660" O.D.



NOTE:
ALL FENCE COMPONENTS SHALL BE VINYL COATED UNLESS INDICATED OTHERWISE.

8 VINYL-COATED CHAIN LINK FENCE
3/8" = 1'-0"

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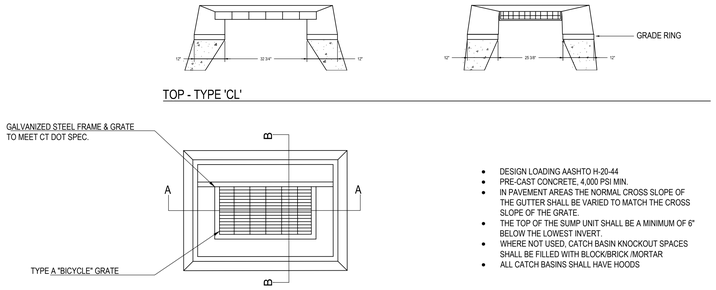
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

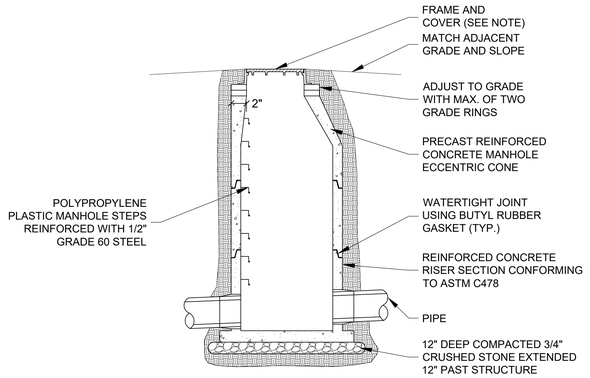
SITE DETAILS

C6.5



1 PRECAST CATCH BASIN

1/2" = 1'-0"



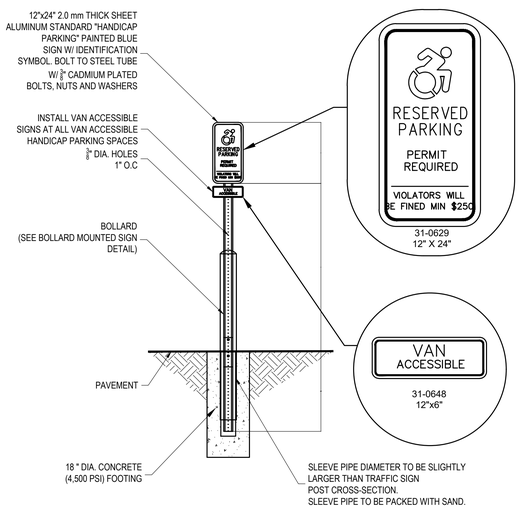
NOTE:
SOLID AND GRATE COVERS TO BE 24" DIAMETER GRAY IRON AS MANUFACTURED BY GENERAL FOUNDARIES INC, SOLID COVERS TO CONTAIN THE WORD 'DRAIN'.

3 STORM DRAINAGE MANHOLE

1 1/2" = 1'-0"

NOTES:
1. ALL POSTS SHALL BE OF ADEQUATE LENGTH TO MEET THE REQUIREMENTS FOR ERECTION AS STATED IN THE CURRENT "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS".
2. ALL POSTS SHALL BE EMBEDDED 3'-6" MINIMUM BELOW GRADE.
3. ALL STEEL POSTS AND BRACKETS SHALL BE CUT, BENT, AND HOLES PUNCHED AND DRILLED BEFORE GALVANIZING. GALVANIZING SHALL BE IN CONFORMANCE WITH CURRENT A.S.T.M. SPECIFICATION A123-78 (OR LATEST REVISED).
4. POSTS SHALL BE BREAKAWAY TYPE II TWO-PIECE U-POST OR OTHER BREAKAWAY STRUCTURAL SUPPORT HARDWARE AS NOTED IN THE LATEST EDITION OF AASHTO'S "SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINARIES, AND TRAFFIC SIGNALS."
5. SIGN PANEL SIZES SHALL DETERMINE POST TYPE AND NUMBERS AS SHOWN ON THIS DETAIL AND DIRECTIONAL SIGN SHEET.
6. BOLTS SHALL NOT PROTRUDE MORE THAN 3/4" BEYOND THE NUT WHEN TIGHT BUT SHALL ENGAGE ALL THREADS IN THE NUT.

ADA PARKING SIGN SHALL CONFORM WITH CURRENT STATE & LOCAL CODES AND REGULATIONS.



2 ACCESSIBLE PARKING SIGNAGE BOLLARD

1/2" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

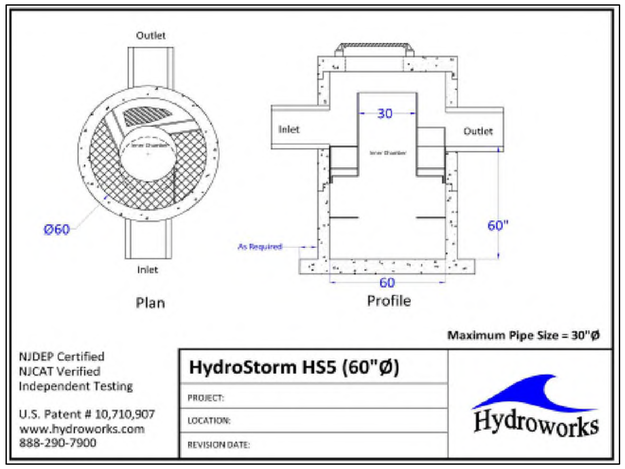
Revisions

STATE OF CONNECTION
CHRISTOPHER SCRIFFIGNANO
28064
LICENSED PROFESSIONAL ENGINEER

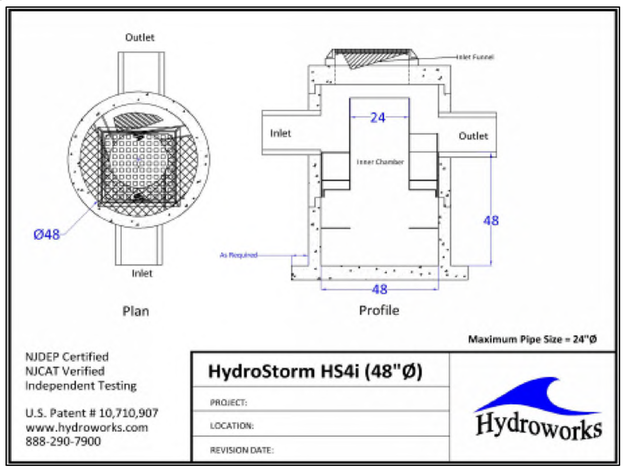
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE DETAILS

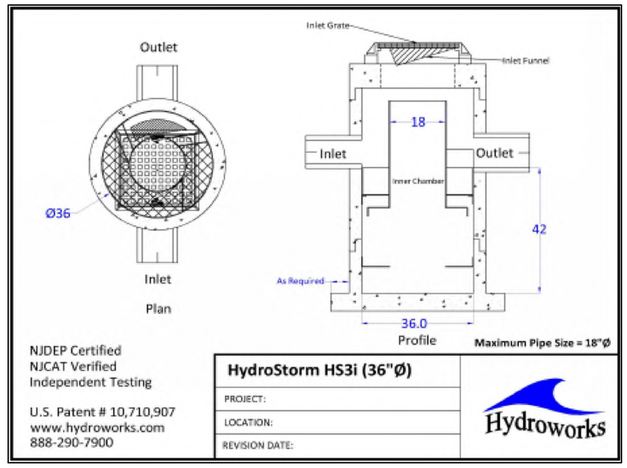
C6.6



1 HYDROWORK HYDROSTORM HYDRODYNAMIC SEPARATOR (HDS-1 AND HDS-7)
N.T.S.



2 HYDROWORK HYDROSTORM HYDRODYNAMIC SEPARATOR (HDS-9)
N.T.S.



3 HYDROWORK HYDROSTORM HYDRODYNAMIC SEPARATOR (HDS-5)
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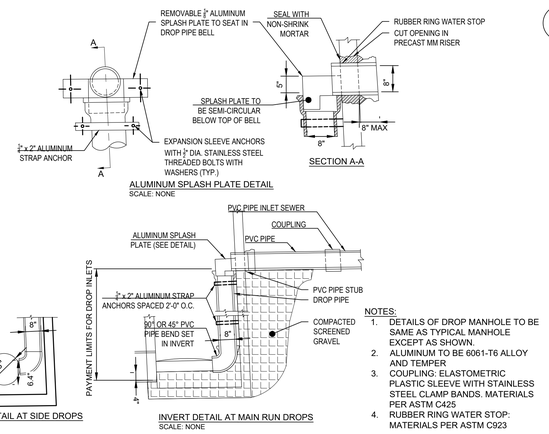
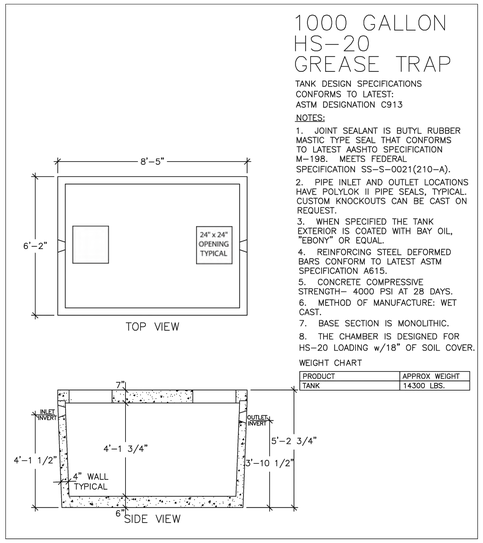
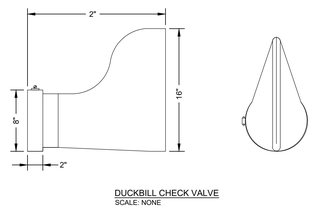




4 1000 GALLON CONCRETE GREASE TRAP
N.T.S.



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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #: 0726-500158.00

Revisions

STATE OF CONNECTION
GREGORY SCRITTORE
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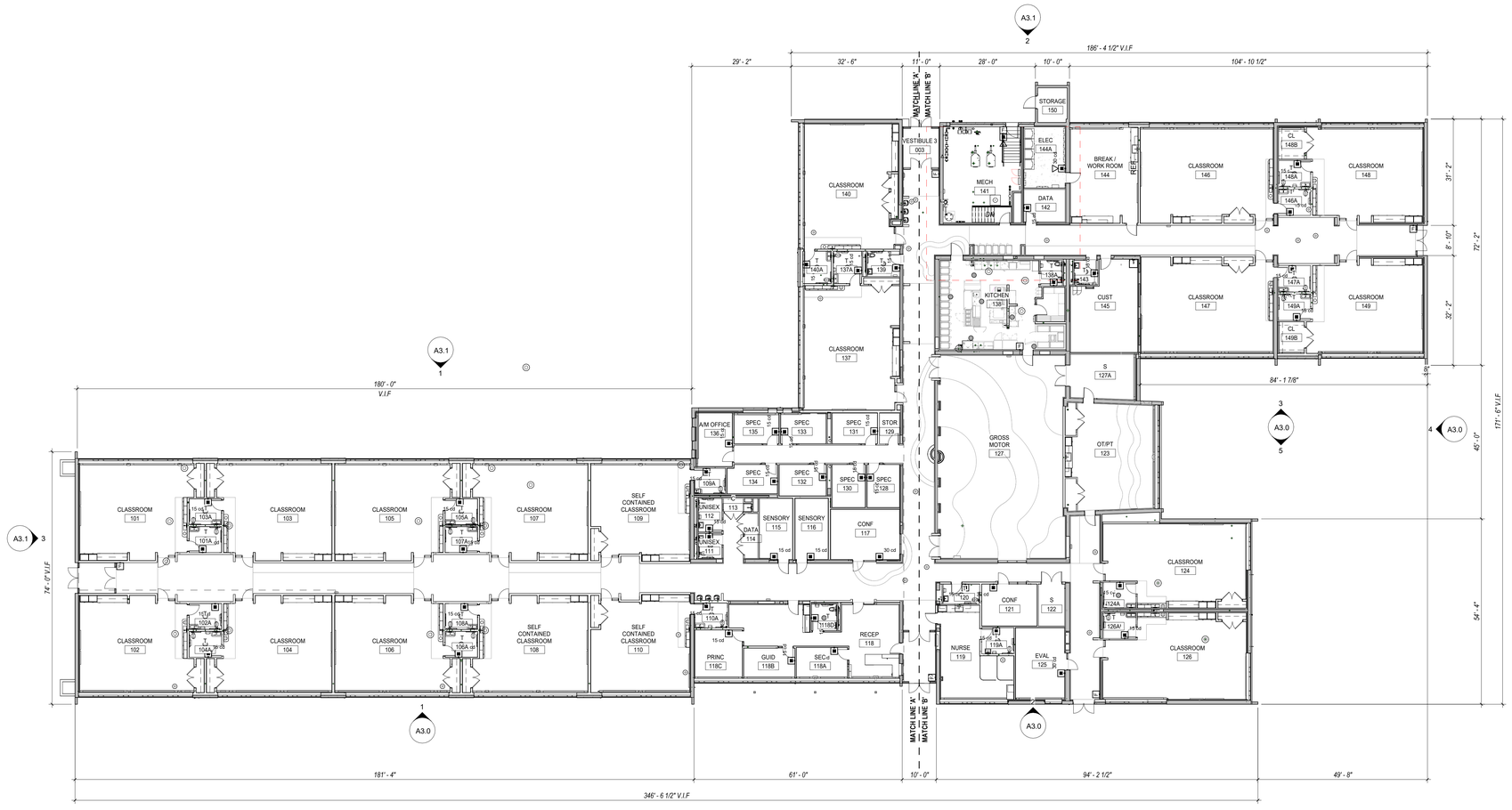
PROFESSIONAL ENGINEER

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SITE
DETAILS

C6.7



1 A1.1 **OVERALL FIRST FLOOR PLAN**
1/16" = 1'-0"

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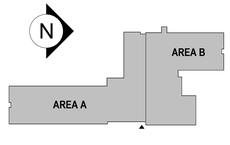
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

OVERALL FIRST FLOOR PLAN

A1.1

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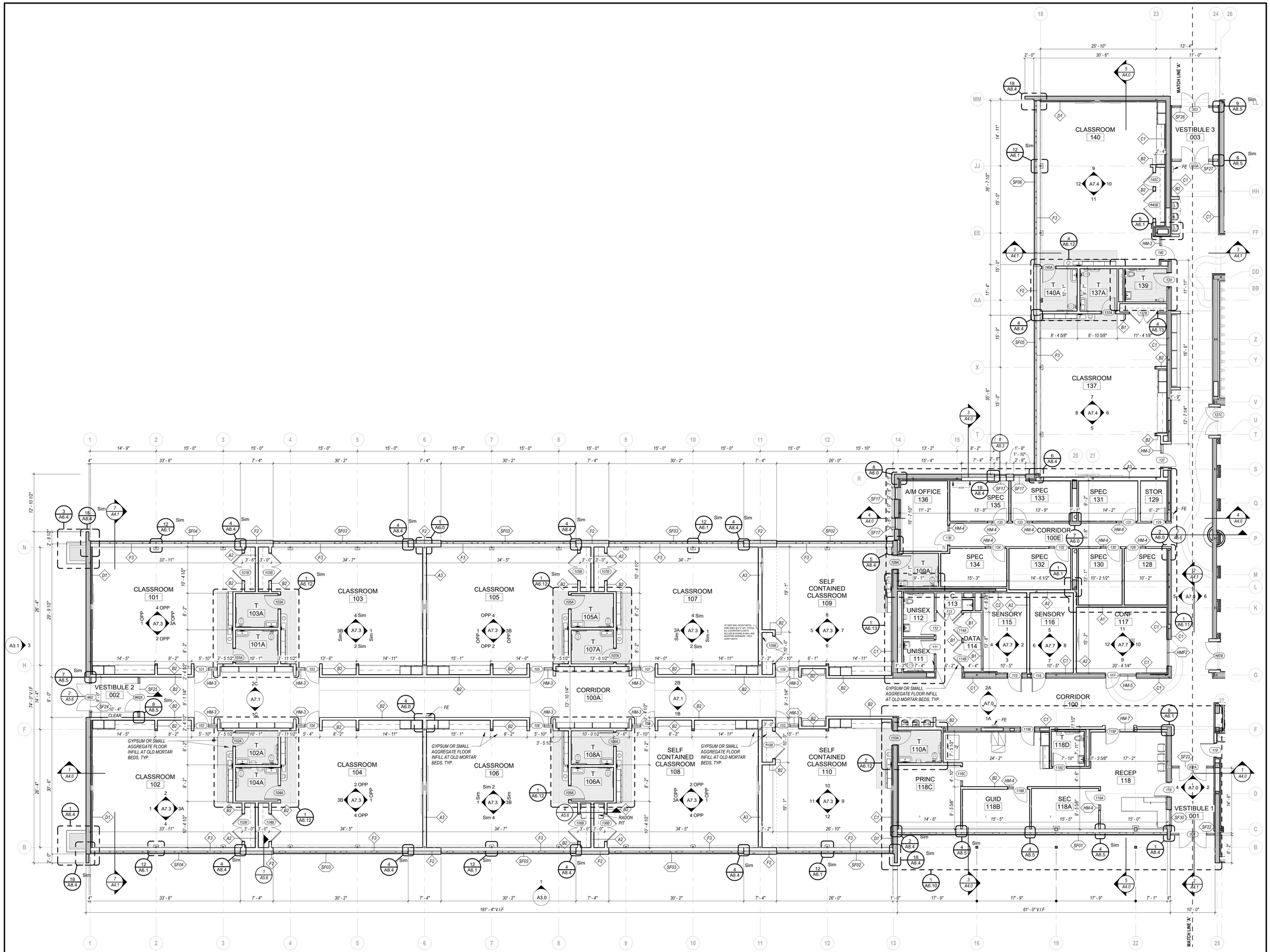

1 A1.1A FIRST FLOOR PLAN-AREA A
1/8" = 1'-0"

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RENOVATIONS TO:

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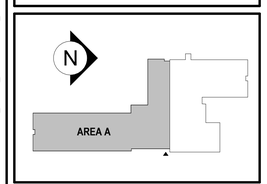
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR PLAN-AREA A

A1.1A

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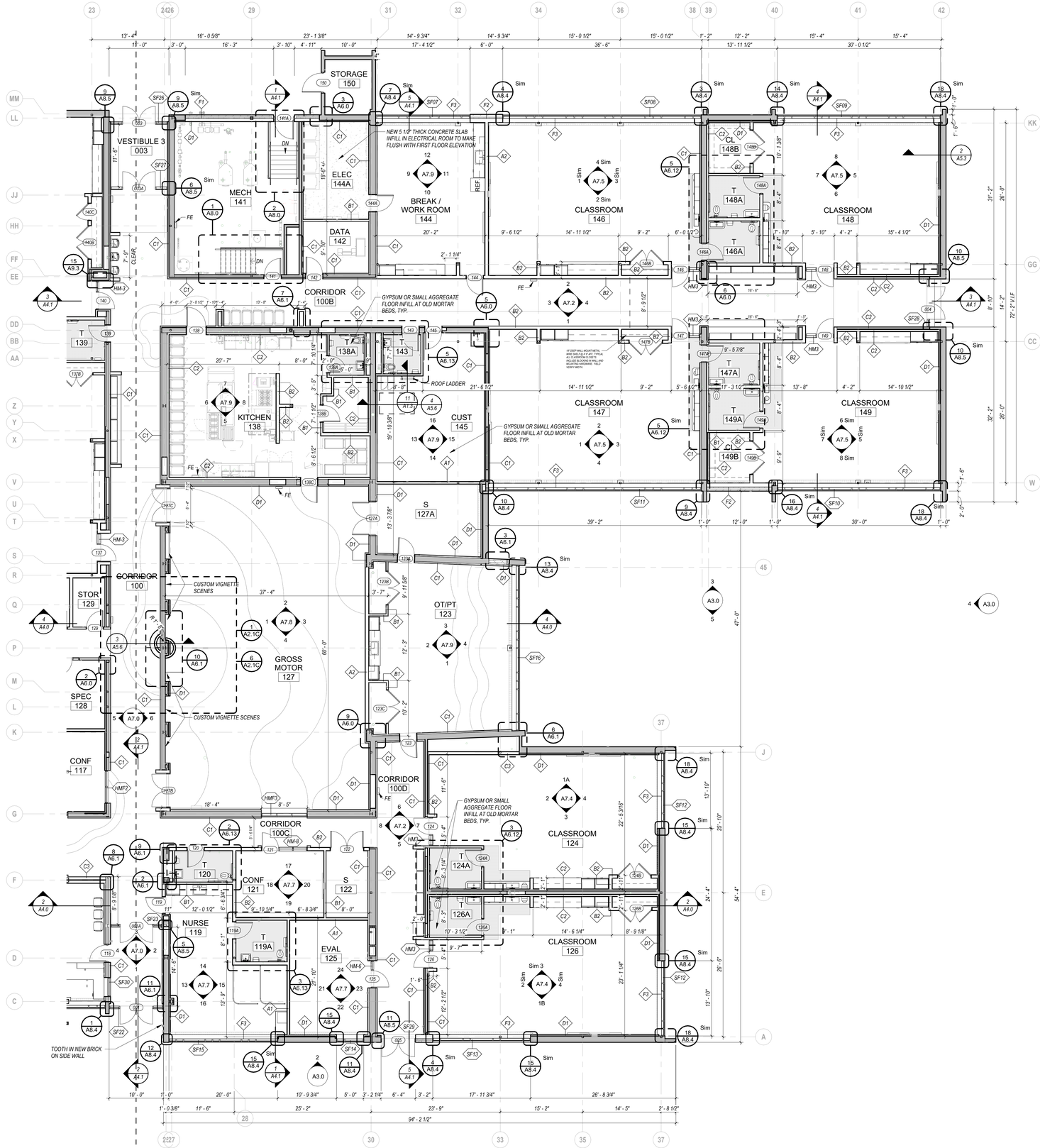

1 A1.1B **FIRST FLOOR PLAN-AREA B**
1/8" = 1'-0"

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195 Scott Swamp Road
Farmington, CT 06032
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STATE OF CONNECTICUT · JOYCE MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR PLAN-AREA B

A1.1B

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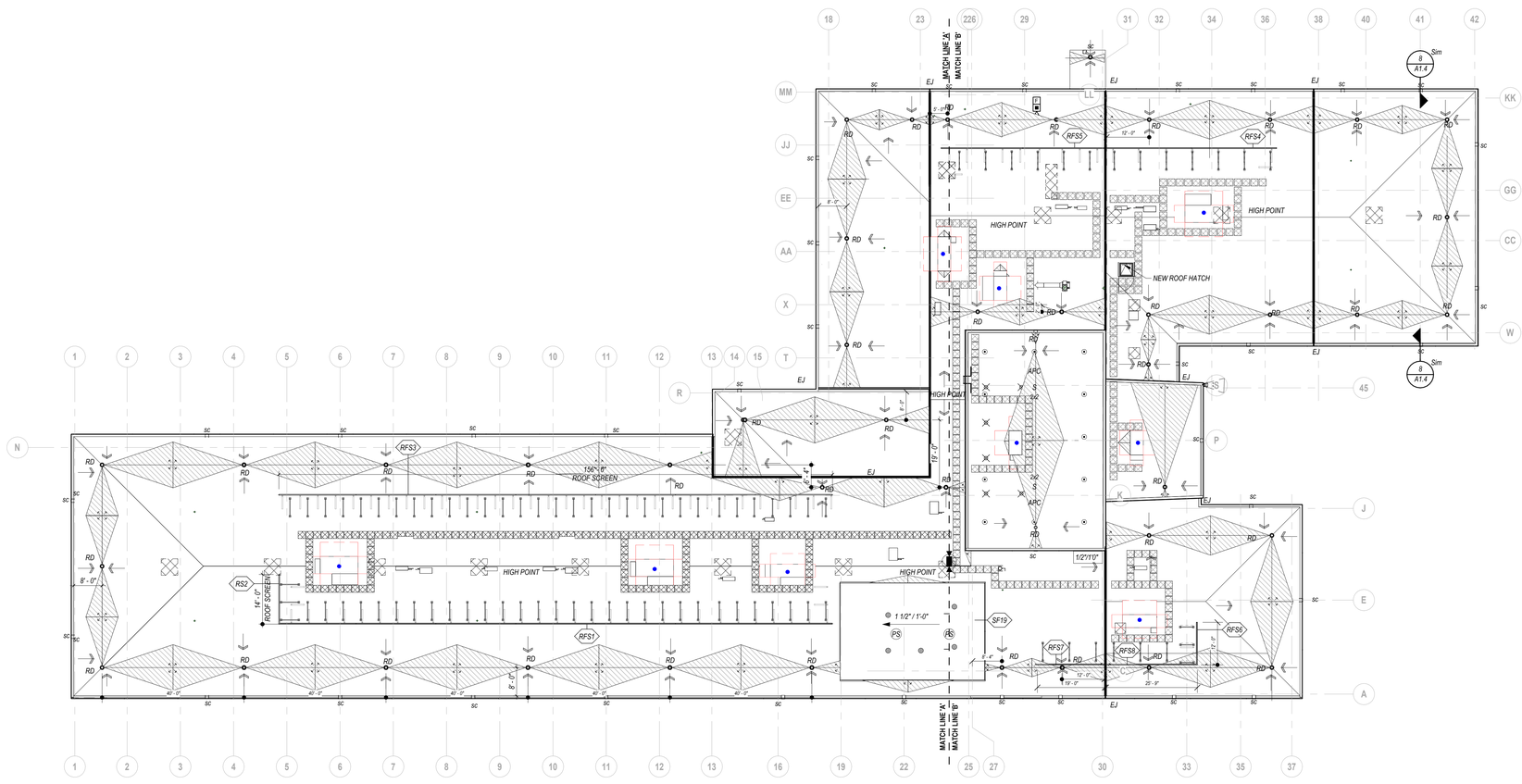

1 A1.2 **OVERALL ROOF PLAN**
1/16" = 1'-0"

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QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
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STATE OF CONNECTICUT · MICHAEL MALIK · REG. 9199 · REGISTERED ARCHITECT

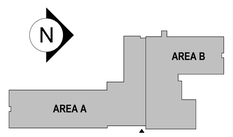
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

OVERALL ROOF PLAN

A1.2

ROOF TYPES:

TYPE 1 (FLAT ROOF):
- EPDM ROOF MEMBRANE
- 1/2" COVER BOARD
- TAPERED RIGID INSULATION
- 5" RIGID INSULATION (R-30 MIN.)
- SELF ADHERED VAPOR BARRIER
- 5/8" SUBSTRATE BOARD
- EXISTING METAL ROOF DECK, SEE STRUCTURAL DRAWINGS

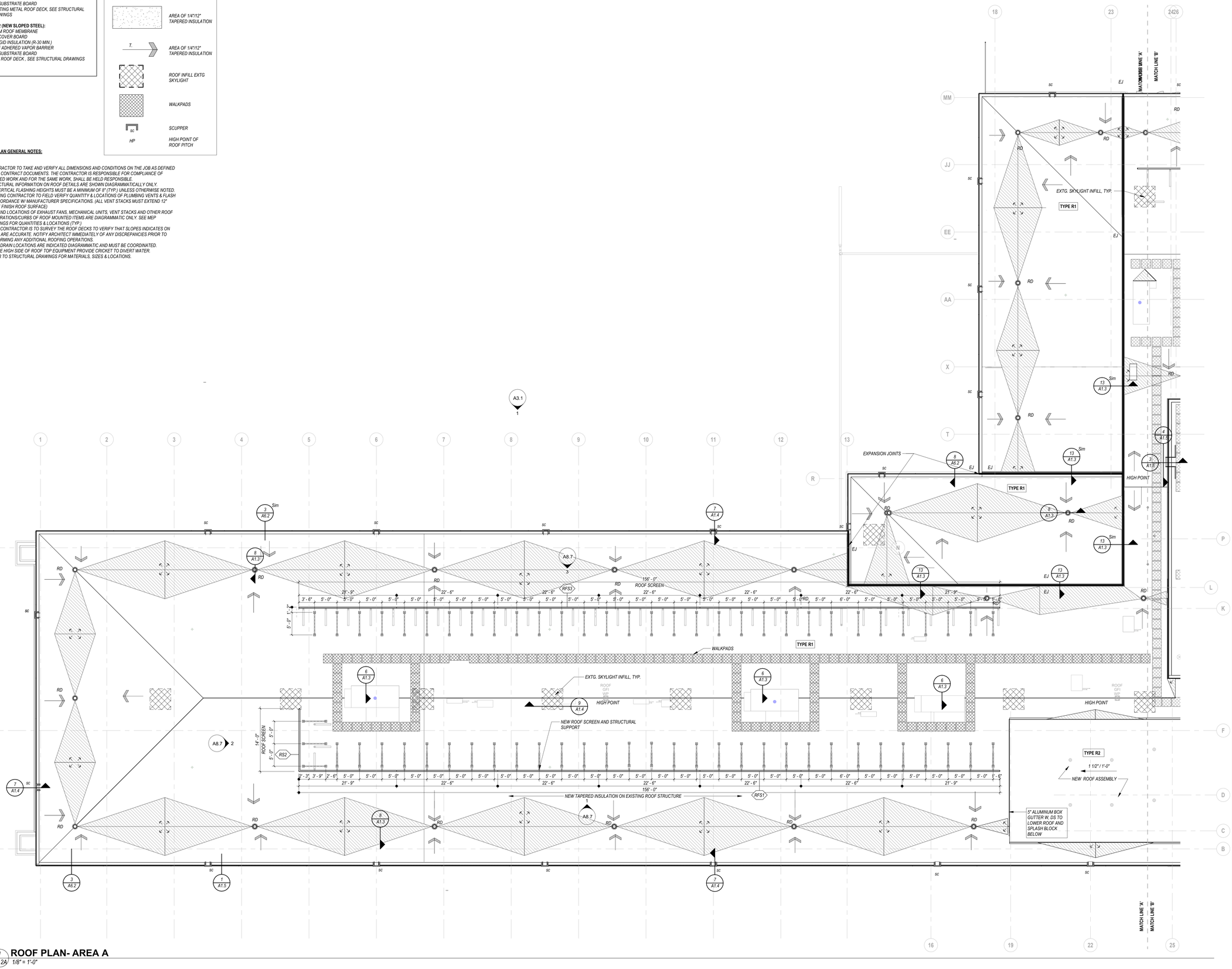
TYPE 2 (NEW SLOPED STEEL):
- EPDM ROOF MEMBRANE
- 1/2" COVER BOARD
- 5" RIGID INSULATION (R-30 MIN.)
- SELF ADHERED VAPOR BARRIER
- 5/8" SUBSTRATE BOARD
- NEW ROOF DECK , SEE STRUCTURAL DRAWINGS

ROOF PLAN LEGEND

- 1/2"/12" CRICKET
- AREA OF 1/4"/12" TAPERED INSULATION
- T. AREA OF 1/4"/12" TAPERED INSULATION
- ROOF INFILL EXTG SKYLIGHT
- WALKPADS
- SC SCUPPER
- HP HIGH POINT OF ROOF PITCH

ROOF PLAN GENERAL NOTES:

1. CONTRACTOR TO TAKE AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE JOB AS DEFINED IN THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE OF FINISHED WORK AND FOR THE SAME WORK, SHALL BE HELD RESPONSIBLE.
2. STRUCTURAL INFORMATION ON ROOF DETAILS ARE SHOWN DIAGRAMMATICALLY ONLY.
3. ALL VERTICAL FLASHING HEIGHTS MUST BE A MINIMUM OF 8" (TYP.) UNLESS OTHERWISE NOTED.
4. ROOFING CONTRACTOR TO FIELD VERIFY QUANTITY & LOCATIONS OF PLUMBING VENTS & FLASH IN ACCORDANCE W/ MANUFACTURER SPECIFICATIONS. (ALL VENT STACKS MUST EXTEND 12" ABOVE FINISH ROOF SURFACE)
5. SIZE AND LOCATIONS OF EXHAUST FANS, MECHANICAL UNITS, VENT STACKS AND OTHER ROOF PENETRATIONS/CURBS OF ROOF MOUNTED ITEMS ARE DIAGRAMMATIC ONLY. SEE MEP DRAWINGS FOR QUANTITIES & LOCATIONS (TYP.)
6. ROOF CONTRACTOR IS TO SURVEY THE ROOF DECKS TO VERIFY THAT SLOPES INDICATES ON PLANS ARE ACCURATE. NOTIFY ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO PERFORMING ANY ADDITIONAL ROOFING OPERATIONS.
7. ROOF DRAIN LOCATIONS ARE INDICATED DIAGRAMMATIC AND MUST BE COORDINATED.
8. ON THE HIGH SIDE OF ROOF TOP EQUIPMENT PROVIDE CRICKET TO DIVERT WATER.
9. REFER TO STRUCTURAL DRAWINGS FOR MATERIALS, SIZES & LOCATIONS.



1 A1.2A ROOF PLAN- AREA A
1/8" = 1'-0"

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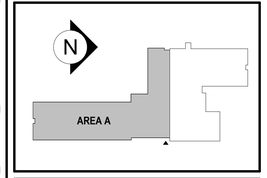
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF PLAN-AREA A

A1.2A

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ROOF TYPES:

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- 5" RIGID INSULATION (R-30 MIN.)
- SELF ADHERED VAPOR BARRIER
- 5/8" SUBSTRATE BOARD
- EXISTING METAL ROOF DECK, SEE STRUCTURAL DRAWINGS

TYPE 2 (NEW SLOPED STEEL):
- EPDM ROOF MEMBRANE
- 1/2" COVER BOARD
- 5" RIGID INSULATION (R-30 MIN.)
- SELF ADHERED VAPOR BARRIER
- 5/8" SUBSTRATE BOARD
- NEW ROOF DECK , SEE STRUCTURAL DRAWINGS

ROOF PLAN LEGEND

- 1/2"/12" CRICKET
- AREA OF 1/4"/12" TAPERED INSULATION
- T. — AREA OF 1/4"/12" TAPERED INSULATION
- ROOF INFILL EXTG SKYLIGHT
- WALKPADS
- sc — SCUPPER
- HP — HIGH POINT OF ROOF PITCH

ROOF PLAN GENERAL NOTES:

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5. SIZE AND LOCATIONS OF EXHAUST FANS, MECHANICAL UNITS, VENT STACKS AND OTHER ROOF PENETRATIONS/CURBS OF ROOF MOUNTED ITEMS ARE DIAGRAMMATIC ONLY. SEE MEP DRAWINGS FOR QUANTITIES & LOCATIONS (TYP.)
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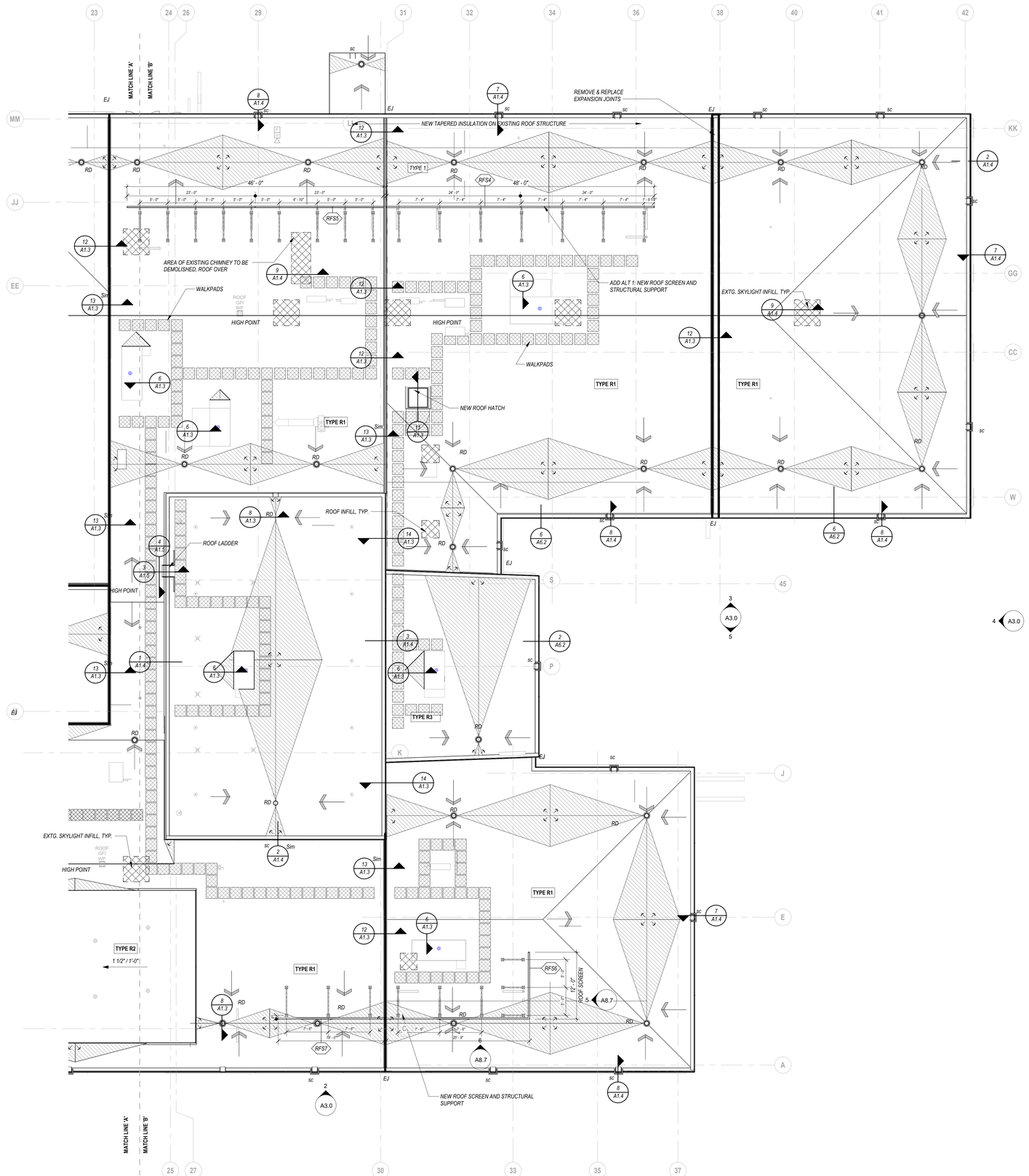
8. ON THE HIGH SIDE OF ROOF TOP EQUIPMENT PROVIDE CRICKET TO DIVERT WATER.
9. REFER TO STRUCTURAL DRAWINGS FOR MATERIALS, SIZES & LOCATIONS.



1 A1.2B **ROOF PLAN-AREA B**
1/8" = 1'-0"

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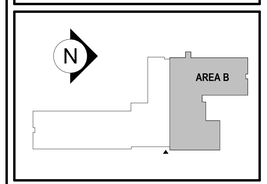
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF PLAN-AREA B

A1.2B

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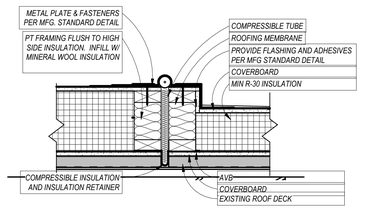
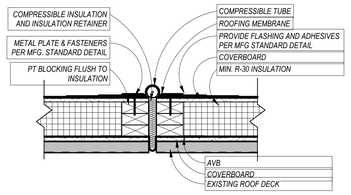
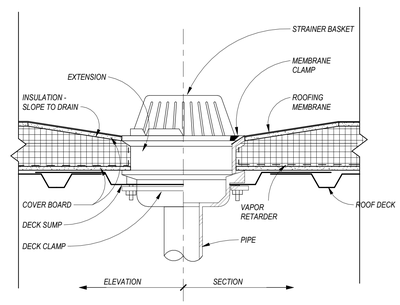


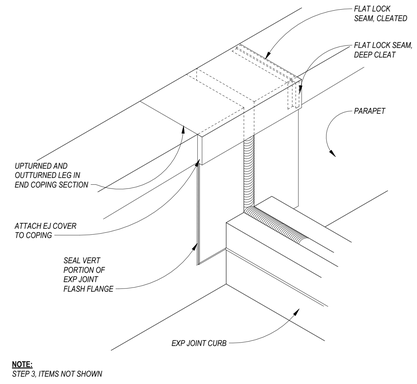
13 A1.3 **OFFSET EXPANSION JOINT**
1 1/2" = 1'-0"



12 A1.3 **FLUSH EXPANSION JOINT**
1 1/2" = 1'-0"

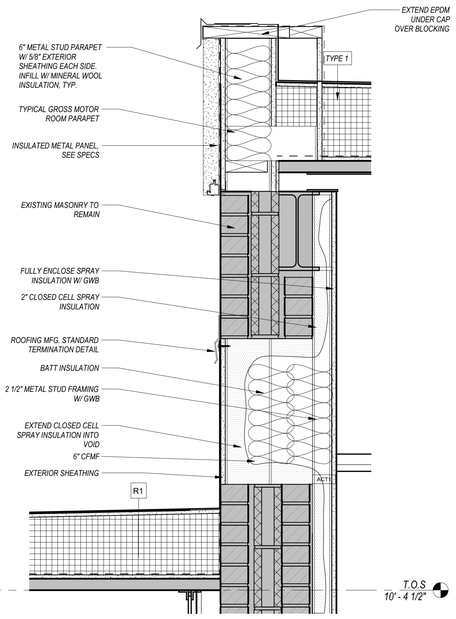


8 A1.3 **ROOF DRAIN 1**
1 1/2" = 1'-0"

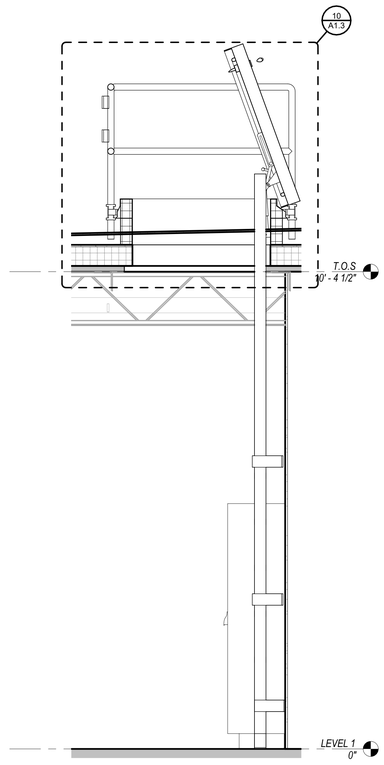


NOTE:
STEP 3, ITEMS NOT SHOWN

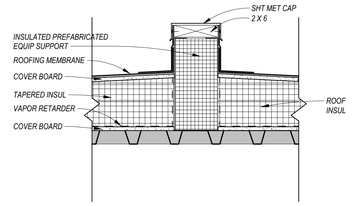
4 A1.3 **EXP. JOINT TRANSITION-STEP 4**
1" = 1'-0"



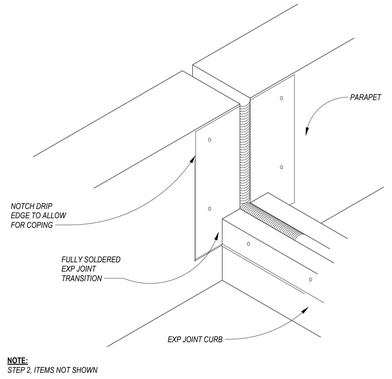
14 A1.3 **GROSS MOTOR ROOM WINDOW INFILL**
1 1/2" = 1'-0"



11 A1.3 **INTERIOR ROOF LADDER**
3/4" = 1'-0"

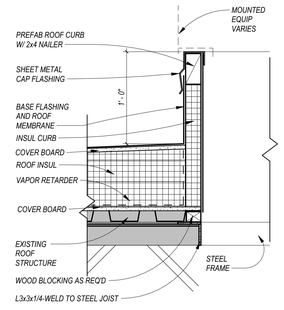


7 A1.3 **ROOF EQUIPM. SUPPORT**
1 1/2" = 1'-0"

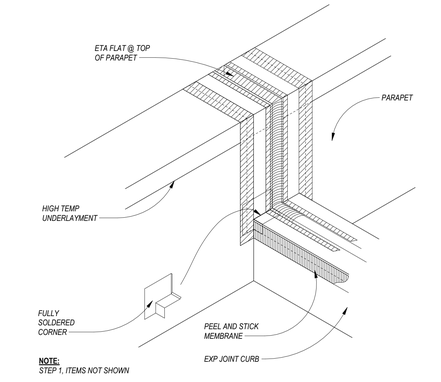


NOTE:
STEP 2, ITEMS NOT SHOWN

3 A1.3 **EXP. JOINT TRANSITION-STEP 3**
1" = 1'-0"

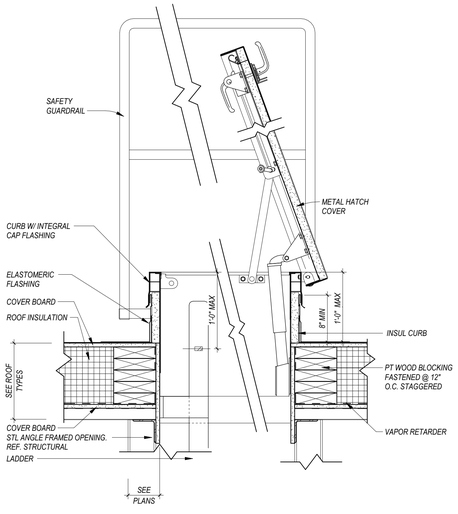


6 A1.3 **MECH. EQP. CURB 1**
1 1/2" = 1'-0"

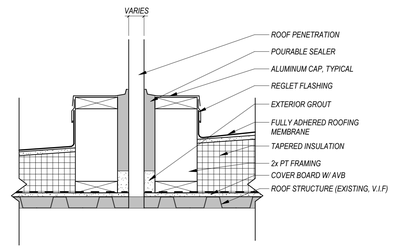


NOTE:
STEP 1, ITEMS NOT SHOWN

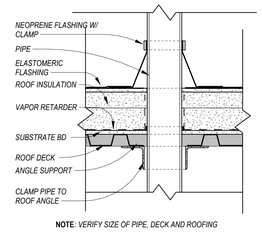
2 A1.3 **EXP. JOINT TRANSITION- STEP 2**
1" = 1'-0"



10 A1.3 **ROOF ACCESS HATCH**
1 1/2" = 1'-0"

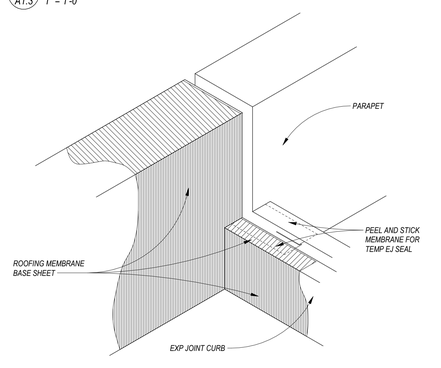


9 A1.3 **ROOF PENETRATION 1**
1 1/2" = 1'-0"



NOTE: VERIFY SIZE OF PIPE, DECK AND ROOFING

5 A1.3 **PIPE FLASHING AT EPDM ROOF**
1 1/2" = 1'-0"



1 A1.3 **EXP. JOINT TRANSITION-STEP 1**
1" = 1'-0"

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195 Scott Swamp Road
Farmington, CT 06032
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STATE OF CONNECTICUT
STEVEN MALIK
REG. 9193
REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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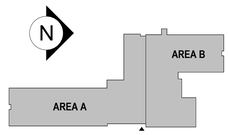

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF DETAILS

A1.3

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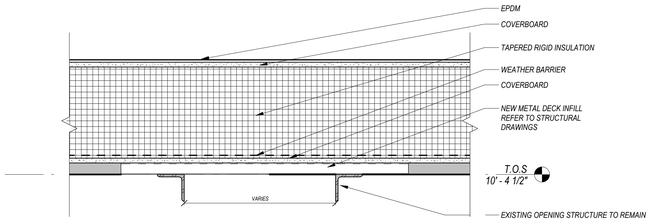
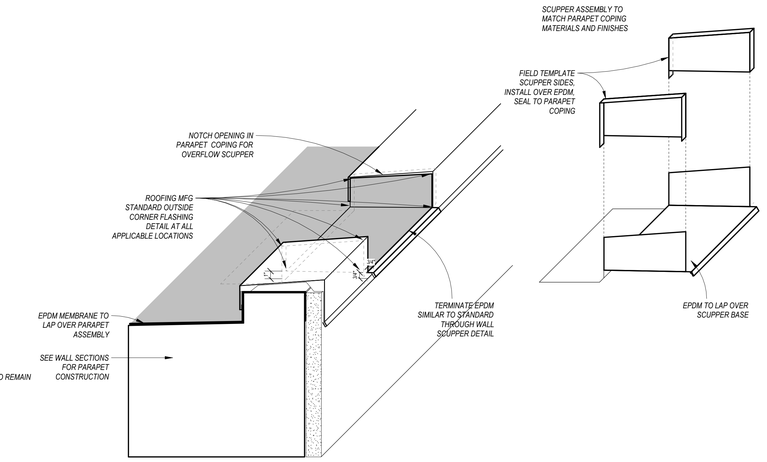


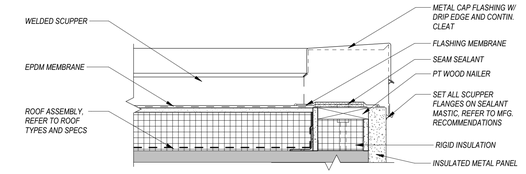
9 A1.4 ROOF DETAIL AT SKYLIGHT & EXISTING ROOF OPENINGS INFILL

1 1/2" = 1'-0"



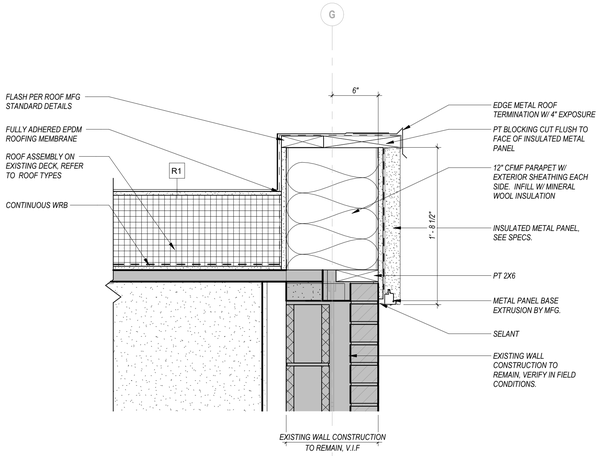
8 A1.4 TYPICAL PARAPET SCUPPER

1 1/2" = 1'-0"



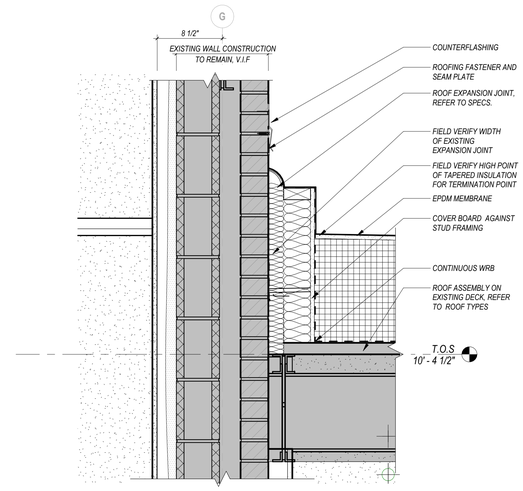
7 A1.4 TYPICAL SCUPPER DETAIL

1 1/2" = 1'-0"



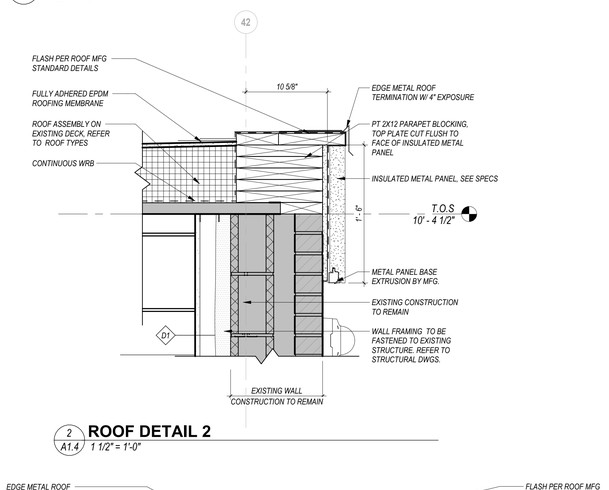
6 A1.4 ROOF DETAIL 6

1 1/2" = 1'-0"



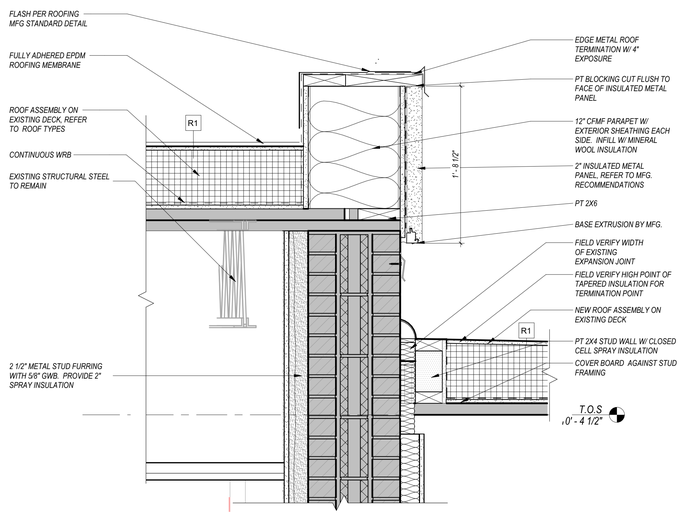
4 A1.4 ROOF DETAIL 4

1 1/2" = 1'-0"



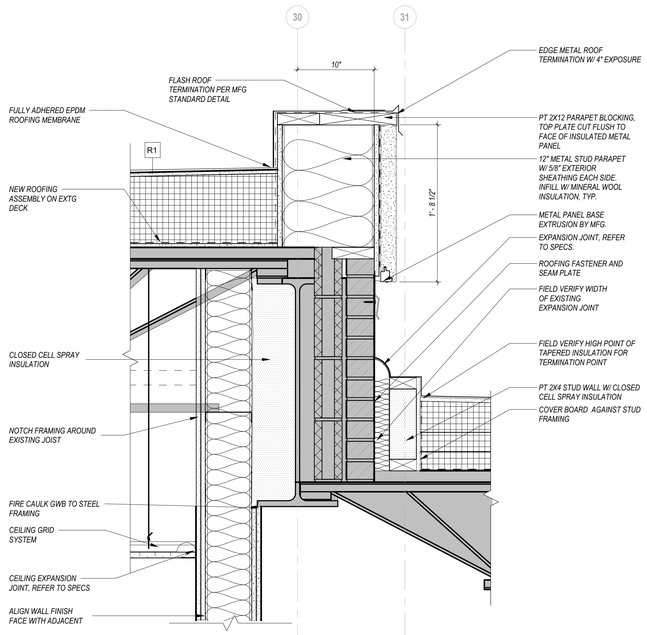
2 A1.4 ROOF DETAIL 2

1 1/2" = 1'-0"



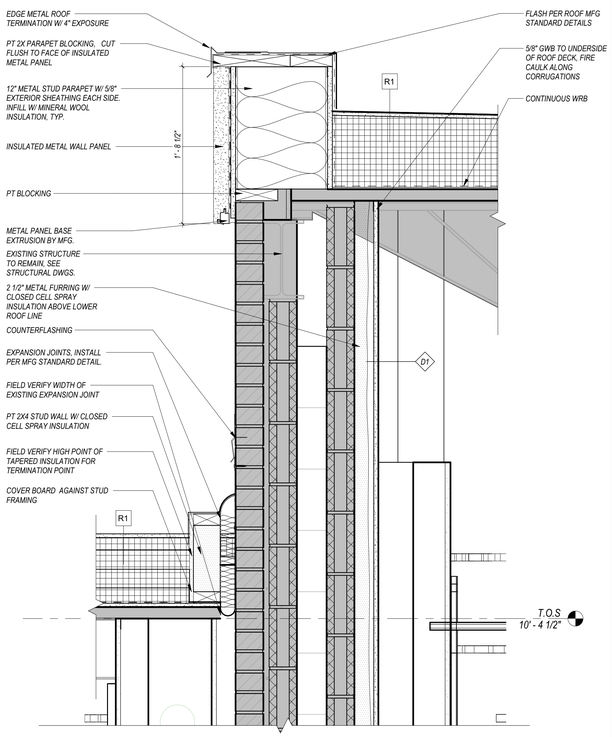
5 A1.4 ROOF DETAIL 5

1 1/2" = 1'-0"



3 A1.4 ROOF DETAIL 3

1 1/2" = 1'-0"



1 A1.4 ROOF DETAIL 1

1 1/2" = 1'-0"

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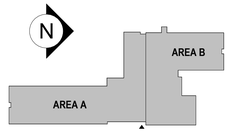
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

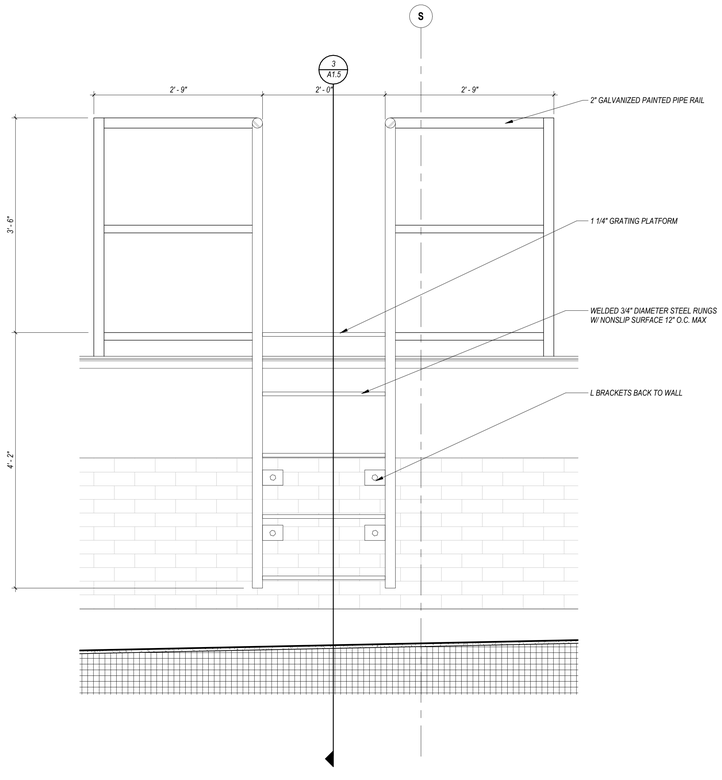
Revisions



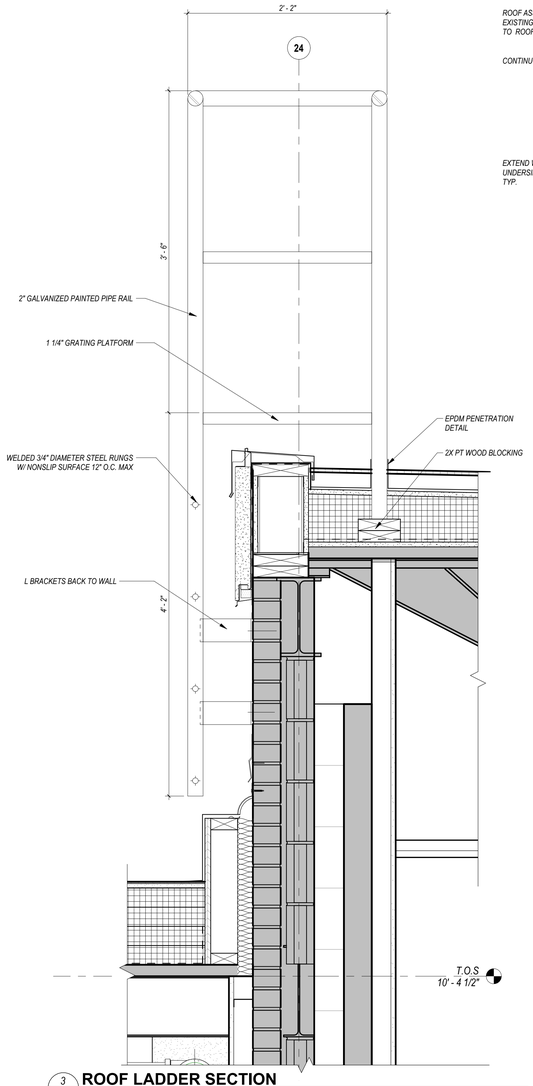
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF DETAILS

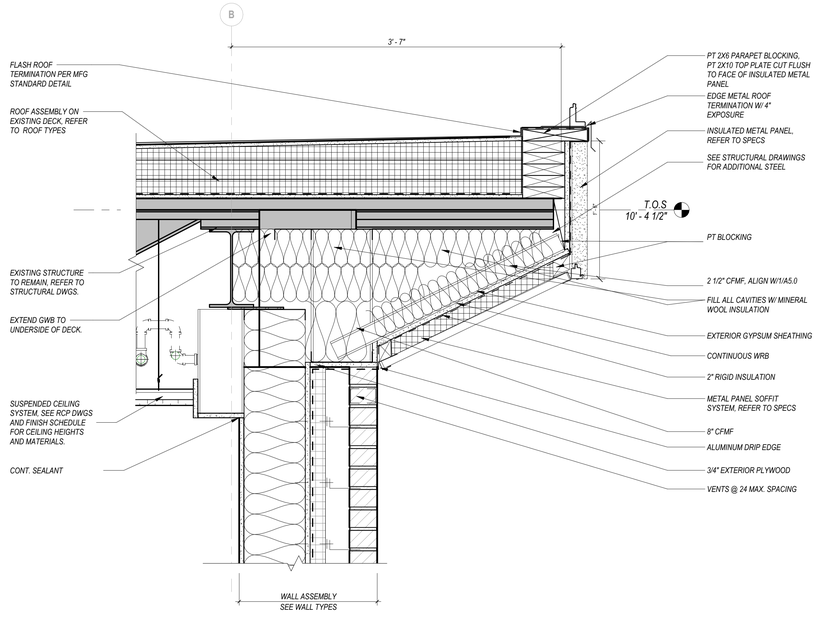
A1.4



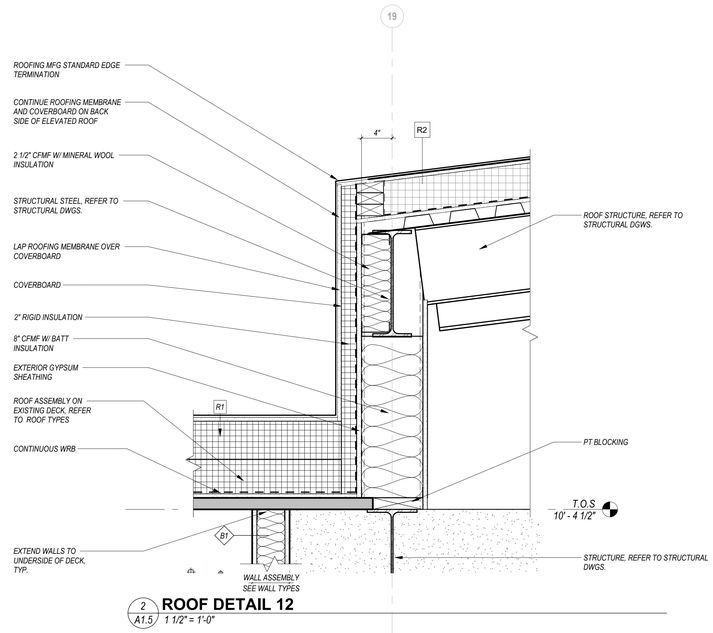
4 A1.5 **ROOF LADDER ELEVATION**
1" = 1'-0"



3 A1.5 **ROOF LADDER SECTION**
1 1/2" = 1'-0"



1 A1.5 **ROOF DETAIL 13**
1 1/2" = 1'-0"



2 A1.5 **ROOF DETAIL 12**
1 1/2" = 1'-0"

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EDGEWOOD PRE-K ACADEMY
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State Project #: 017-0090 RNV
Project #:25064

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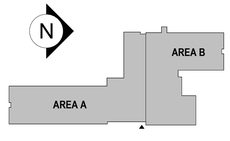

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF DETAILS

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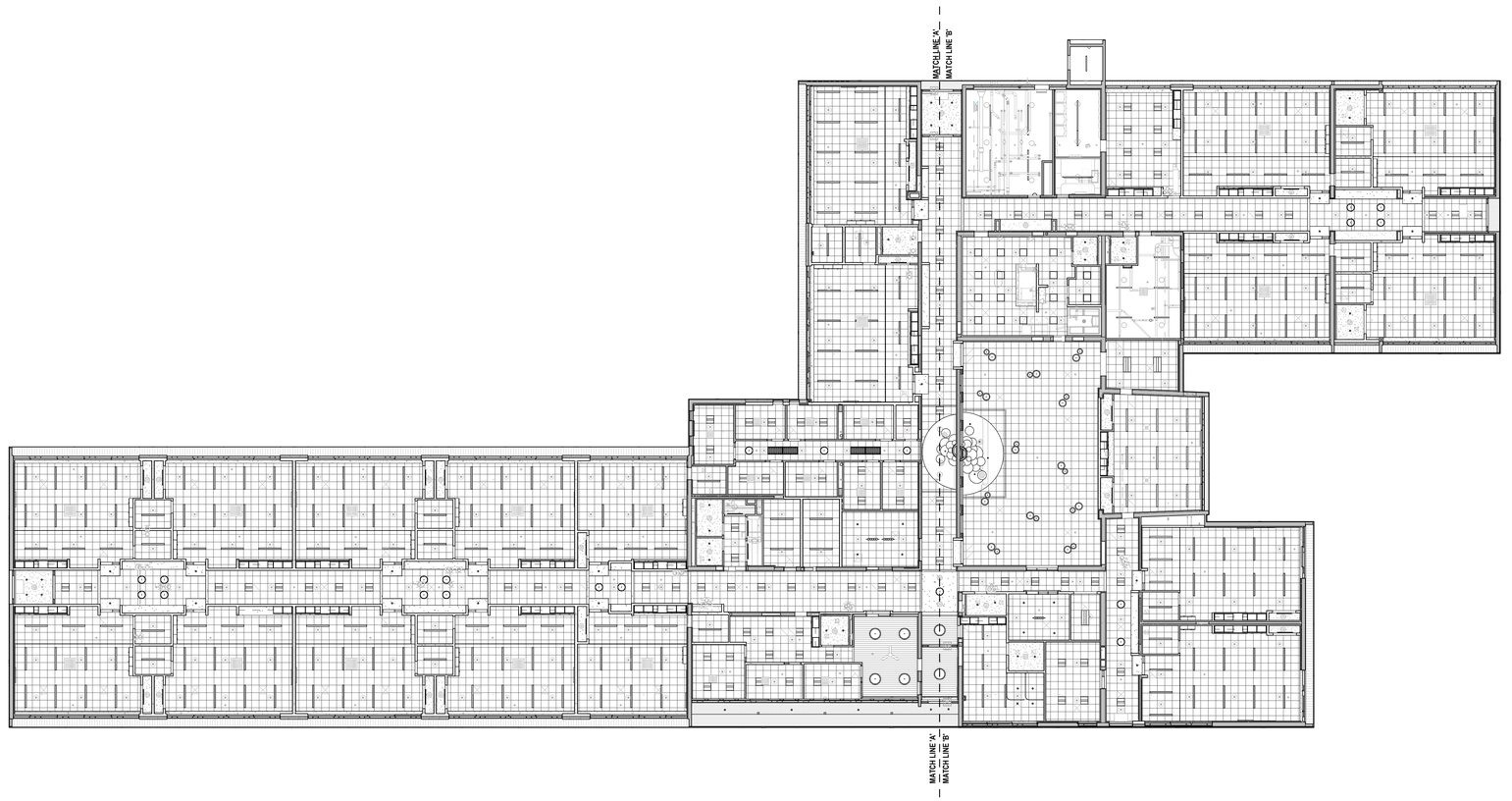

1 A2.1 **OVERALL RCP**
1/16" = 1'-0"

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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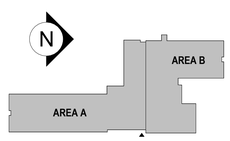

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

OVERALL RCP

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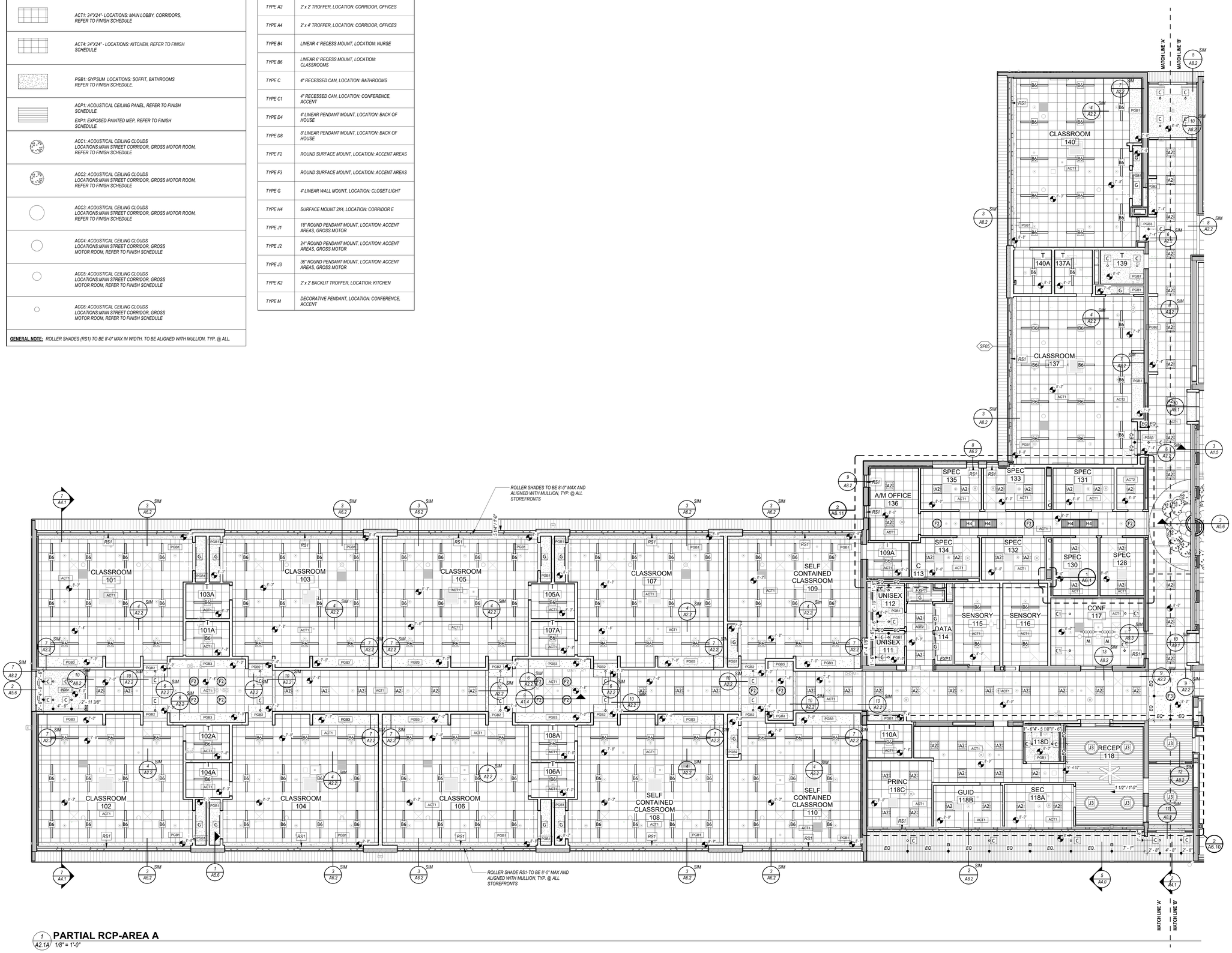
CEILING TYPE LEGEND:

	ACT1: 24"X24" - LOCATIONS: MAIN LOBBY, CORRIDORS, REFER TO FINISH SCHEDULE
	ACT4: 24"X24" - LOCATIONS: KITCHEN, REFER TO FINISH SCHEDULE
	PGB1: GYPSUM LOCATIONS: SOFFIT, BATHROOMS REFER TO FINISH SCHEDULE.
	ACP1: ACOUSTICAL CEILING PANEL, REFER TO FINISH SCHEDULE. EXP1: EXPOSED PAINTED MEP, REFER TO FINISH SCHEDULE.
	ACC1: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC2: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC3: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC4: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC5: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC6: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE

GENERAL NOTE: ROLLER SHADES (RS1) TO BE 8'-0" MAX IN WIDTH. TO BE ALIGNED WITH MULLION, TYP. @ ALL.

LIGHT FIXTURE LEGEND:

TYPE A2	2' x 2' TROFFER, LOCATION: CORRIDOR, OFFICES
TYPE A4	2' x 4' TROFFER, LOCATION: CORRIDOR, OFFICES
TYPE B4	LINEAR 4' RECESS MOUNT, LOCATION: NURSE
TYPE B6	LINEAR 6' RECESS MOUNT, LOCATION: CLASSROOMS
TYPE C	4" RECESSED CAN, LOCATION: BATHROOMS
TYPE C1	4" RECESSED CAN, LOCATION: CONFERENCE, ACCENT
TYPE D4	4' LINEAR PENDANT MOUNT, LOCATION: BACK OF HOUSE
TYPE D8	8' LINEAR PENDANT MOUNT, LOCATION: BACK OF HOUSE
TYPE F2	ROUND SURFACE MOUNT, LOCATION: ACCENT AREAS
TYPE F3	ROUND SURFACE MOUNT, LOCATION: ACCENT AREAS
TYPE G	4' LINEAR WALL MOUNT, LOCATION: CLOSET LIGHT
TYPE H4	SURFACE MOUNT 2X4, LOCATION: CORRIDOR E
TYPE J1	18" ROUND PENDANT MOUNT, LOCATION: ACCENT AREAS, GROSS MOTOR
TYPE J2	24" ROUND PENDANT MOUNT, LOCATION: ACCENT AREAS, GROSS MOTOR
TYPE J3	36" ROUND PENDANT MOUNT, LOCATION: ACCENT AREAS, GROSS MOTOR
TYPE K2	2' x 2' BACKLIT TROFFER, LOCATION: KITCHEN
TYPE M	DECORATIVE PENDANT, LOCATION: CONFERENCE, ACCENT



1 A2.1A **PARTIAL RCP-AREA A**
1/8" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

RCP-AREA A

A2.1A

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CEILING TYPE LEGEND:

	ACT1: 24"X24" - LOCATIONS: MAIN LOBBY, CORRIDORS, REFER TO FINISH SCHEDULE
	ACT4: 24"X24" - LOCATIONS: KITCHEN, REFER TO FINISH SCHEDULE
	PGB1: GYPSUM LOCATIONS: SOFFIT, BATHROOMS REFER TO FINISH SCHEDULE.
	ACP1: ACOUSTICAL CEILING PANEL, REFER TO FINISH SCHEDULE. EXP1: EXPOSED PAINTED MEP, REFER TO FINISH SCHEDULE.
	ACC1: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
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	ACC3: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC4: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC5: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC6: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE

GENERAL NOTE: ROLLER SHADES (RS1) TO BE 8'-0" MAX IN WIDTH. TO BE ALIGNED WITH MULLION, TYP. @ ALL.

LIGHT FIXTURE LEGEND:

TYPE A2	2' x 2' TROFFER, LOCATION: CORRIDOR, OFFICES
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TYPE B4	LINEAR 4' RECESS MOUNT, LOCATION: NURSE
TYPE B6	LINEAR 6' RECESS MOUNT, LOCATION: CLASSROOMS
TYPE C	4" RECESSED CAN, LOCATION: BATHROOMS
TYPE C1	4" RECESSED CAN, LOCATION: CONFERENCE, ACCENT
TYPE D4	4' LINEAR PENDANT MOUNT, LOCATION: BACK OF HOUSE
TYPE D8	8' LINEAR PENDANT MOUNT, LOCATION: BACK OF HOUSE
TYPE F2	ROUND SURFACE MOUNT, LOCATION: ACCENT AREAS
TYPE F3	ROUND SURFACE MOUNT, LOCATION: ACCENT AREAS
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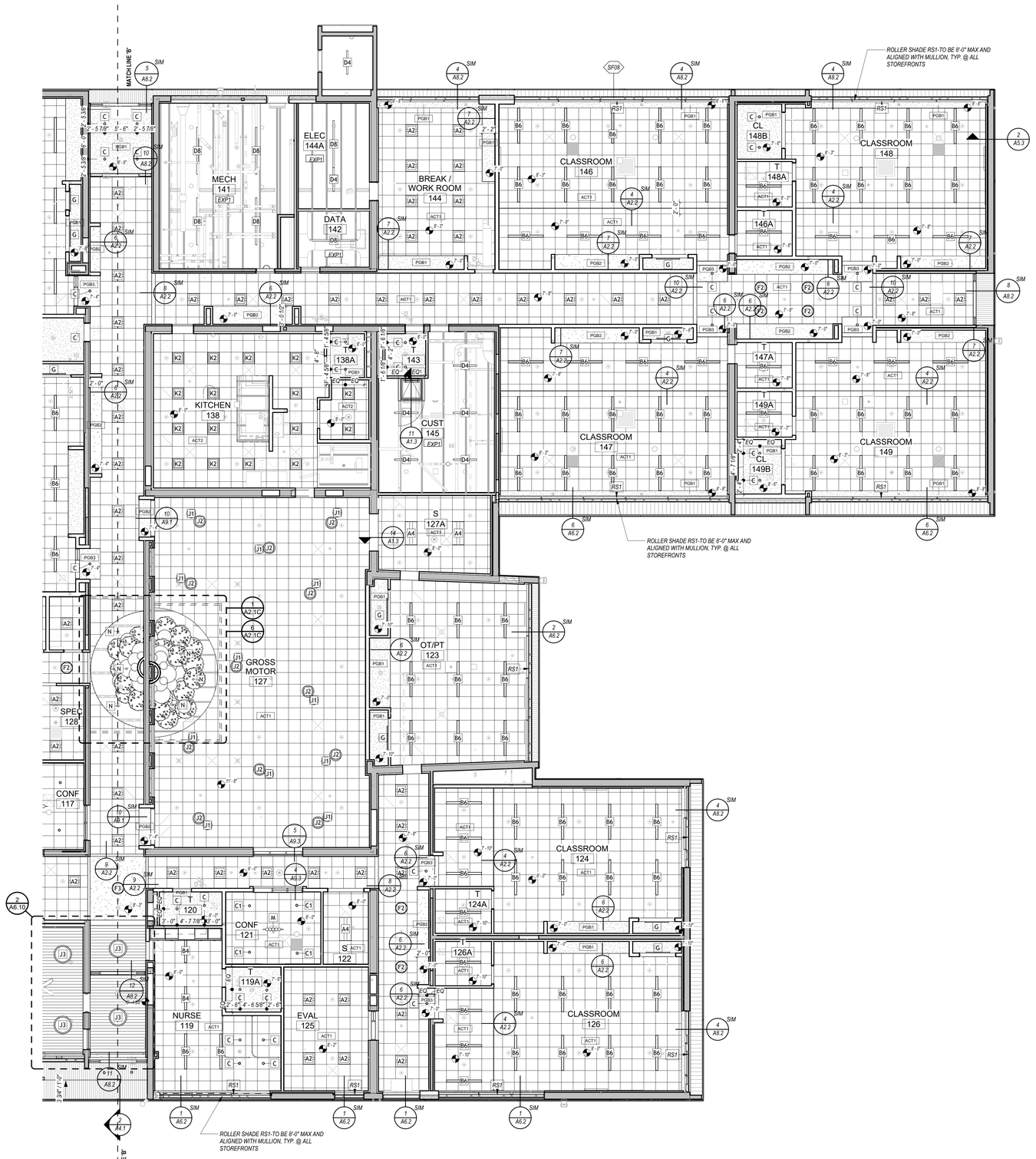
TYPE H4	SURFACE MOUNT 2X4, LOCATION: CORRIDOR E
TYPE J1	18" ROUND PENDANT MOUNT, LOCATION: ACCENT AREAS, GROSS MOTOR
TYPE J2	24" ROUND PENDANT MOUNT, LOCATION: ACCENT AREAS, GROSS MOTOR
TYPE J3	36" ROUND PENDANT MOUNT, LOCATION: ACCENT AREAS, GROSS MOTOR
TYPE K2	2' x 2' BACKLIT TROFFER, LOCATION: KITCHEN
TYPE M	DECORATIVE PENDANT, LOCATION: CONFERENCE, ACCENT



1 A2.1B **PARTIAL RCP-AREA B**
1/8" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

RCP-AREA B

A2.1B

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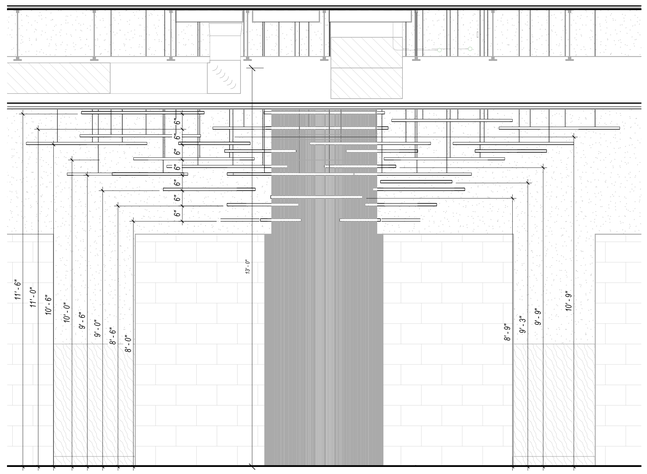
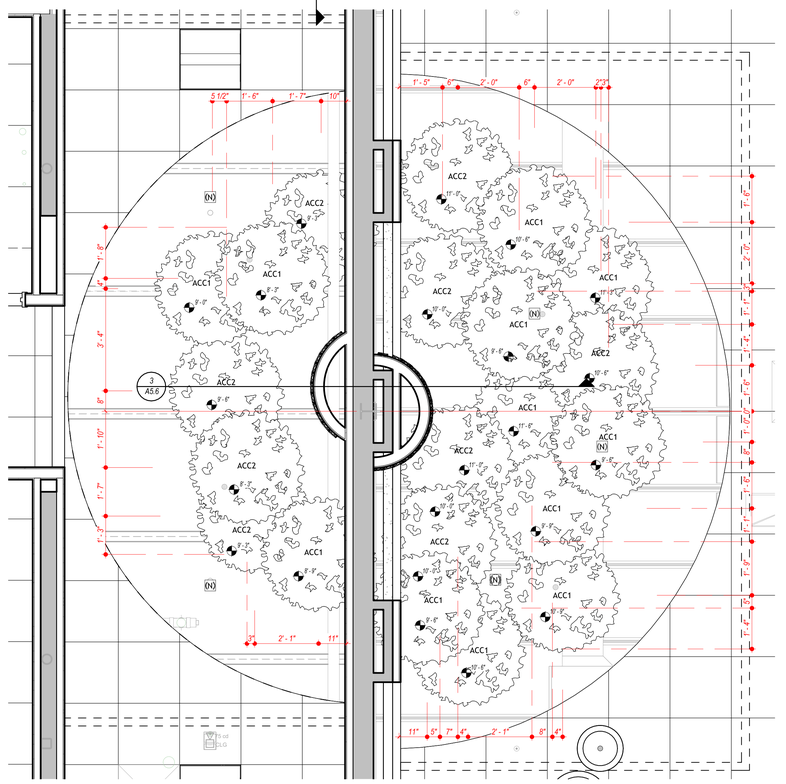
ACOUSTICAL CEILING CLOUDS LEGEND:

	ACC1: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC2: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC3: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC4: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC5: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE
	ACC6: ACOUSTICAL CEILING CLOUDS LOCATIONS:MAIN STREET CORRIDOR, GROSS MOTOR ROOM, REFER TO FINISH SCHEDULE

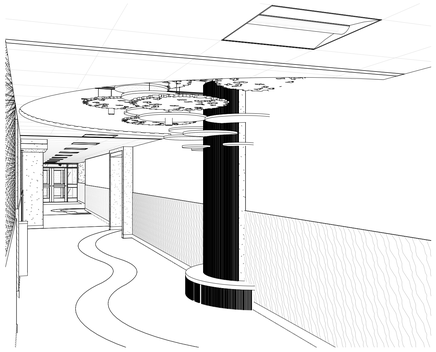
GENERAL NOTE: ROLLER SHADES (RS1) TO BE 8'-0" MAX IN WIDTH. TO BE ALIGNED WITH MULLION, TYP. @ ALL.



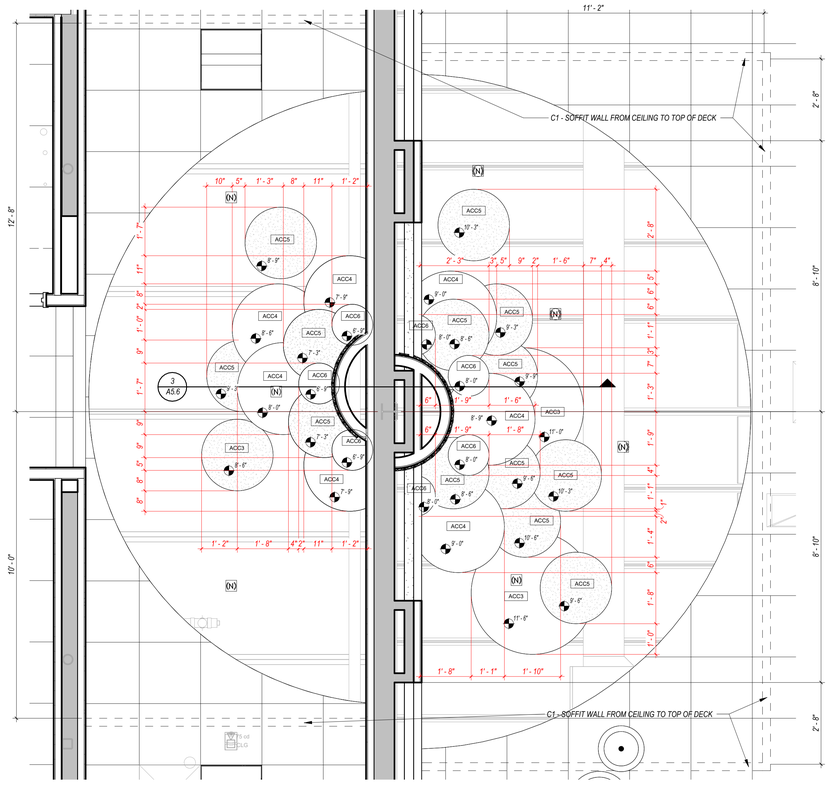
5 A2.1C **GROSS MOTOR 127-TREE ELEVATION**
1/2" = 1'-0"



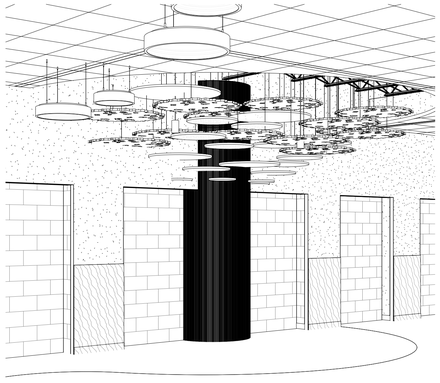
6 A2.1C **TREE ACOUSTIC CELING PANELS RCP 2**
1/2" = 1'-0"



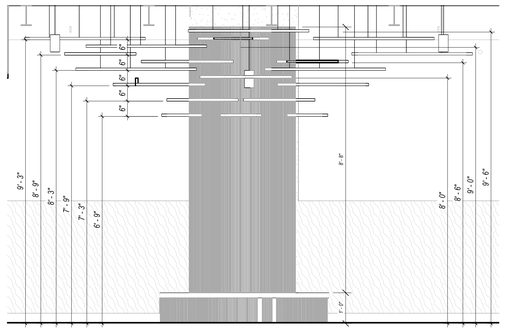
2 A2.1C **CORRIDOR TREE**



1 A2.1C **TREE ACOUSTIC CELING PANELS RCP 1**
1/2" = 1'-0"



3 A2.1C **GROSS MOTOR TREE**



4 A2.1C **MAIN CORRIDOR 100 TREE ELEVATION-1**
1/2" = 1'-0"

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State Project #: 017-0090 RNV
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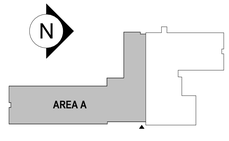
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED TREE RCPS & ELEVATIONS

A2.1C

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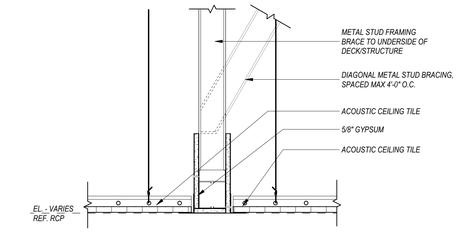
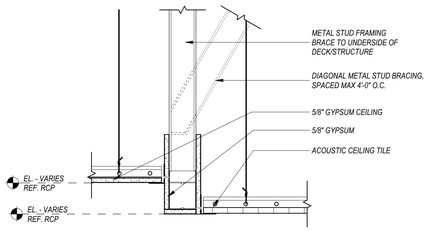
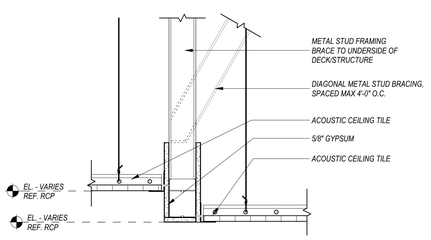


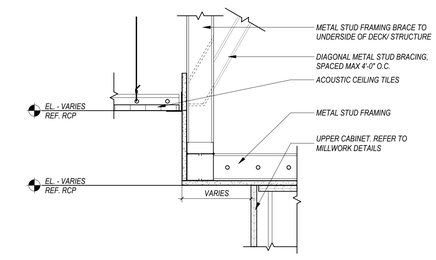
10 / A2.2 GYPSUM SOFFIT BREAK AT ACT CEILINGS SAME LEVEL
1 1/2" = 1'-0"



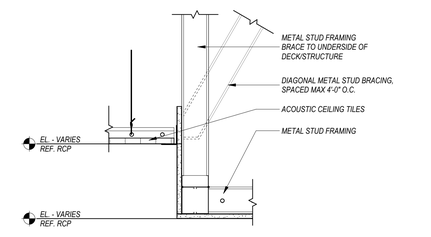
9 / A2.2 GYPSUM SOFFIT BREAK ACT TO GYP CEILINGS
1 1/2" = 1'-0"



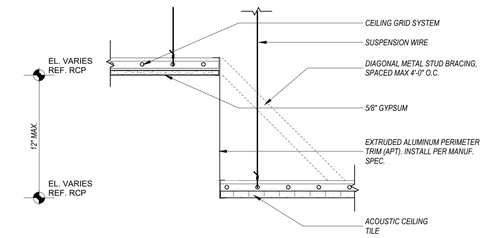
8 / A2.2 GYPSUM SOFFIT BREAK AT ACT CEILINGS
1 1/2" = 1'-0"



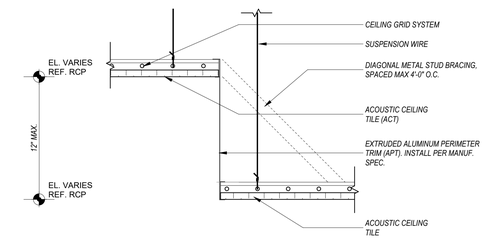
7 / A2.2 MILLWORK GYP SOFFIT TO ACT TRANSITION
1 1/2" = 1'-0"



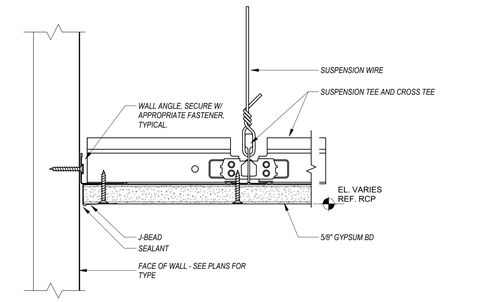
6 / A2.2 GYP CEILING TO ACT TRANSITION
1 1/2" = 1'-0"



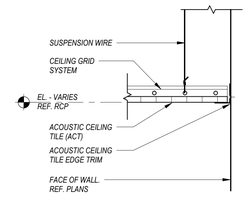
5 / A2.2 ACT TO GYP CEILING TRANSITION DETAIL
1 1/2" = 1'-0"



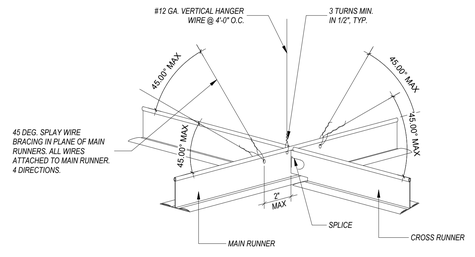
4 / A2.2 ACT TO ACT CEILING TRANSITION DETAIL
1 1/2" = 1'-0"



3 / A2.2 GYP. CEILING DETAIL,TYP
6" = 1'-0"



2 / A2.2 ACT CEILING DETAIL, TYP
1 1/2" = 1'-0"



1 / A2.2 ACT SEISMIC DETAIL-ISOMETRIC
1 1/2" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

CEILING DETAILS

A2.2

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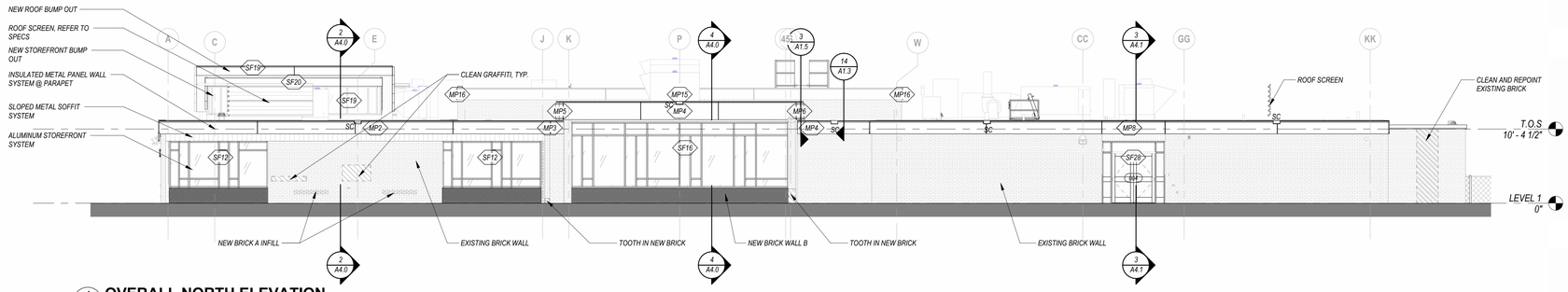
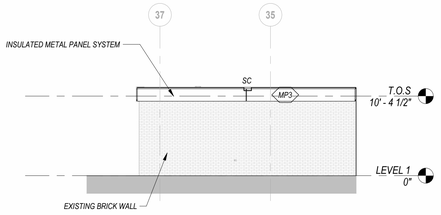


4 A3.0 **OVERALL NORTH ELEVATION**
1/8" = 1'-0"



5 A3.0 **PARTIAL WEST ELEVATION**
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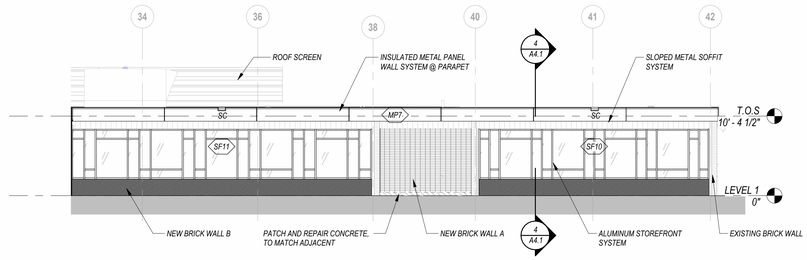
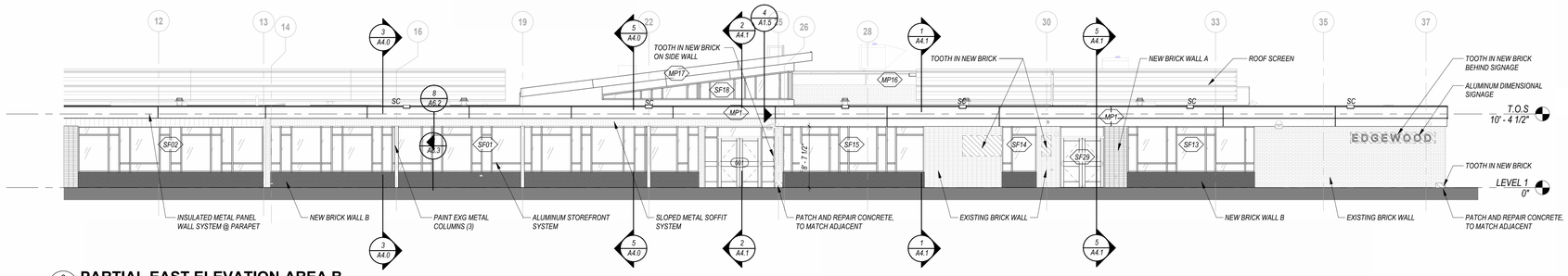
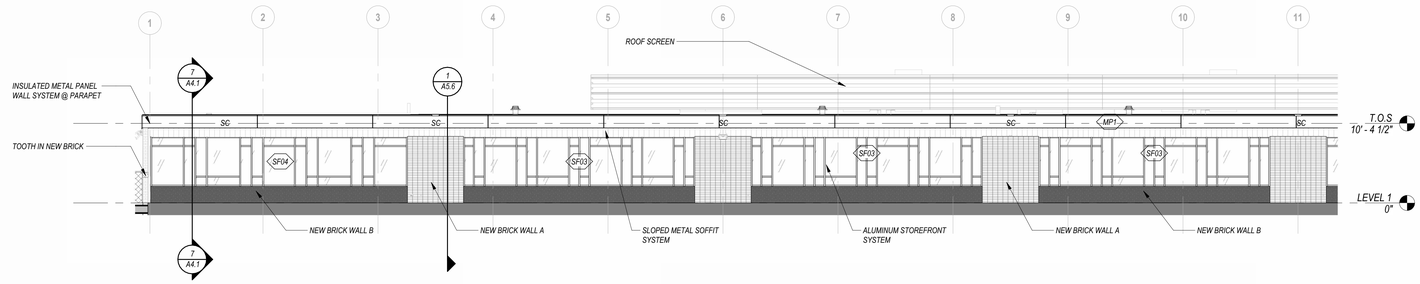


3 A3.0 **PARTIAL EAST ELEVATION - AREA B**
1/8" = 1'-0"



2 A3.0 **PARTIAL EAST ELEVATION-AREA B**
1/8" = 1'-0"



1 A3.0 **PARTIAL EAST ELEVATION-AREA A**
1/8" = 1'-0"

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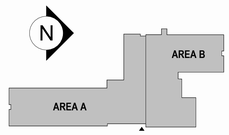
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

EXTERIOR ELEVATIONS

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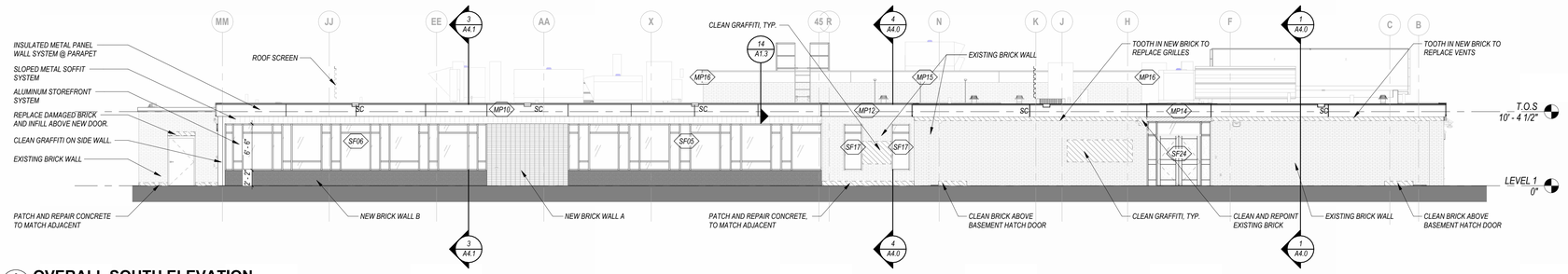
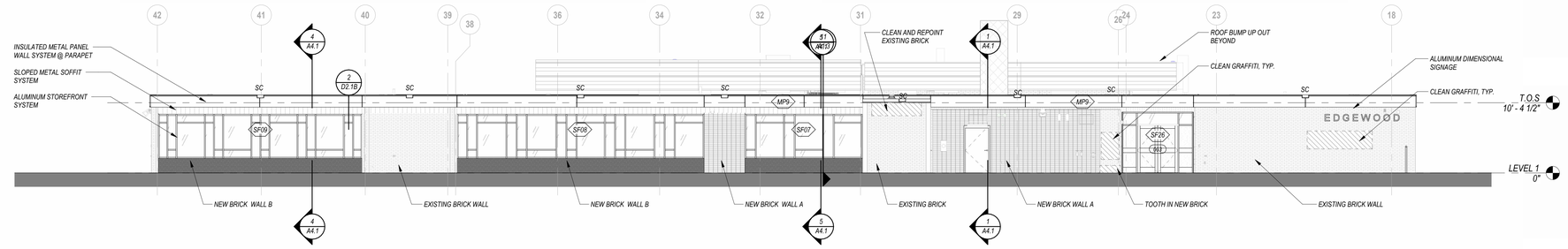
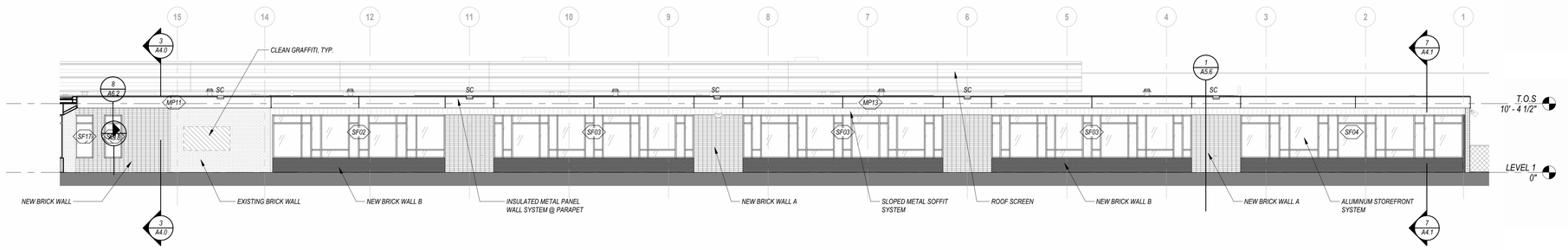


3 A3.1 **OVERALL SOUTH ELEVATION**
1/8" = 1'-0"



2 A3.1 **PARTIAL WEST ELEVATION-AREA B**
1/8" = 1'-0"



1 A3.1 **PARTIAL WEST ELEVATION-AREA A**
1/8" = 1'-0"

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EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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State Project #: 017-0090 RNV
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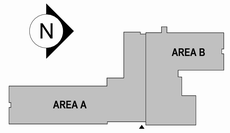

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

EXTERIOR ELEVATIONS

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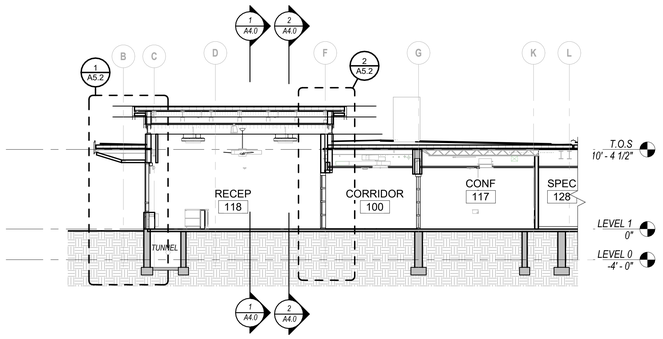
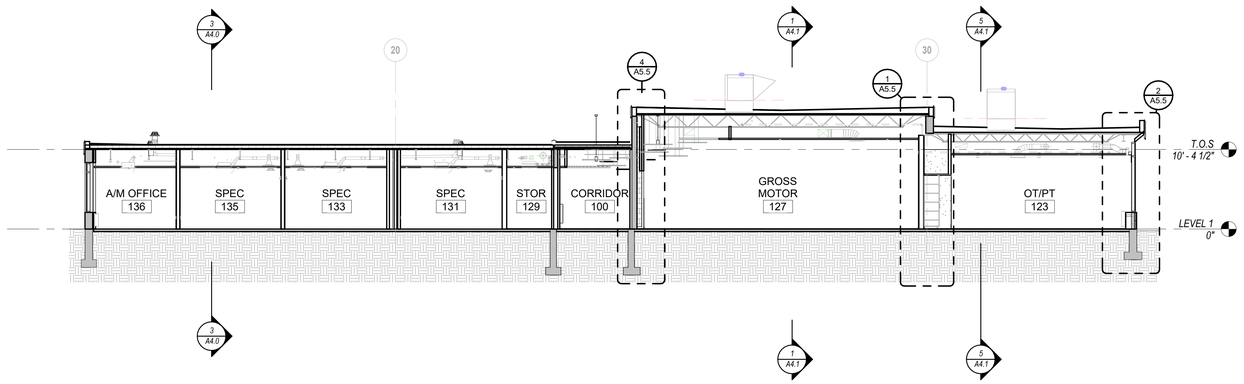
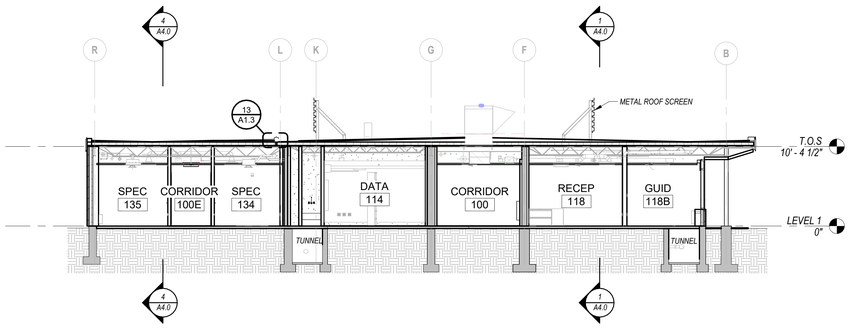


5 A4.0 **BUILDING SECTION F**
1/8" = 1'-0"



4 A4.0 **BUILDING SECTION D**
1/8" = 1'-0"



3 A4.0 **BUILDING SECTION C**
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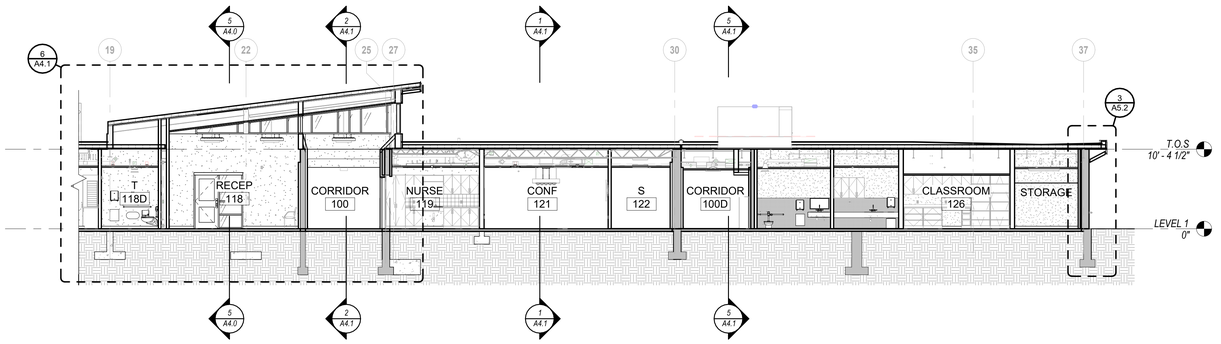
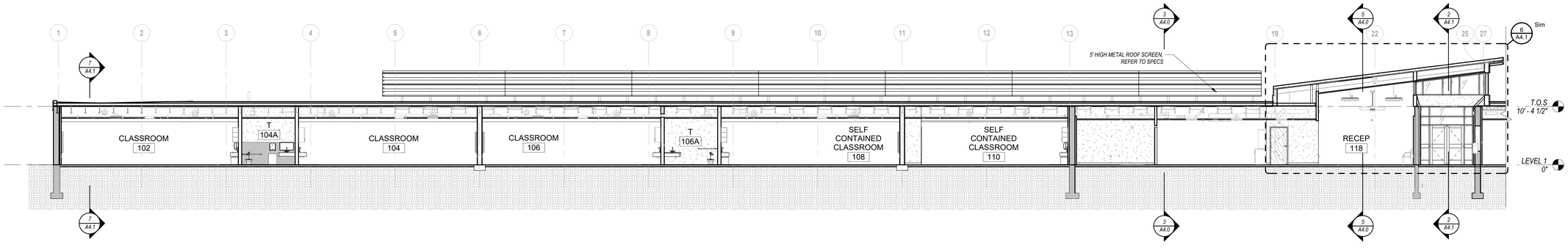


2 A4.0 **LONG BUILDING SECTION-AREA B**
1/8" = 1'-0"



1 A4.0 **LONG BUILDING SECTION-AREA A**
1/8" = 1'-0"

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

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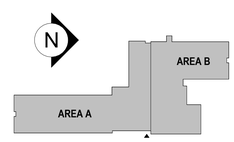

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BUILDING SECTIONS

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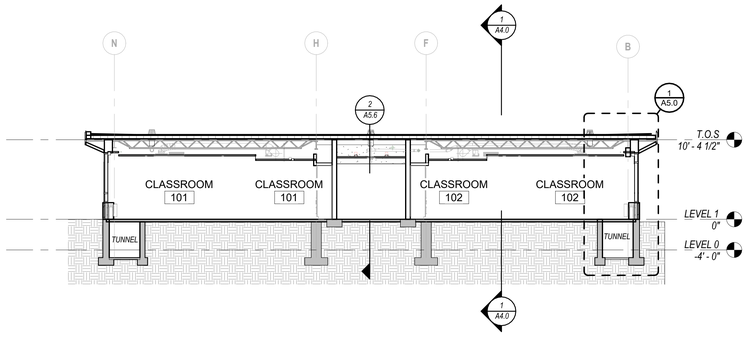
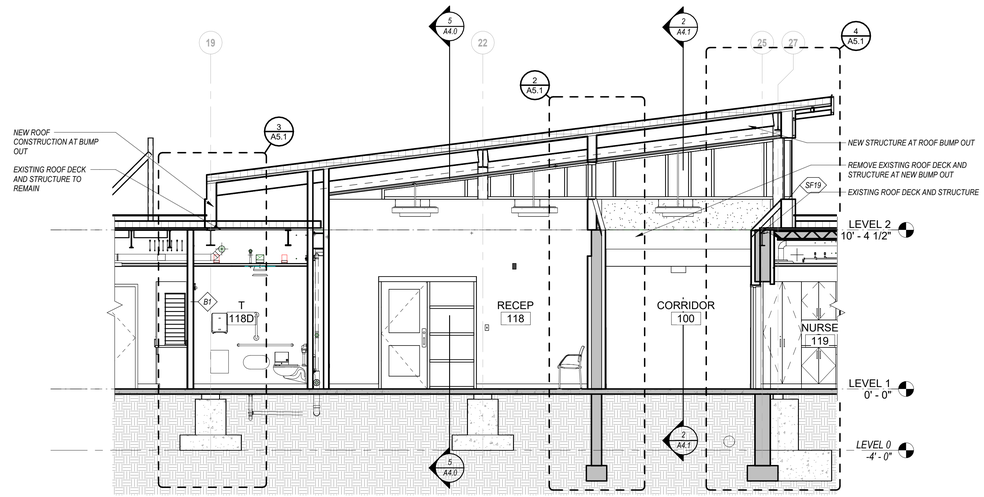
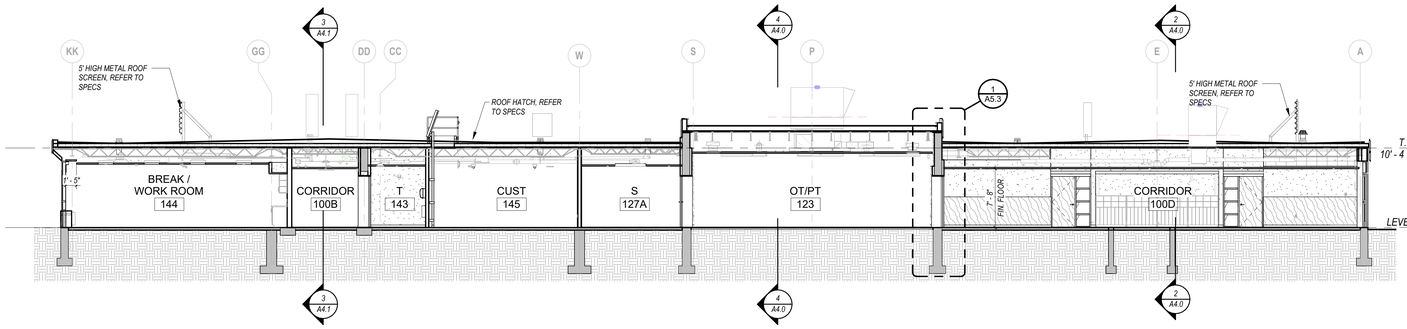


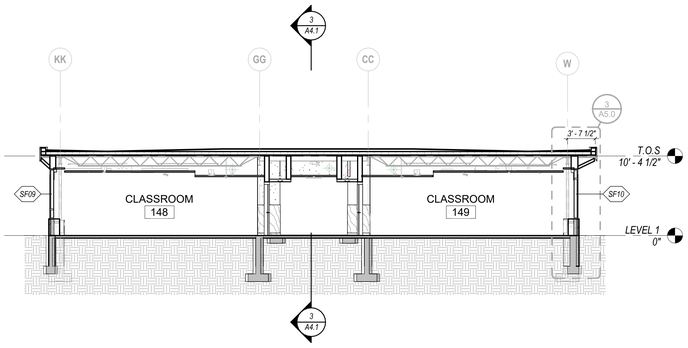
7 A4.1 **BUILDING SECTION-J**
1/8" = 1'-0"



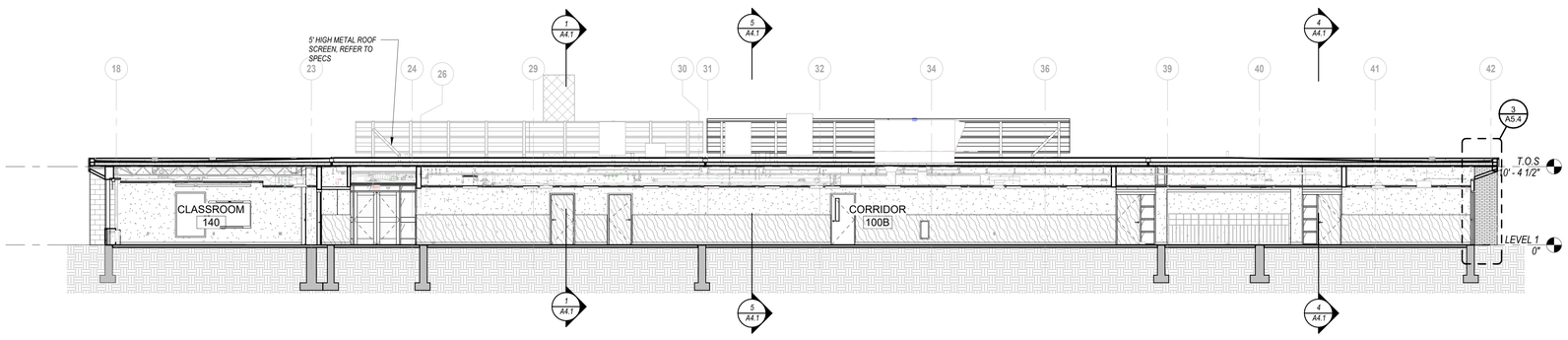
6 A4.1 **BUILDING SECTION AT NEW ROOF BUMP OUT**
1/4" = 1'-0"



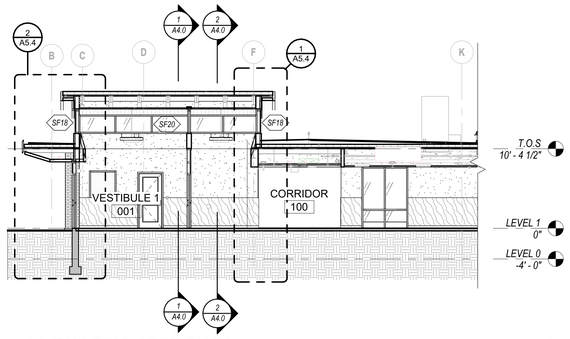
5 A4.1 **BUIDING SECTION H**
1/8" = 1'-0"



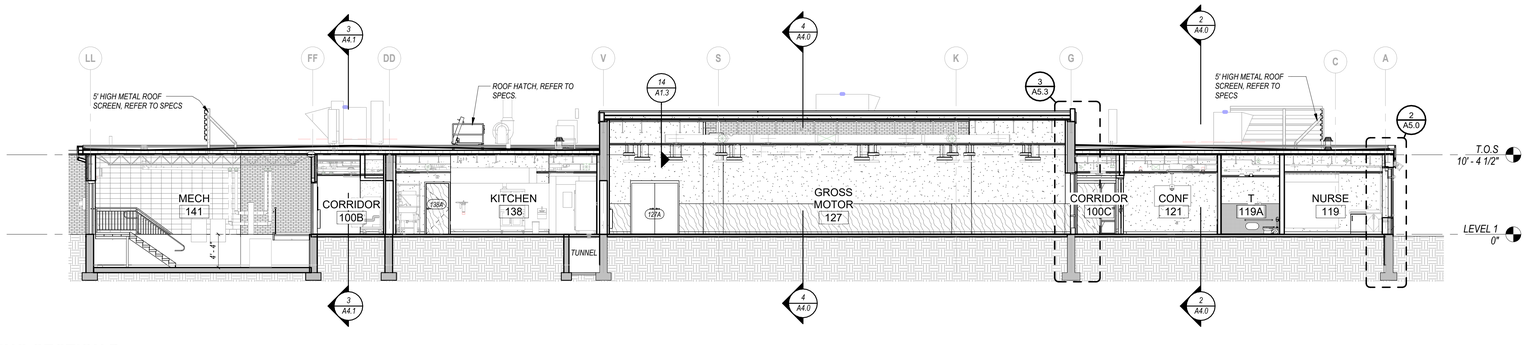
4 A4.1 **BUILDING SECTION G**
1/8" = 1'-0"



3 A4.1 **BUILDING SECTION E**
1/8" = 1'-0"



2 A4.1 **BUILDING SECTION F1**
1/8" = 1'-0"



1 A4.1 **BUIDING SECTION D**
1/8" = 1'-0"

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RENOVATIONS TO:
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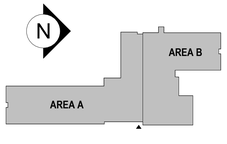
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BUILDING SECTIONS

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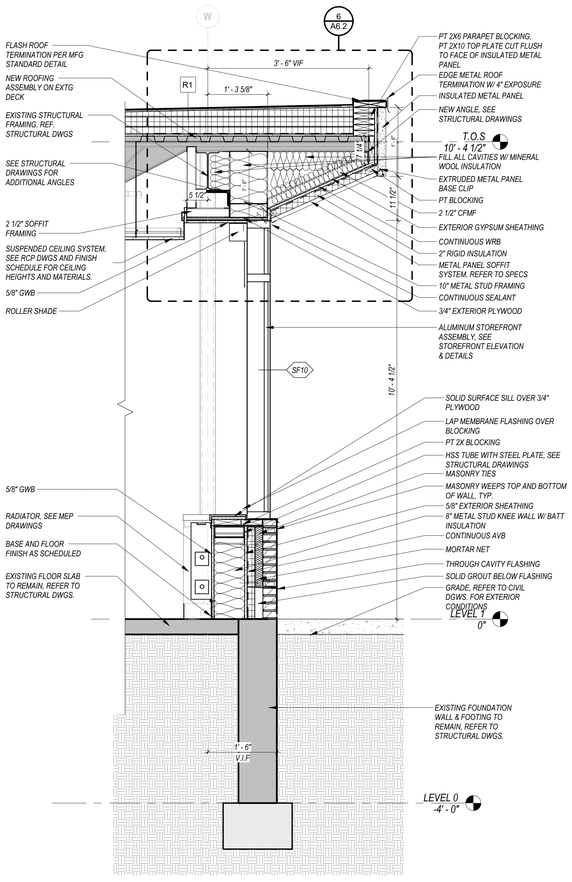
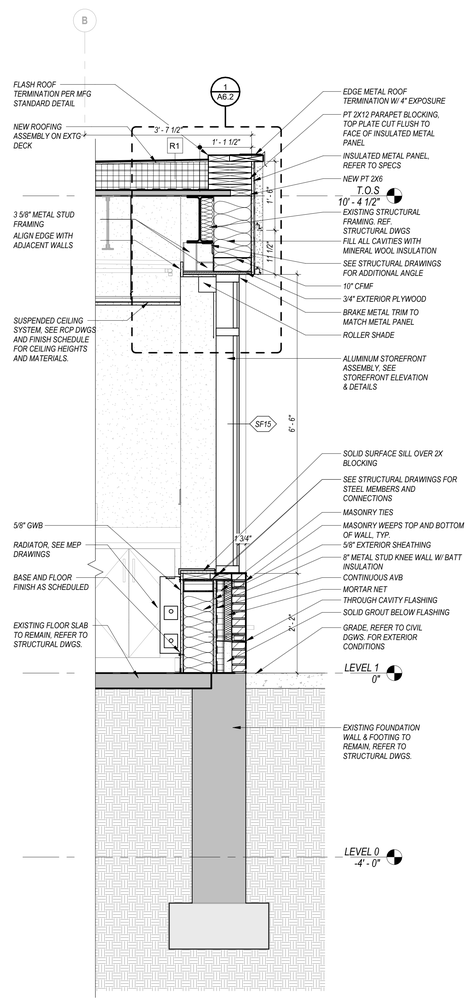
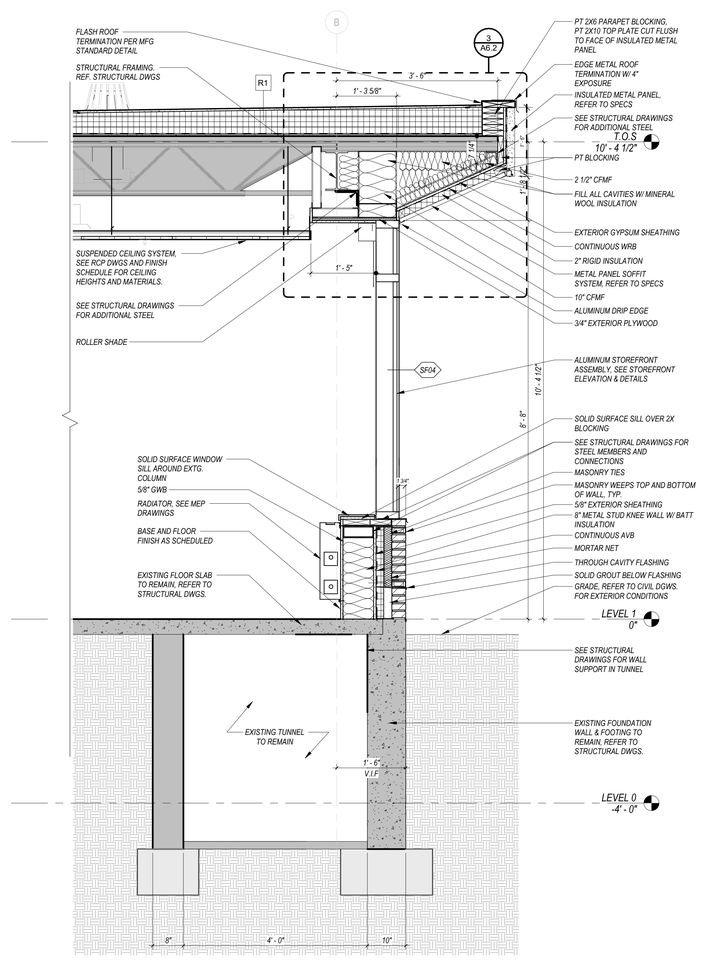


3 A5.0 **WALL SECTION 3**
3/4" = 1'-0"



2 A5.0 **WALL SECTION 2**
3/4" = 1'-0"



1 A5.0 **WALL SECTION 1**
3/4" = 1'-0"

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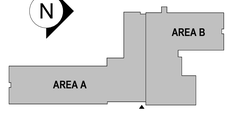
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

A5.0

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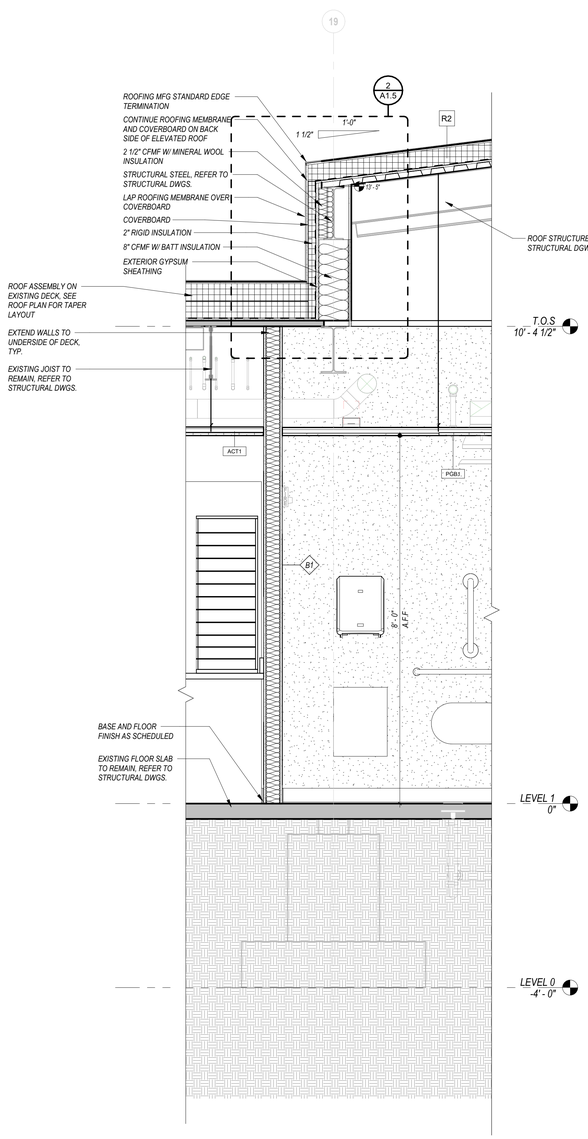
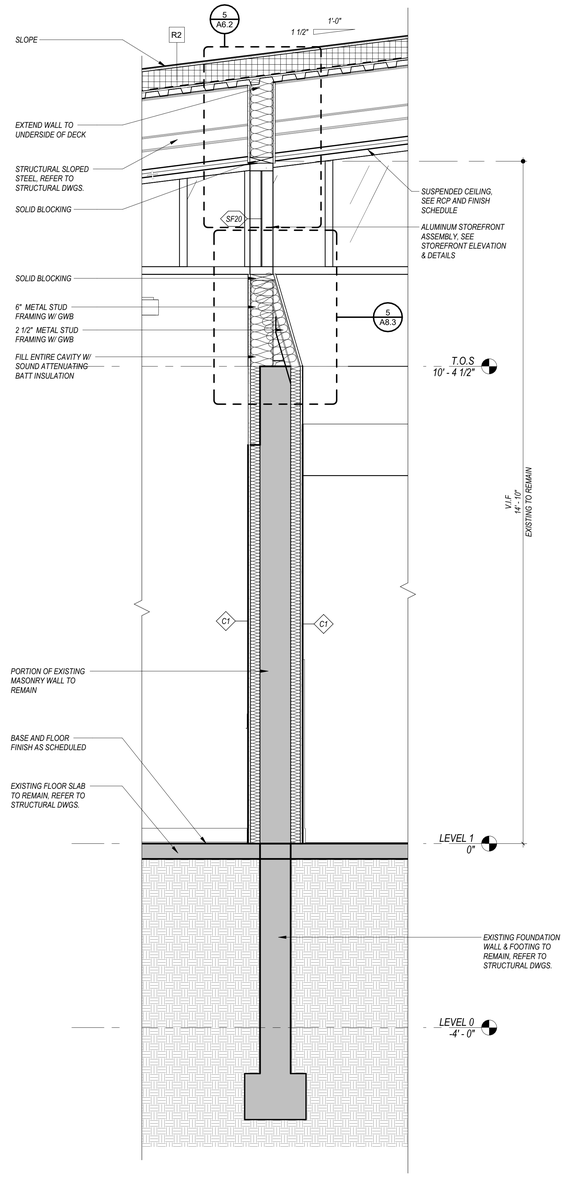
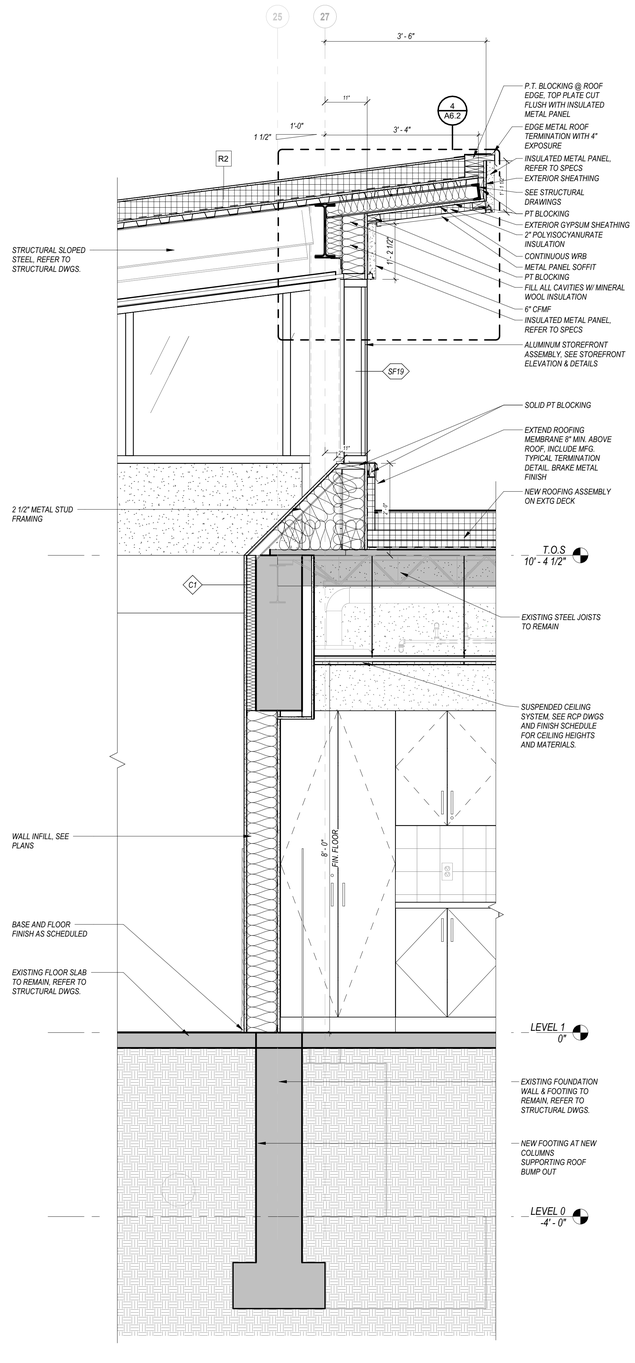


3 A5.1 **WALL SECTION 6**
3/4" = 1'-0"



2 A5.1 **WALL SECTION 5**
3/4" = 1'-0"



4 A5.1 **WALL SECTION 4**
3/4" = 1'-0"

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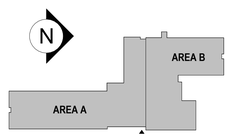
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:250064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

A5.1

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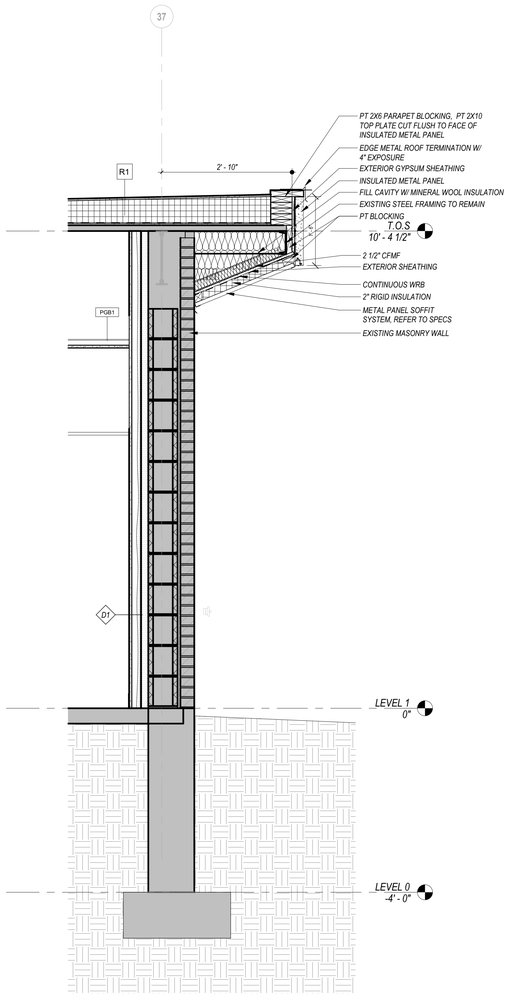
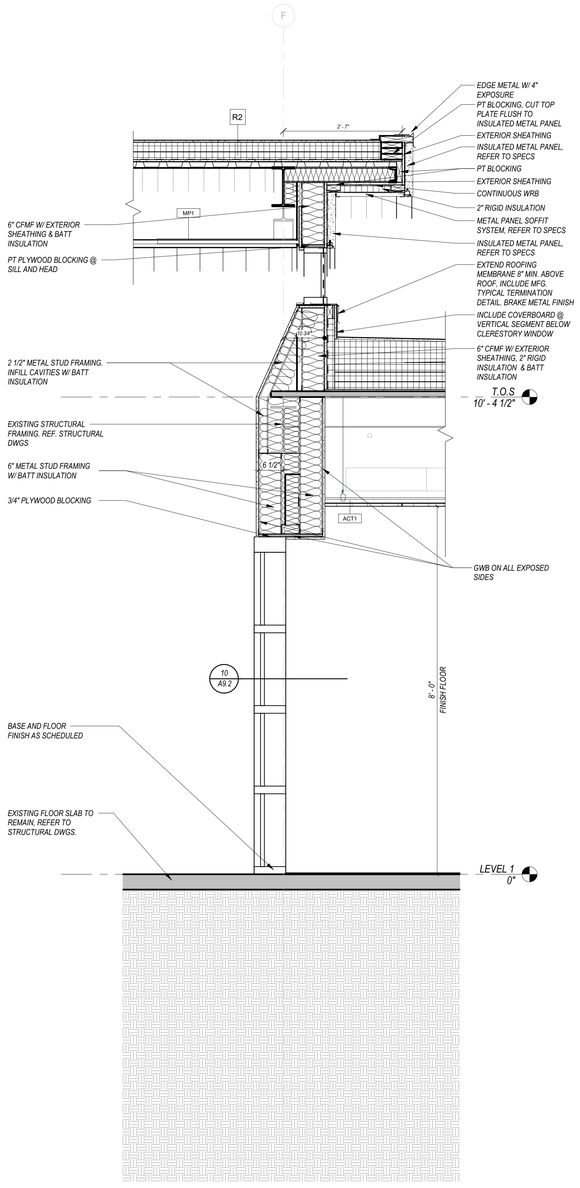
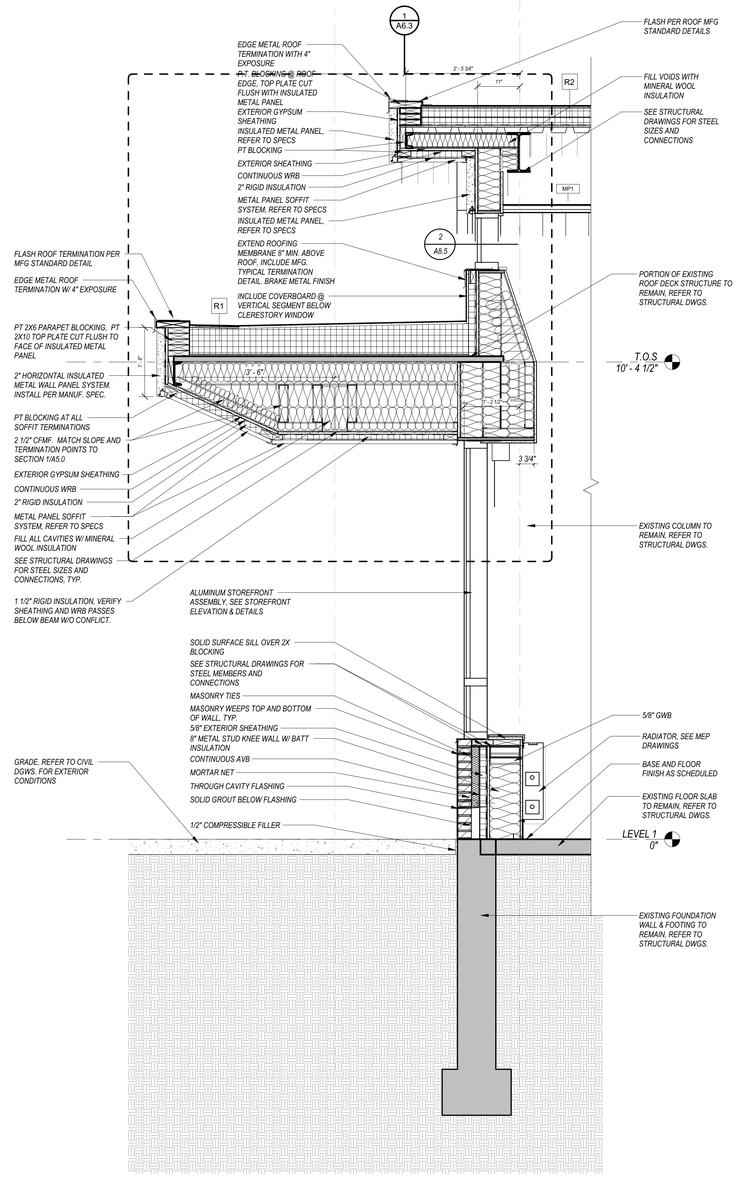


3 A5.2 **WALL SECTION 9**
3/4" = 1'-0"



2 A5.2 **WALL SECTION 8**
3/4" = 1'-0"



1 A5.2 **WALL SECTION 7**
3/4" = 1'-0"

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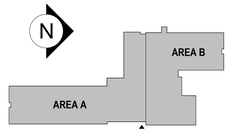
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

A5.2

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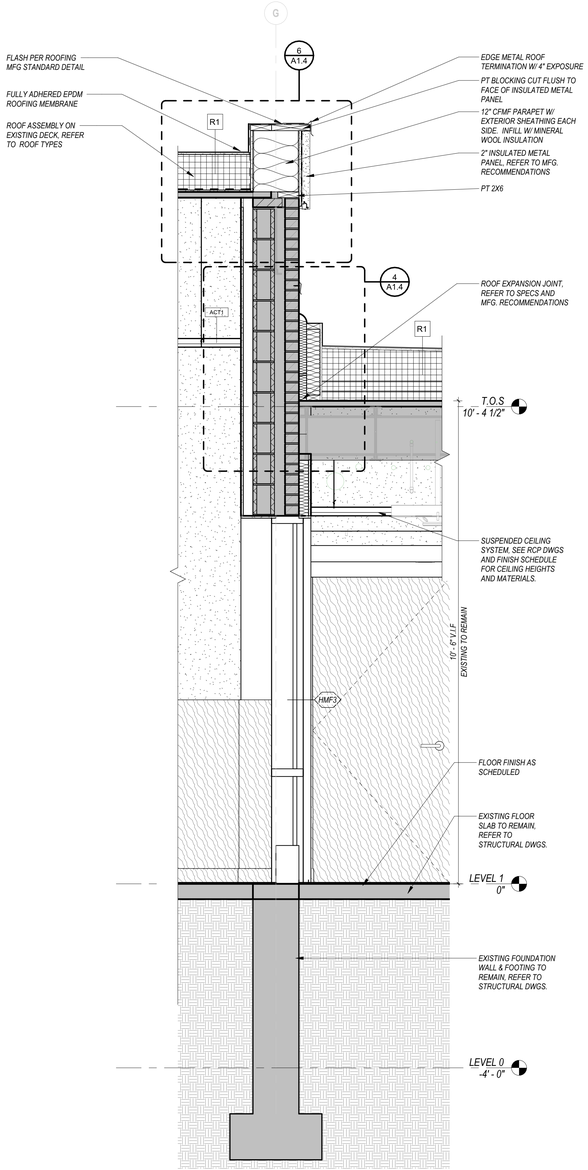
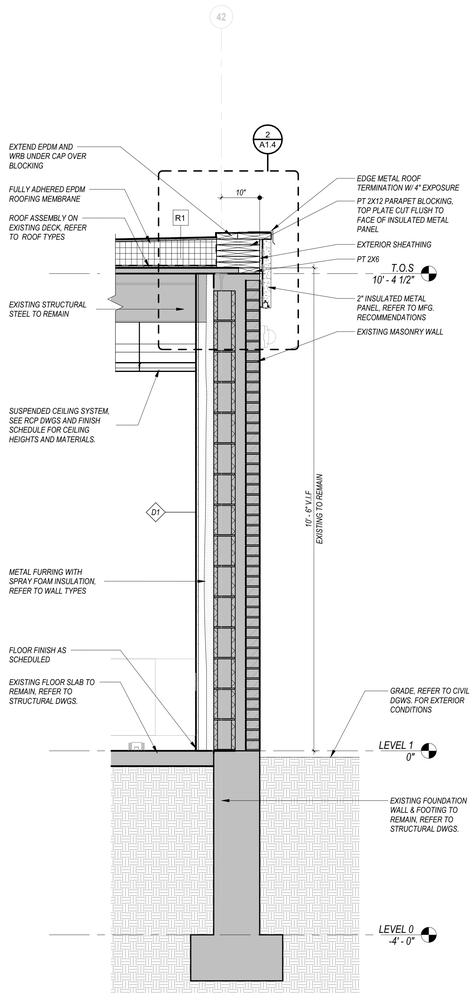
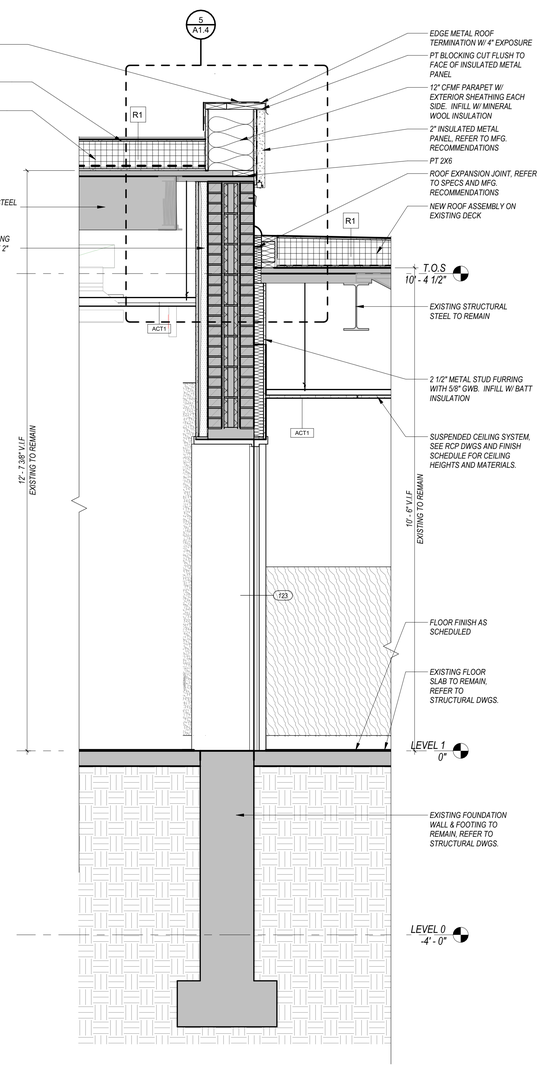


3 A5.3 **WALL SECTION 12**
3/4" = 1'-0"



2 A5.3 **WALL SECTION 11**
3/4" = 1'-0"



1 A5.3 **WALL SECTION 10**
3/4" = 1'-0"

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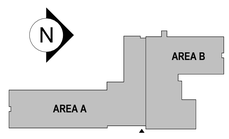
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:250064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

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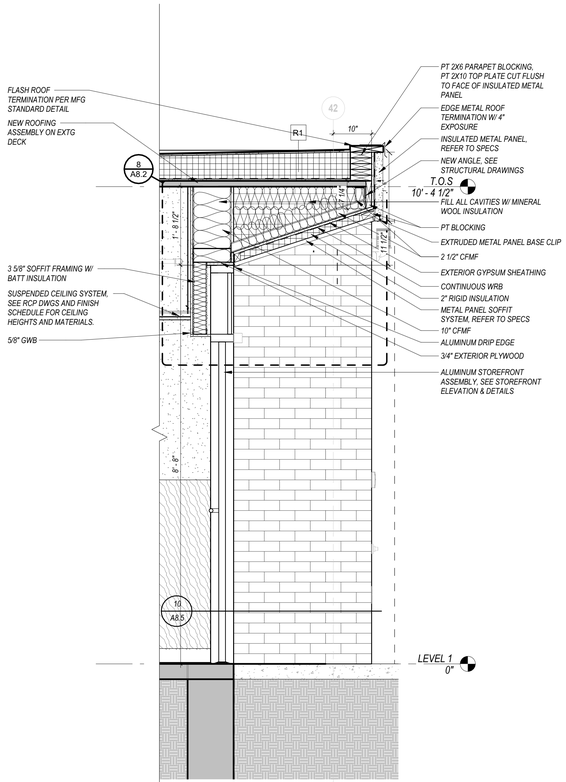

3 A5.4 **WALL SECTION 15**
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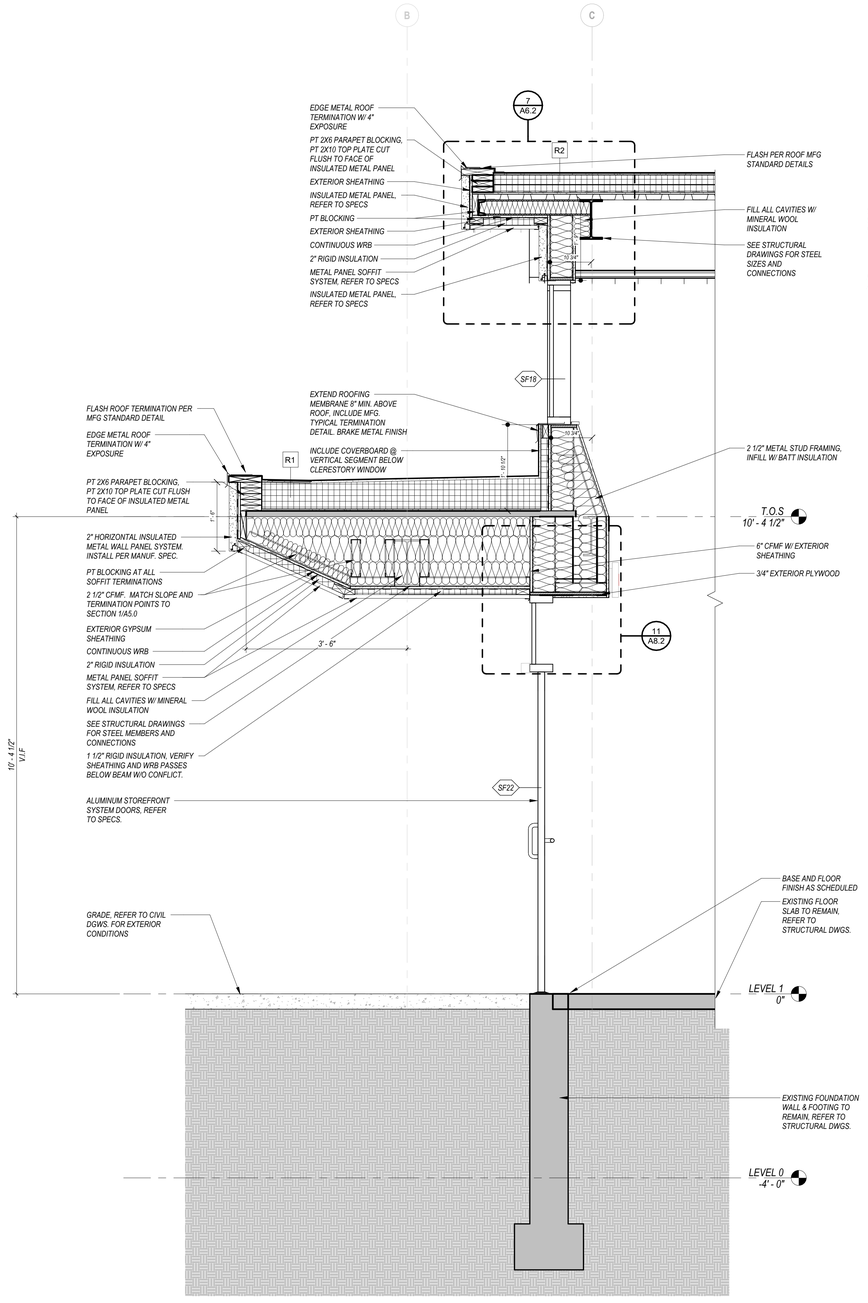

2 A5.4 **WALL SECTION 13**
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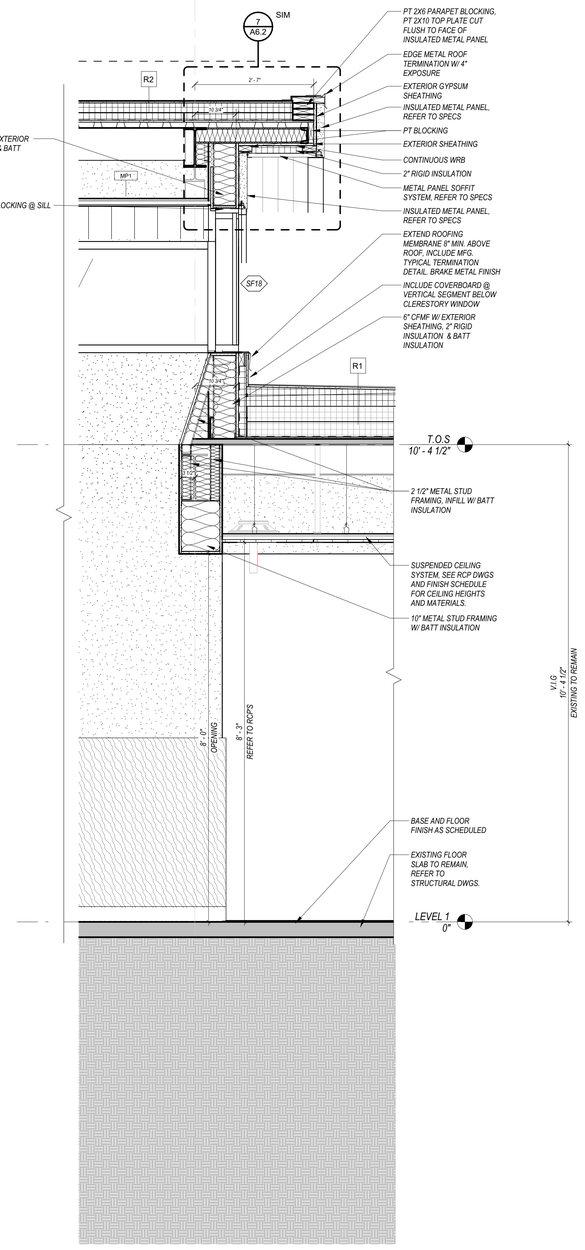

1 A5.4 **WALL SECTION 14**
3/4" = 1'-0"

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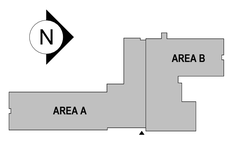
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

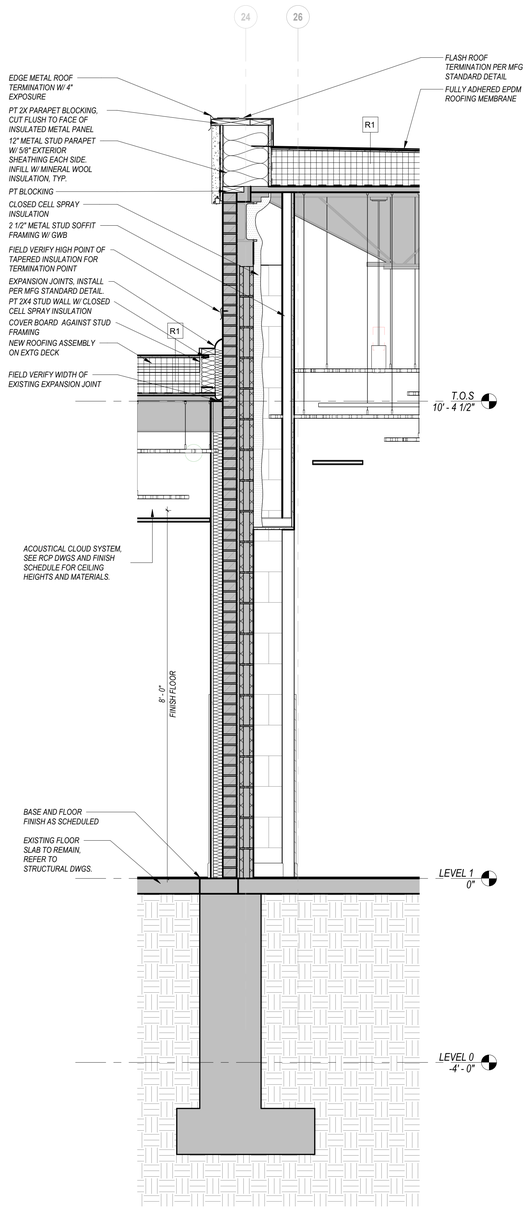
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

A5.4



4 A5.5 **WALL SECTION 18**
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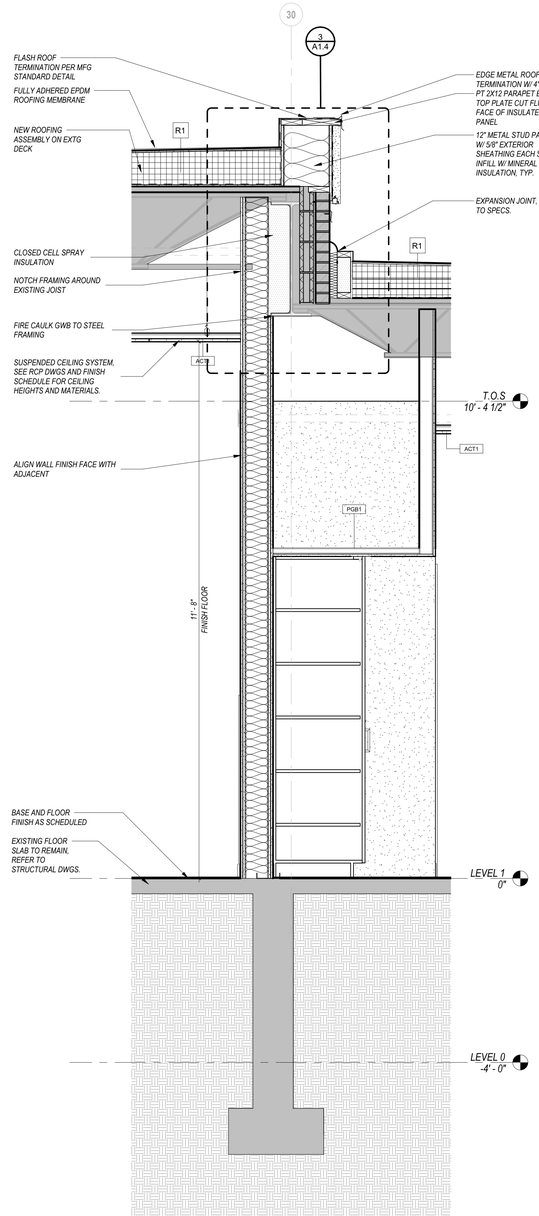

1 A5.5 **WALL SECTION 17**
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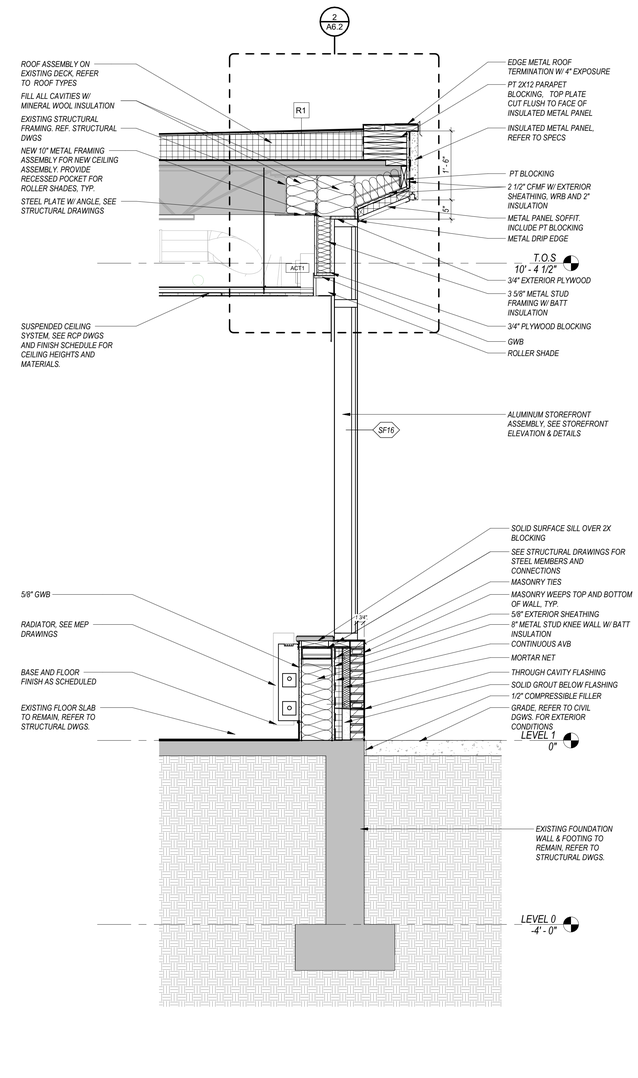

2 A5.5 **WALL SECTION 16**
3/4" = 1'-0"

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RENOVATIONS TO:
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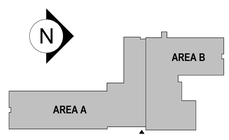
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



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JUNE 5, 2026

WALL SECTIONS-GROSS MOTOR ROOM

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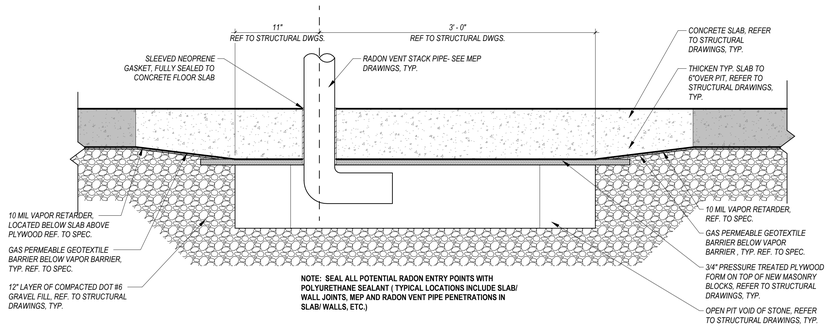
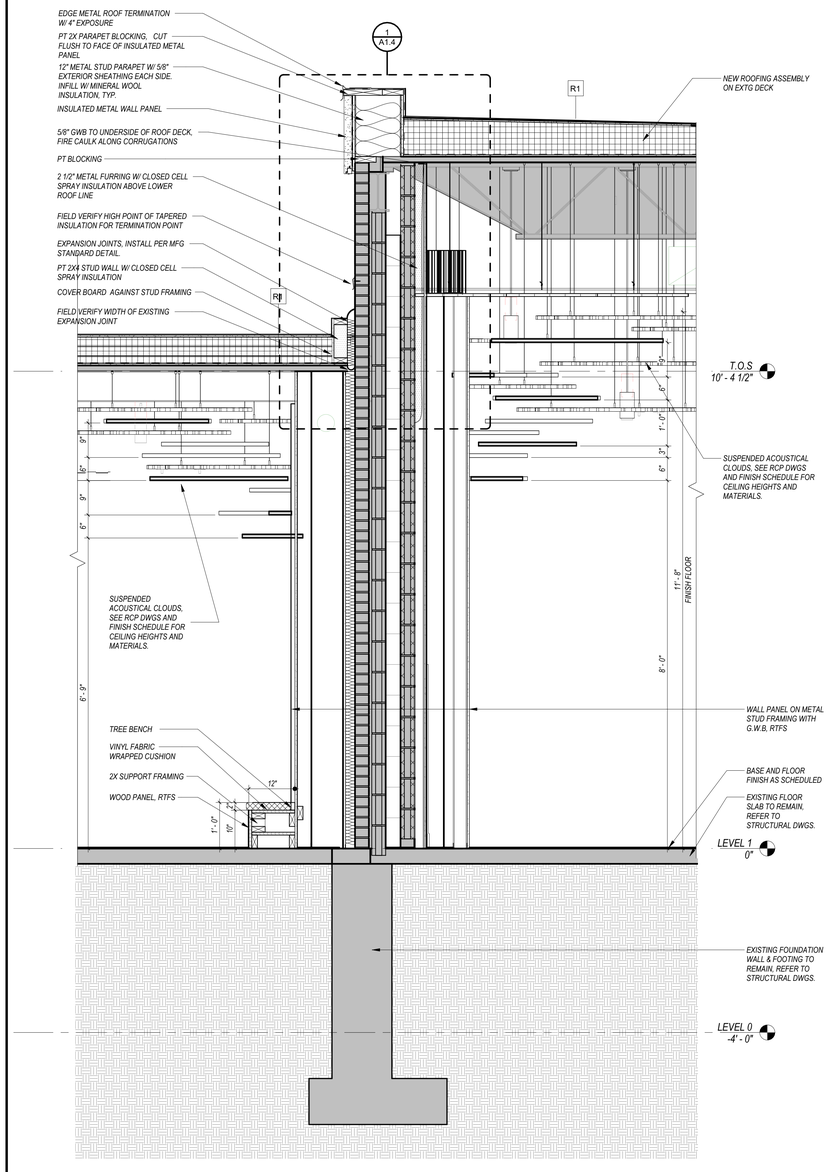


4 / A5.6 TYP. RADON PIT DETAIL
1 1/2" = 1'-0"



3 / A5.6 WALL SECTION 21
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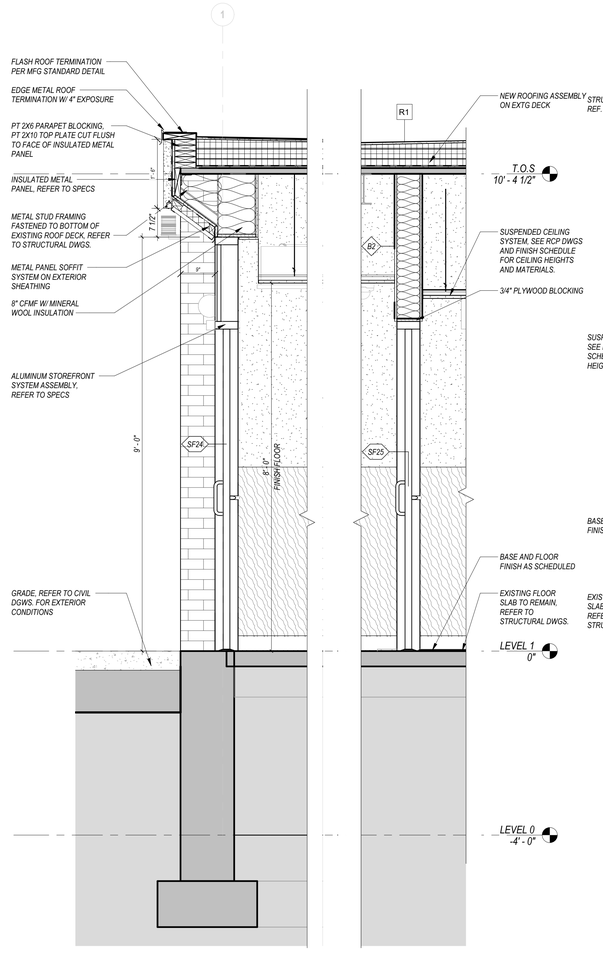

2 / A5.6 WALL SECTION 20
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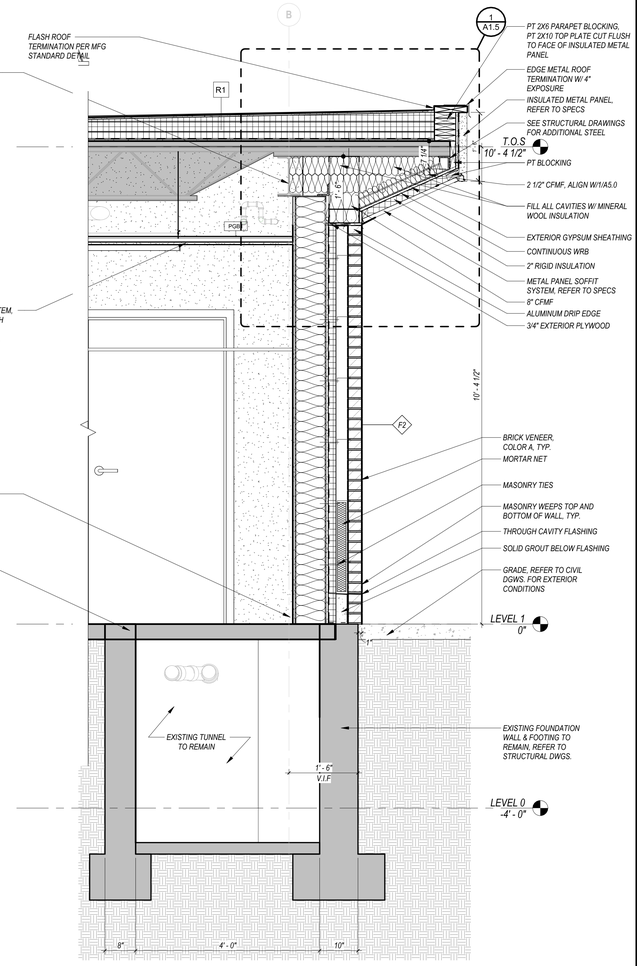

1 / A5.6 WALL SECTION 19
3/4" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

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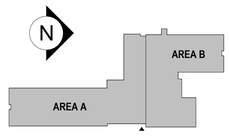
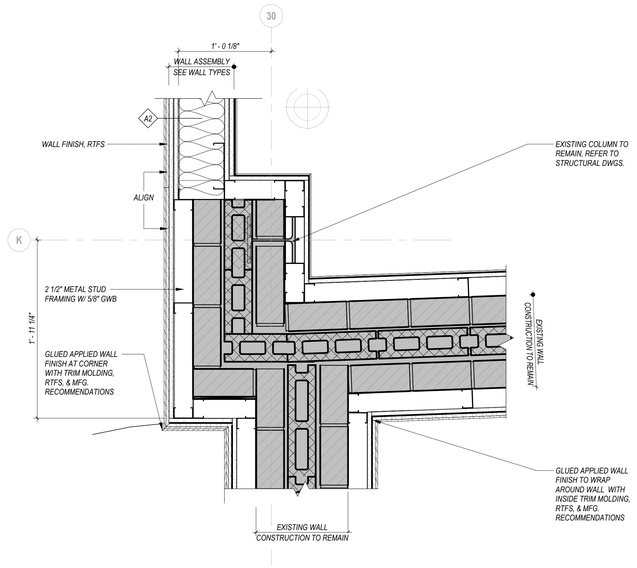


CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

A5.6



9 A6.0 **01B-PLAN DETAIL 4**
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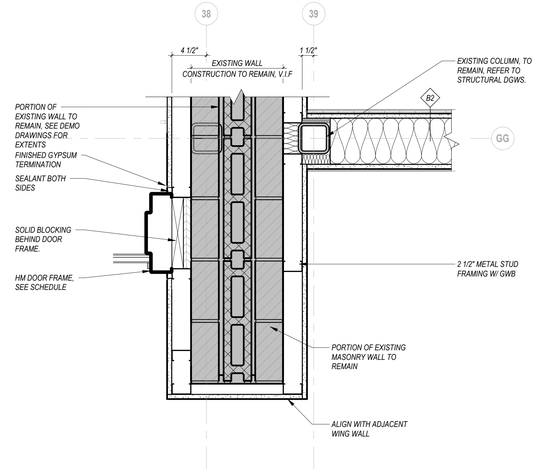

6 A6.0 **01B-PLAN DETAIL 3**
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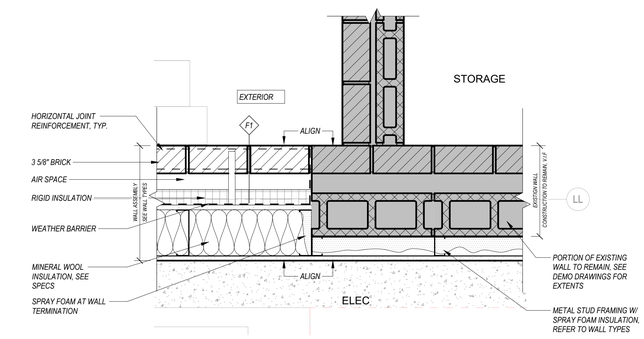
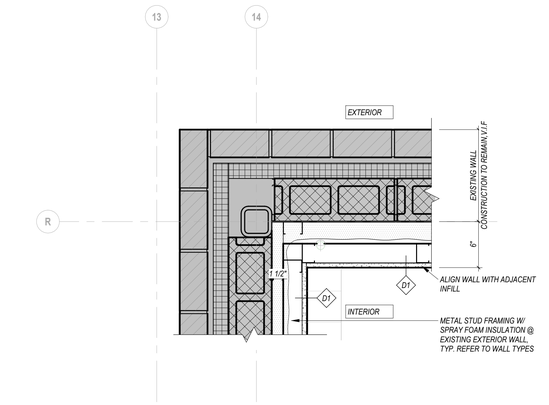


3 A6.0 **01B-PLAN DETAIL 1**
1 1/2" = 1'-0"



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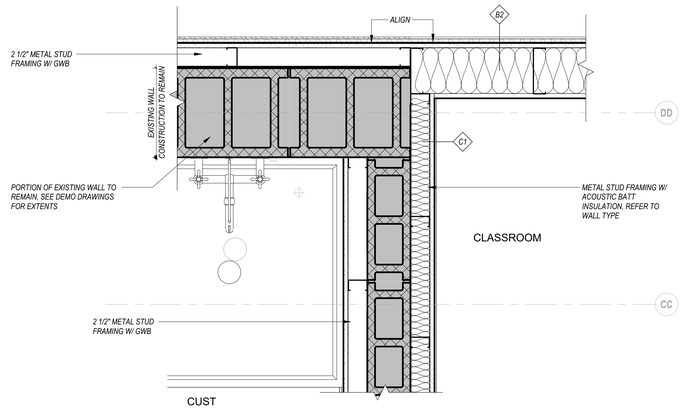

5 A6.0 **01B-PLAN DETAIL 2**
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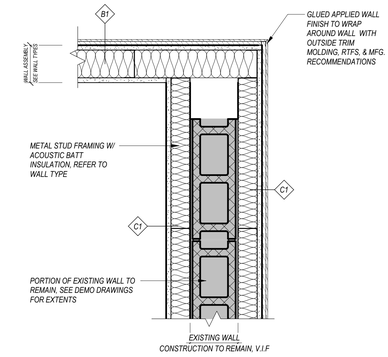
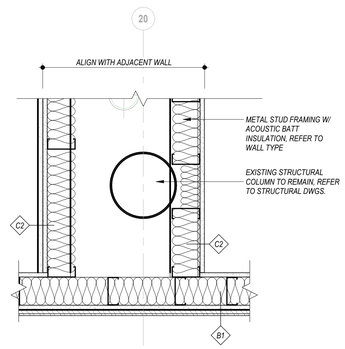
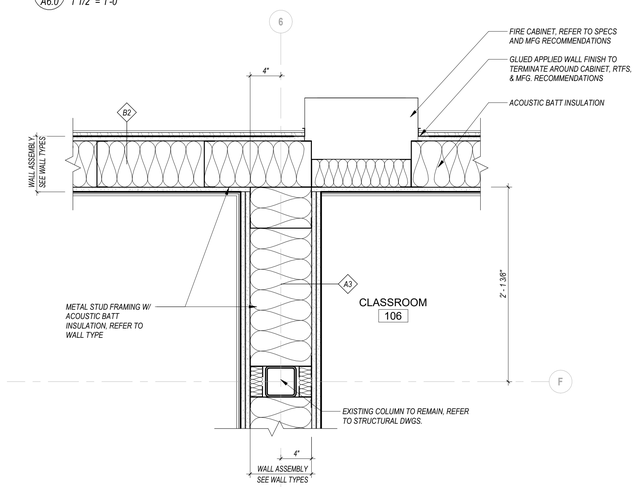


2 A6.0 **01A-PLAN DETAIL 2**
1 1/2" = 1'-0"



7 A6.0 **01A-PLAN DETAIL 4**
1 1/2" = 1'-0"



4 A6.0 **01A-PLAN DETAIL 3**
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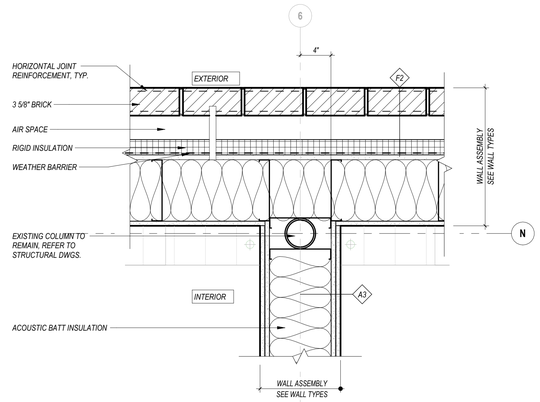

1 A6.0 **01A-PLAN DETAIL-1**
1 1/2" = 1'-0"

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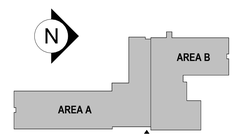
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLAN DETAILS

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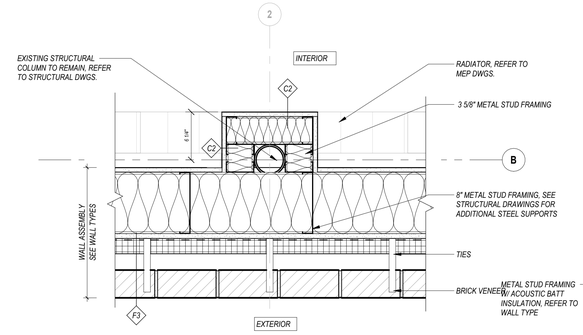

12 A6.1 **TYP. PLAN DETAIL @ COLUMN**
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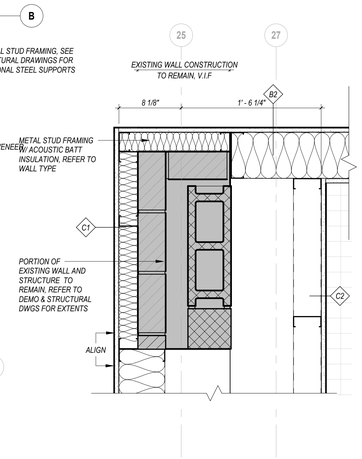
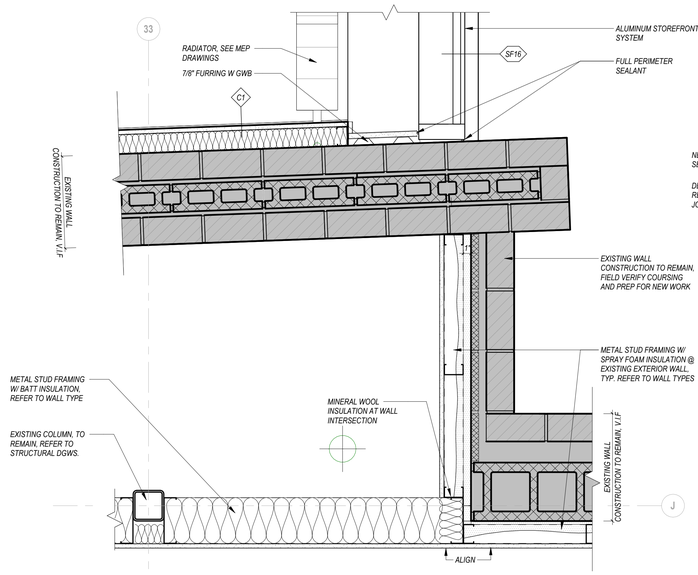
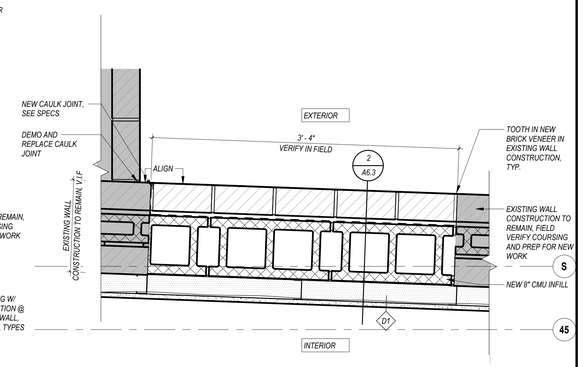


9 A6.1 **01A-PLAN DETAIL-8**
1 1/2" = 1'-0"



6 A6.1 **01B-PLAN DETAIL 7**
1 1/2" = 1'-0"



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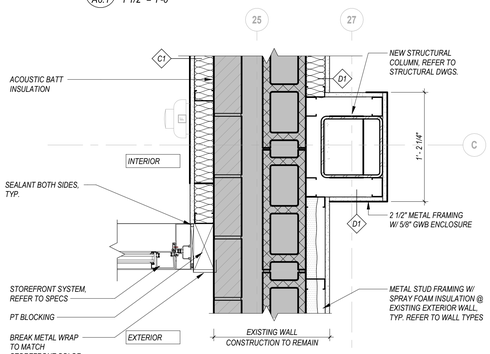
1 1/2" = 1'-0"



11 A6.1 **01B-PLAN DETAIL 9**
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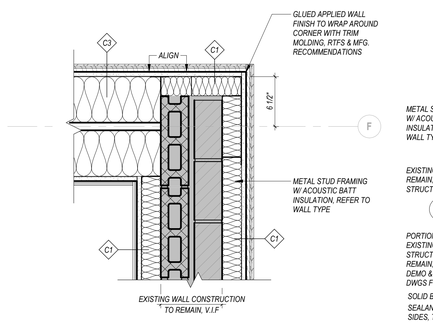

8 A6.1 **01A-PLAN DETAIL 7**
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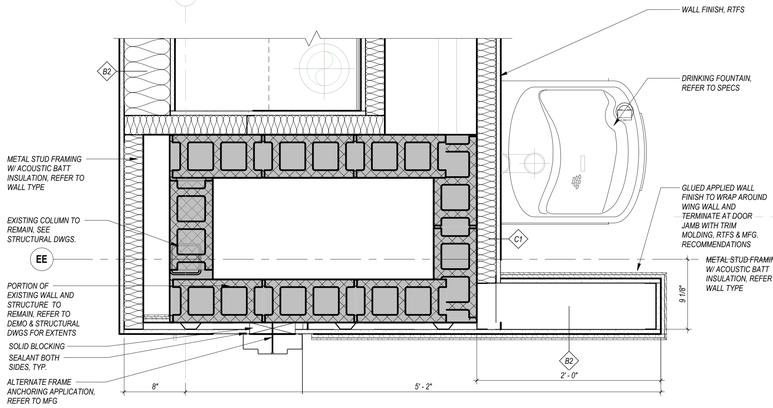

5 A6.1 **01A-PLAN DETAIL -6**
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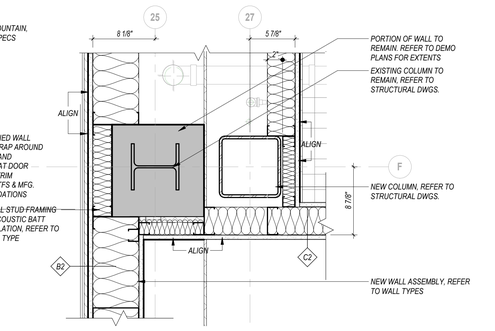

2 A6.1 **01B-PLAN DETAIL 5**
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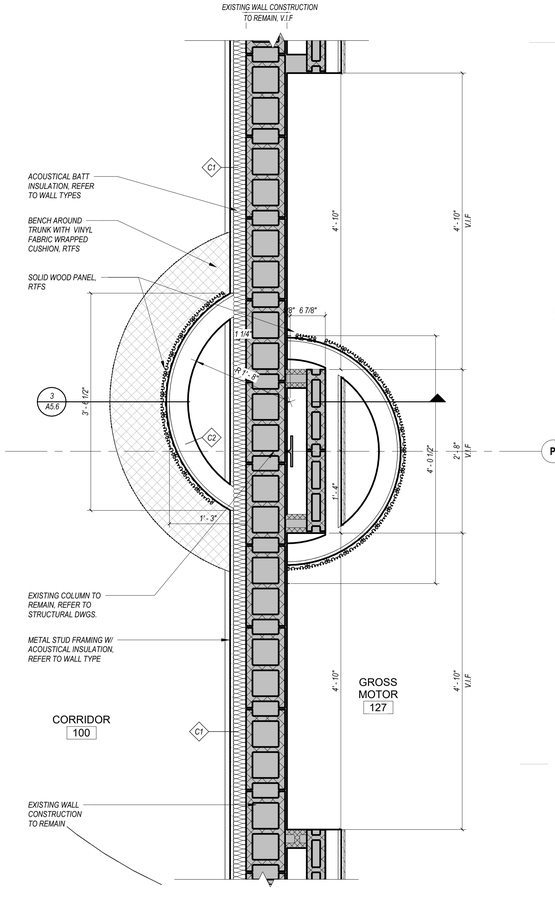
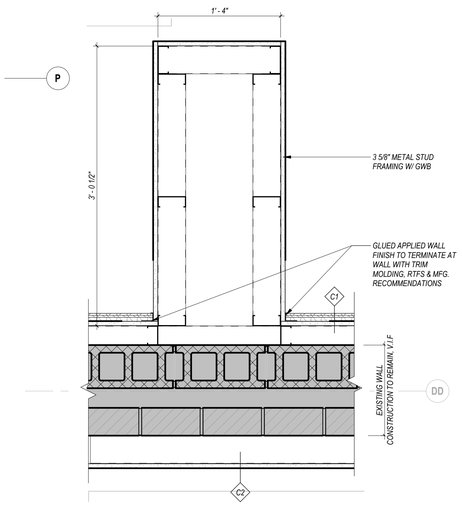
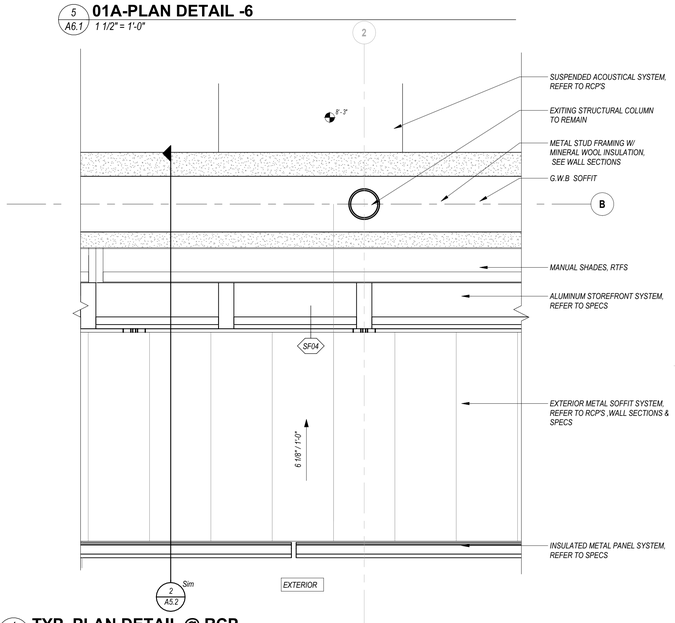


10 A6.1 **PLAN DETAIL 19-TREE**
1" = 1'-0"



7 A6.1 **01B-PLAN DETAIL 8**
1 1/2" = 1'-0"



4 A6.1 **TYP. PLAN DETAIL @ RCP**
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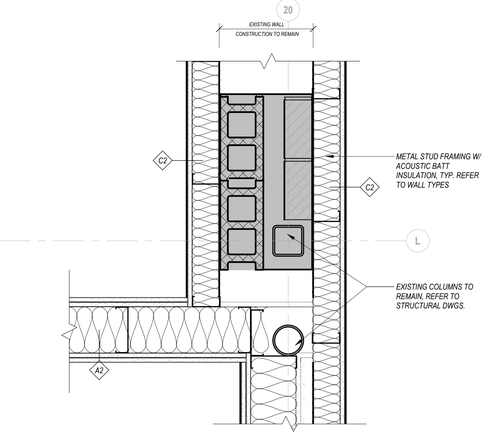

1 A6.1 **01A-PLAN DETAIL-**
1 1/2" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A
AREA B

CONSTRUCTION DOCUMENTS
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PLAN DETAILS

A6.1

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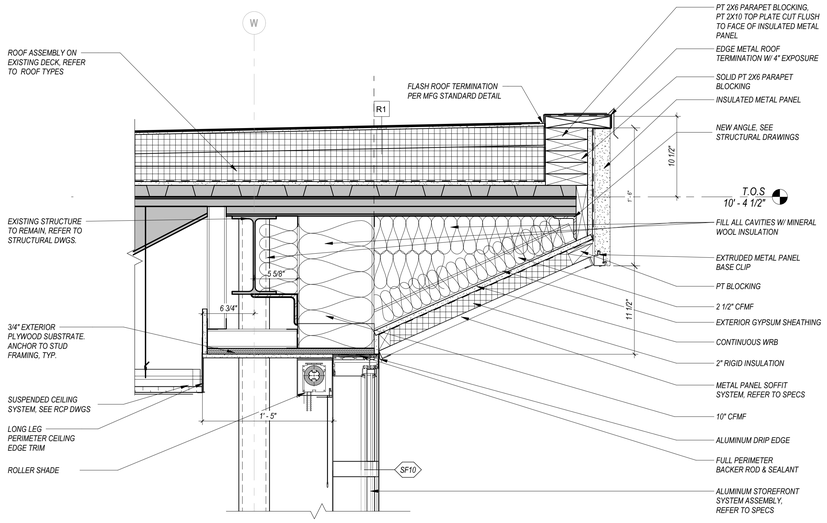
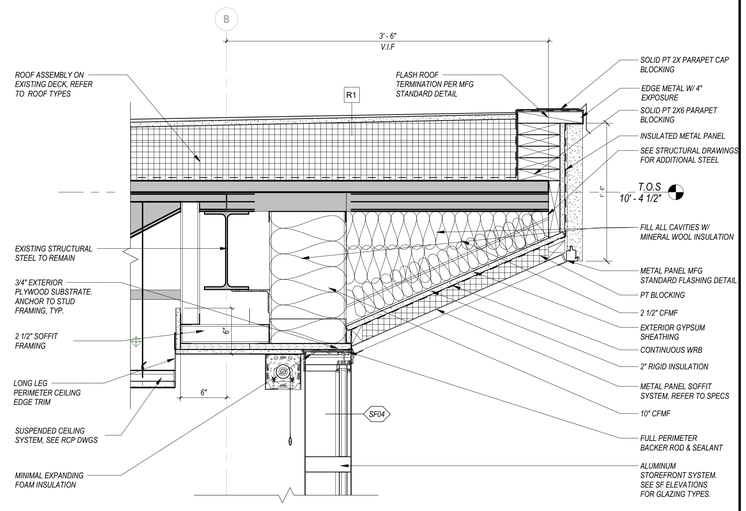
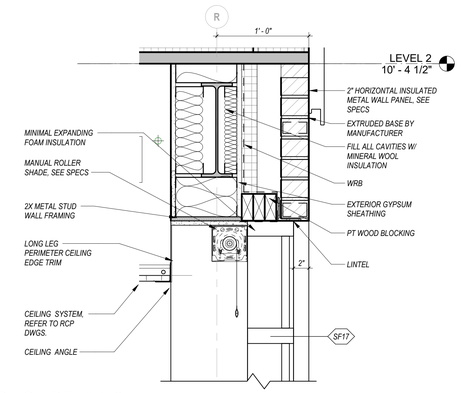


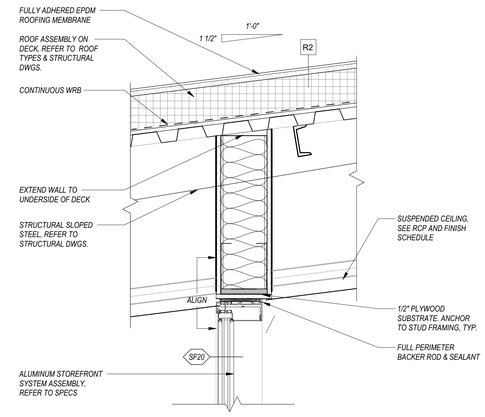
6 A6.2 **SECTION DETAIL 6**
1 1/2" = 1'-0"



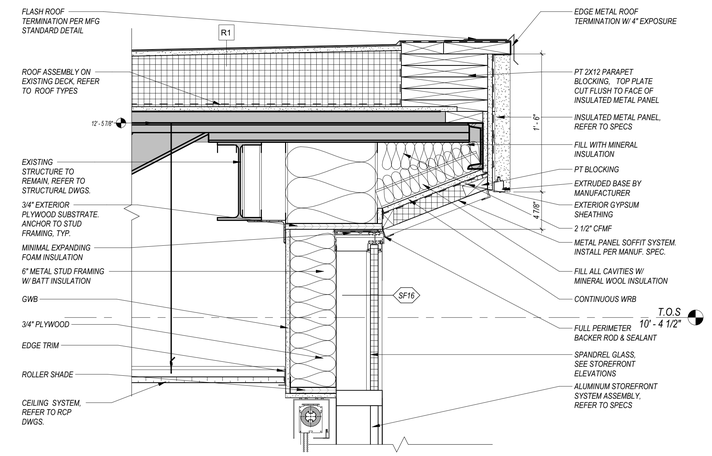
3 A6.2 **SECTION DETAIL 3**
1 1/2" = 1'-0"



8 A6.2 **SECTION DETAIL 8**
1 1/2" = 1'-0"



5 A6.2 **SECTION DETAIL 5**
1 1/2" = 1'-0"



2 A6.2 **SECTION DETAIL 2**
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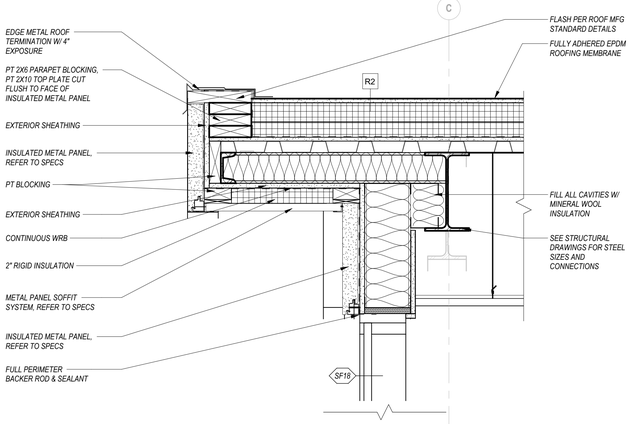
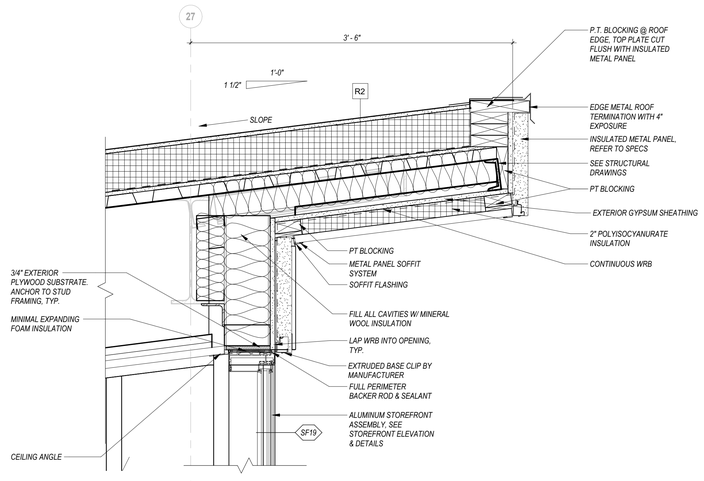
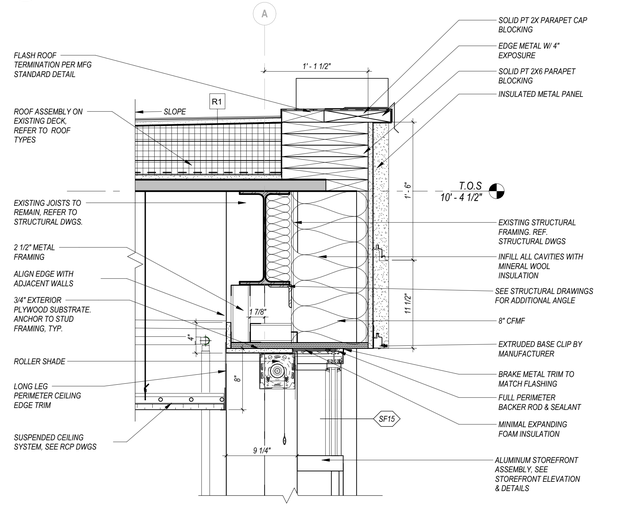


7 A6.2 **SECTION DETAIL 7**
1 1/2" = 1'-0"



4 A6.2 **SECTION DETAIL 4**
1 1/2" = 1'-0"



1 A6.2 **SECTION DETAIL 1**
1 1/2" = 1'-0"

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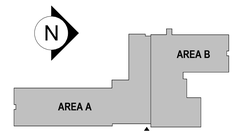
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

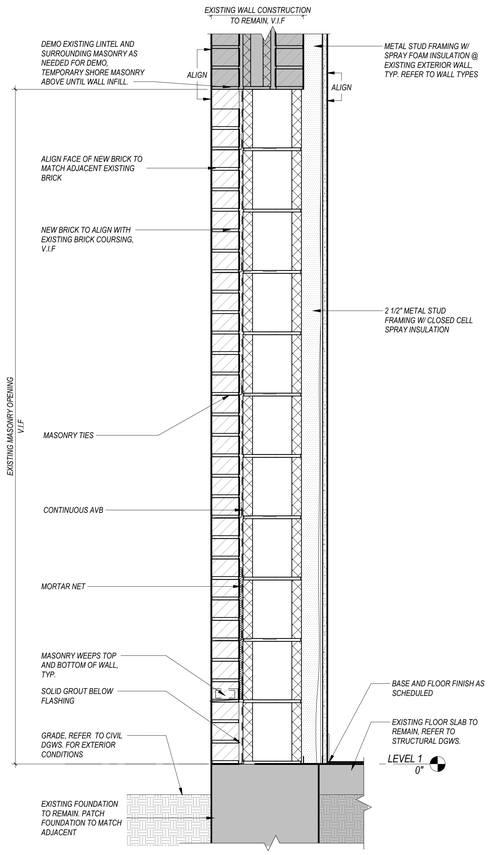
Revisions



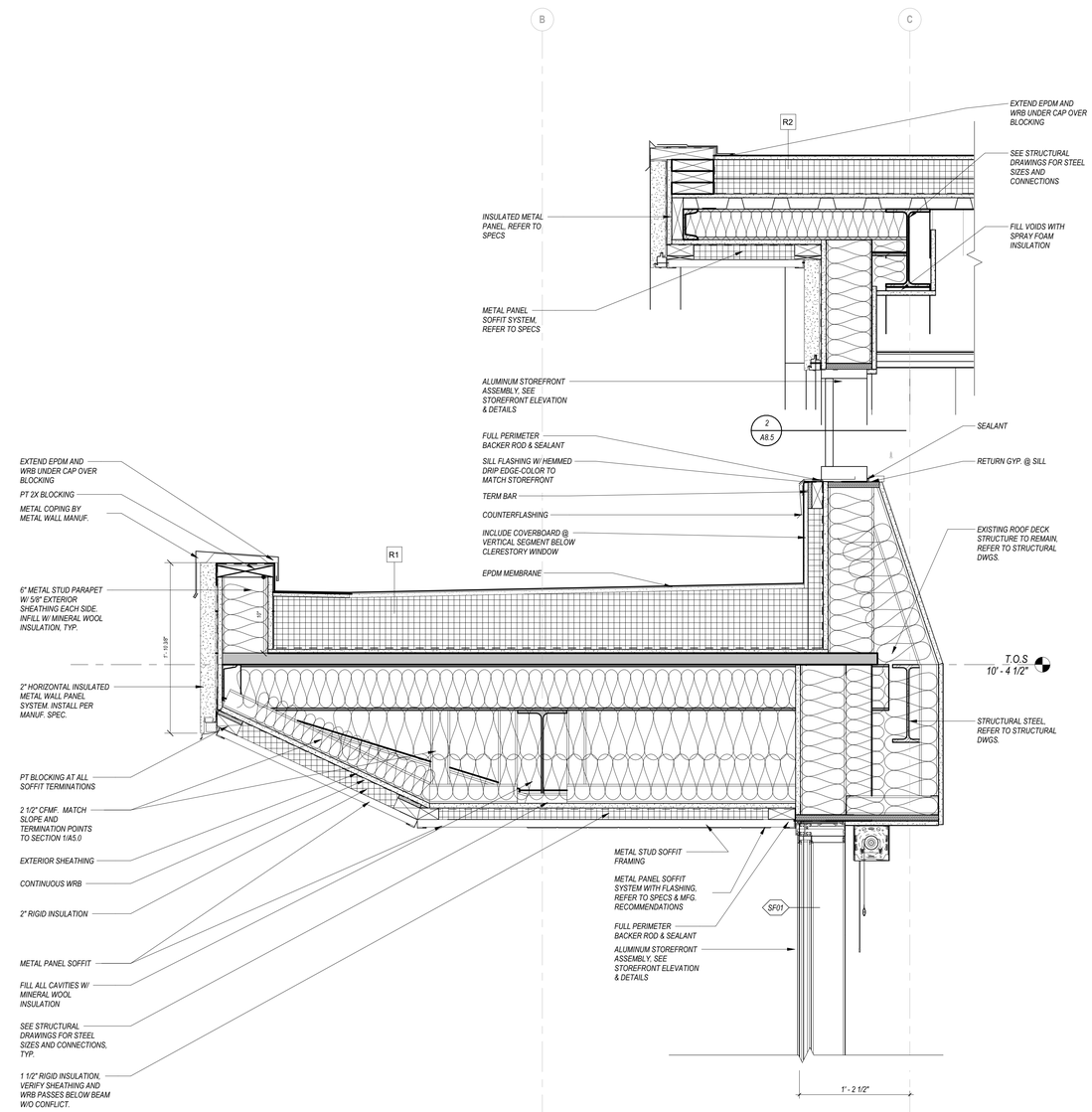
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SECTION DETAILS

A6.2



2 A6.3 **SECTION DETAIL @ DOOR INFILL**
1 1/2" = 1'-0"



1 A6.3 **SECTION DETAIL 10**
1 1/2" = 1'-0"

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RENOVATIONS TO:

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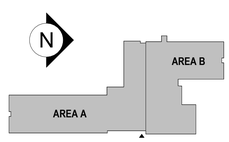
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SECTION DETAILS

A6.3

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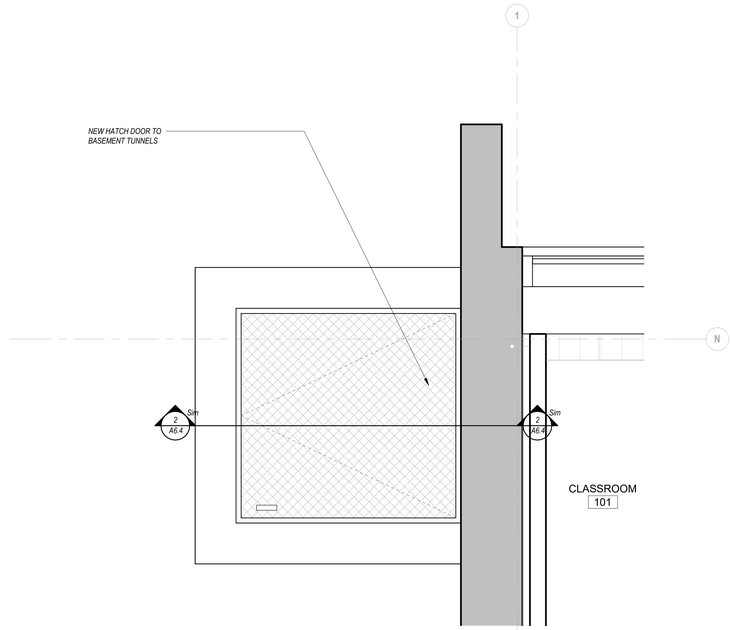
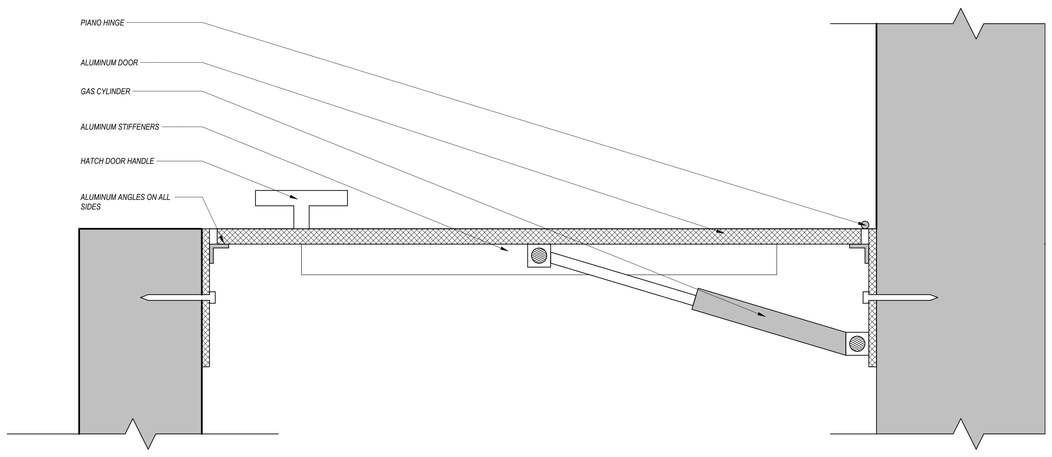
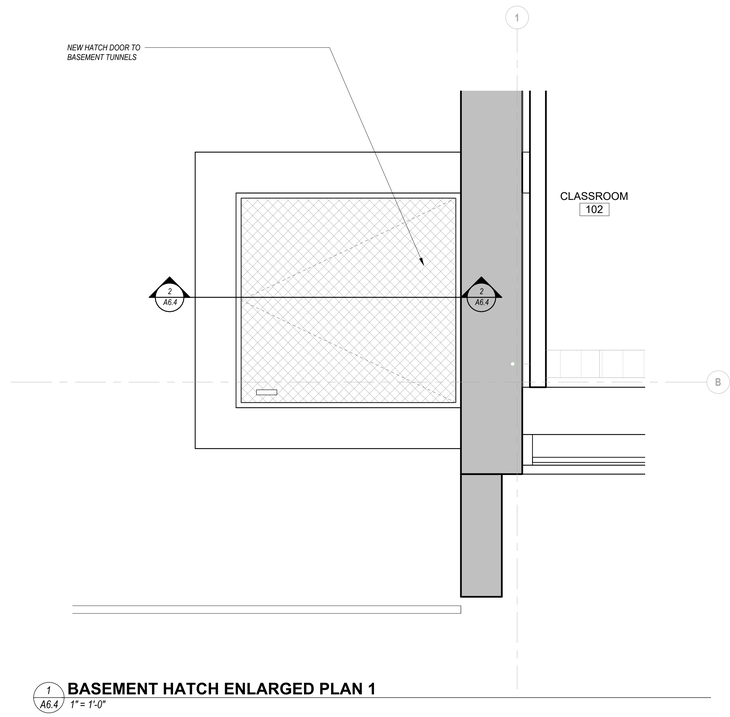


3 A6.4 **BASEMENT HATCH ENLARGED PLAN 2**
1" = 1'-0"



2 A6.4 **BASEMENT DOOR HATCH SECTION**
3" = 1'-0"



1 A6.4 **BASEMENT HATCH ENLARGED PLAN 1**
1" = 1'-0"

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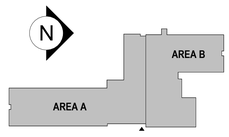
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

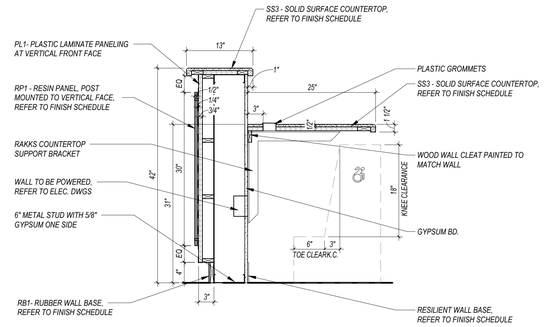
Revisions



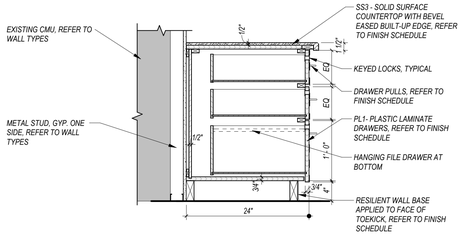
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT HATCH DETAIL

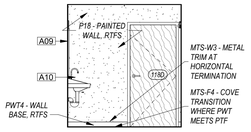
A6.4



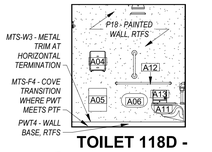
RECEPTION DESK MILLWORK DETAIL - WORKSPACE
11 / A6.10 — 1" = 1'-0"



RECEPTION DESK MILLWORK DETAIL - BOX/BOX/FILE
12 / A6.10 — 1" = 1'-0"

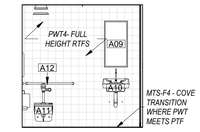


TOILET 118D - ELEVATION 4
6 / A6.10 — 1/4" = 1'-0"



TOILET 118D - ELEVATION 3
5 / A6.10 — 1/4" = 1'-0"

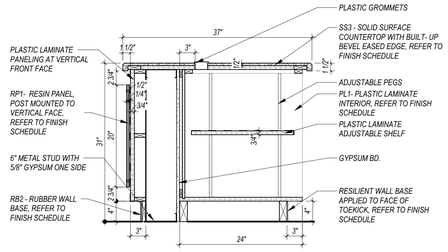
TOILET 118D - ELEVATION 2
4 / A6.10 — 1/4" = 1'-0"



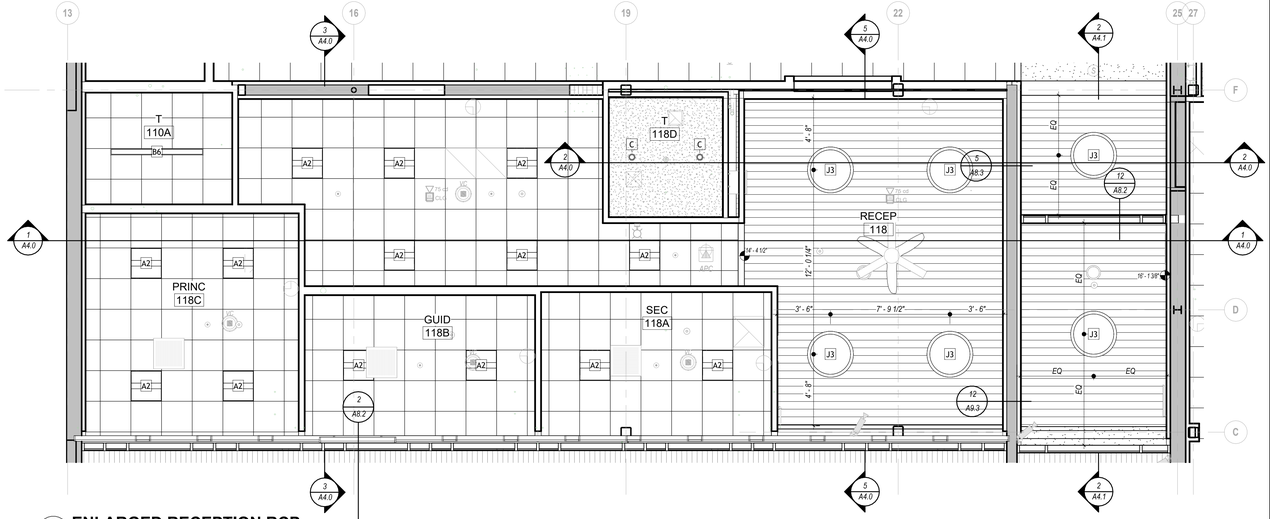
TOILET 118D - ELEVATION 1
3 / A6.10 — 1/4" = 1'-0"

BATHROOM KEYNOTE LEGEND

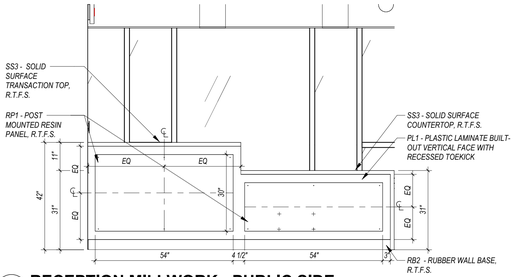
Key Value	Keynote Text
A01	SMALL MIRROR. REFER TO ARCH SPEC.
A02	WALL MOUNTED FAUCET. REFER TO ARCH SPEC.
A03	CUSTOM SS2 SINK. REFER TO ARCH SPEC.
A04	PAPER TOWEL DISPENSER. REFER TO ARCH SPEC.
A05	WALL MOUNTED WASTE RECEPTACLE. REFER TO ARCH SPEC.
A06	TOILET PAPER DISPENSER. REFER TO ARCH SPEC.
A07	SMALL TOILET. REFER TO ARCH SPEC.
A08	SMALL ADA GRAB BARS. REFER TO ARCH SPEC.
A09	LARGE MIRROR. REFER TO ARCH SPEC.
A10	WALL HUNK SINK. REFER TO ARCH SPEC.
A11	LARGE TOILET. REFER TO ARCH SPEC.
A12	LARGE ADA GRAB BARS. REFER TO ARCH SPEC.
A13	NAPKIN DISPOSAL CONTAINER. REFER TO ARCH SPEC.



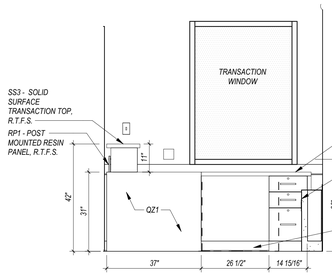
RECEPTION DESK MILLWORK DETAIL - BOOKCASE CABINET
10 / A6.10 — 1" = 1'-0"



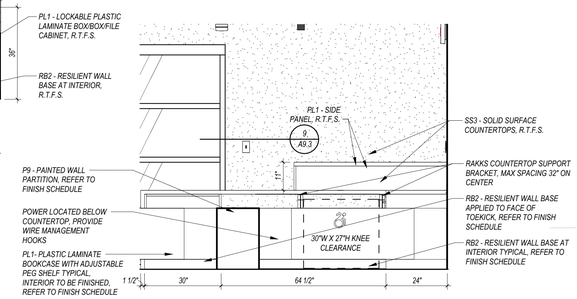
ENLARGED RECEPTION RCP
2 / A6.10 — 1/4" = 1'-0"



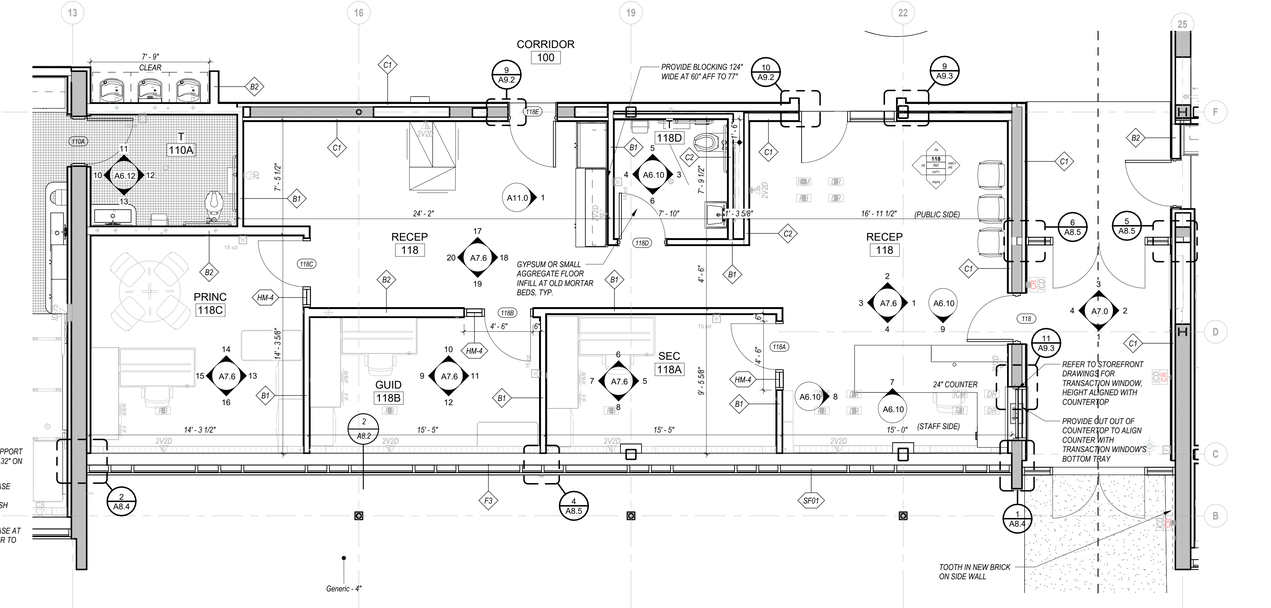
RECEPTION MILLWORK - PUBLIC SIDE
9 / A6.10 — 1/2" = 1'-0"



RECEPTION MILLWORK
8 / A6.10 — 1/2" = 1'-0"



RECEPTION MILLWORK - STAFF SIDE
7 / A6.10 — 1/2" = 1'-0"



ENLARGED RECEPTION PLAN
1 / A6.10 — 1/4" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED RECEPTION PLAN

A6.10

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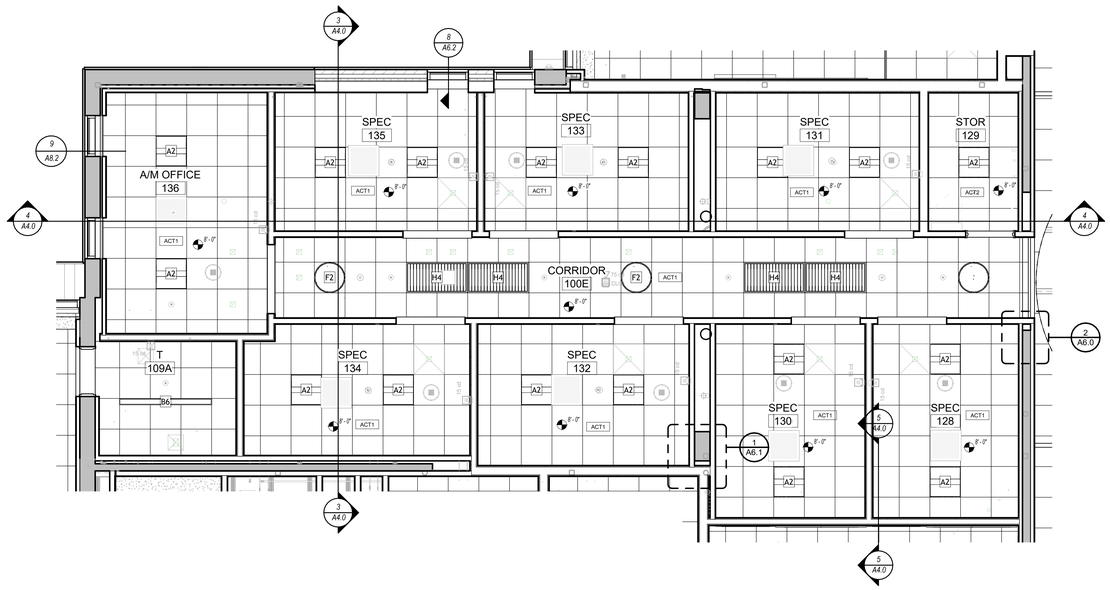
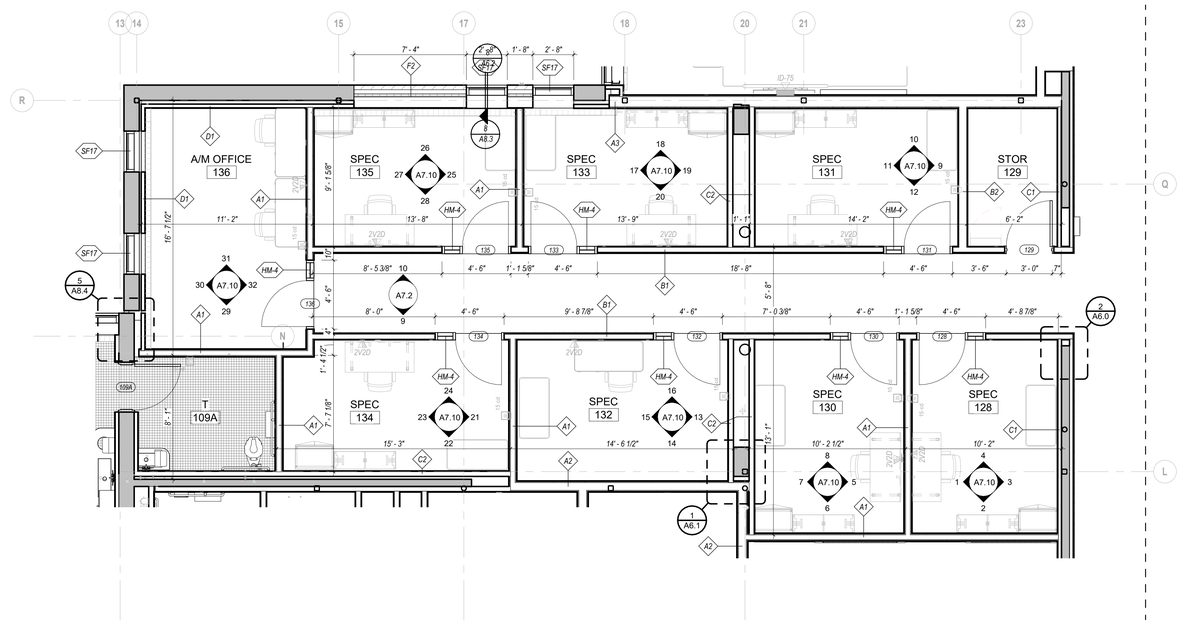


2 A6.11 **ENLARGED SPEC. OFFICES RCPS**
1/4" = 1'-0"



1 A6.11 **ENLARGED SPEC. OFFICES PLAN**
1/4" = 1'-0"

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED SPEC. OFFICES PLAN

A6.11

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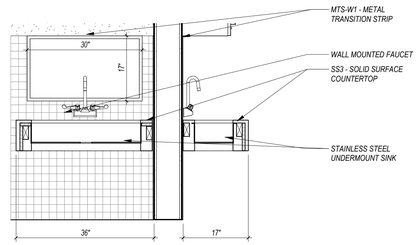
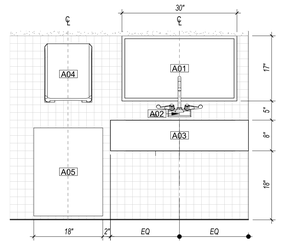
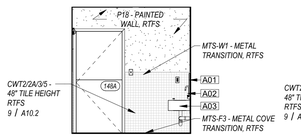


31 A6.12 **TYPICAL CLASSROOM SINK SECTION**
3/4" = 1'-0"

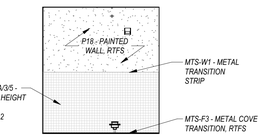


30 A6.12 **TYPICAL CLASSROOM SINK ELEVATION**
3/4" = 1'-0"

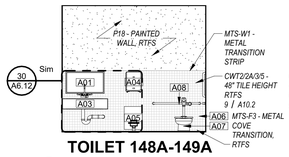
BATHROOM KEYNOTE LEGEND	
Key Value	Keynote Text
A01	SMALL MIRROR. REFER TO ARCH SPEC.
A02	WALL MOUNTED FAUCET. REFER TO ARCH SPEC.
A03	CUSTOM SS2 SINK. REFER TO ARCH SPEC.
A04	PAPER TOWEL DISPENSER. REFER TO ARCH SPEC.
A05	WALL MOUNTED WASTE RECEPTACLE. REFER TO ARCH SPEC.
A06	TOILET PAPER DISPENSER. REFER TO ARCH SPEC.
A07	SMALL TOILET. REFER TO ARCH SPEC.
A08	SMALL ADA GRAB BARS. REFER TO ARCH SPEC.
A09	LARGE MIRROR. REFER TO ARCH SPEC.
A10	WALL HUNK SINK. REFER TO ARCH SPEC.
A11	LARGE TOILET. REFER TO ARCH SPEC.
A12	LARGE ADA GRAB BARS. REFER TO ARCH SPEC.
A13	NAPKIN DISPOSAL CONTAINER. REFER TO ARCH SPEC.



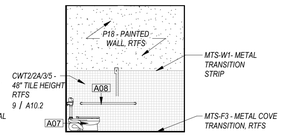
29 A6.12 **TOILET 148A-149A ELEVATION 4**
1/4" = 1'-0"



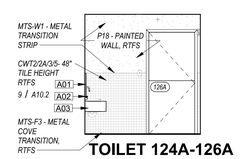
27 A6.12 **TOILET 148A-149A ELEVATION 2**
1/4" = 1'-0"



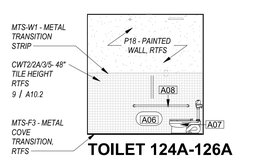
28 A6.12 **TOILET 148A-149A ELEVATION 3**
1/4" = 1'-0"



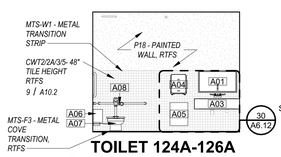
26 A6.12 **TOILET 148A-149A ELEVATION 1**
1/4" = 1'-0"



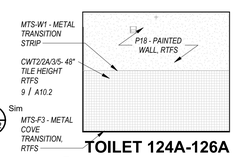
17 A6.12 **TOILET 124A-126A ELEVATION 4**
1/4" = 1'-0"



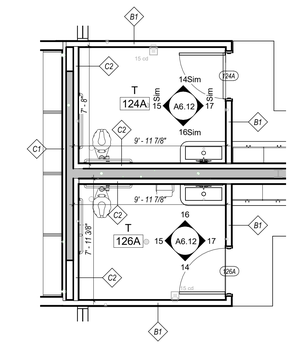
15 A6.12 **TOILET 124A-126A ELEVATION 2**
1/4" = 1'-0"



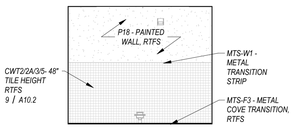
16 A6.12 **TOILET 124A-126A ELEVATION 3**
1/4" = 1'-0"



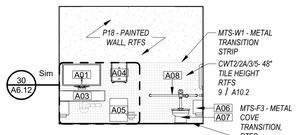
14 A6.12 **TOILET 124A-126A ELEVATION 1**
1/4" = 1'-0"



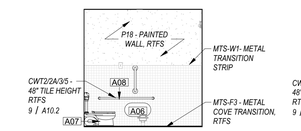
3 A6.12 **TYP CLASSROOM BATHROOMS 124A-126A**
1/4" = 1'-0"



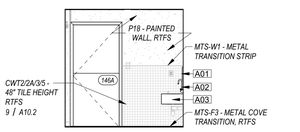
25 A6.12 **TOILET 146A-147A ELEVATION 4**
1/4" = 1'-0"



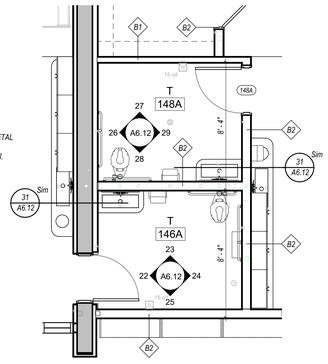
23 A6.12 **TOILET 146A-147A ELEVATION 2**
1/4" = 1'-0"



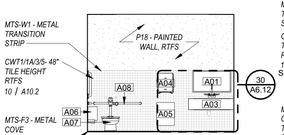
24 A6.12 **TOILET 146A-147A ELEVATION 3**
1/4" = 1'-0"



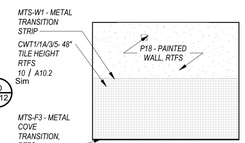
22 A6.12 **TOILET 146A-147A ELEVATION 1**
1/4" = 1'-0"



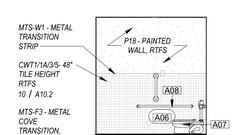
5 A6.12 **TYP CLASSROOM BATHROOMS 146A-149A**
1/4" = 1'-0"



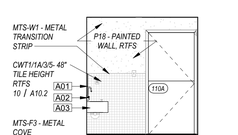
13 A6.12 **TOILET 109A-110A ELEVATION 4**
1/4" = 1'-0"



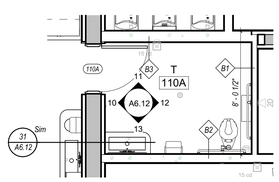
11 A6.12 **TOILET 109A-110A ELEVATION 2**
1/4" = 1'-0"



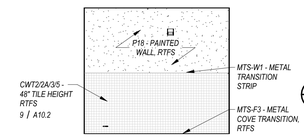
12 A6.12 **TOILET 109A-110A ELEVATION 3**
1/4" = 1'-0"



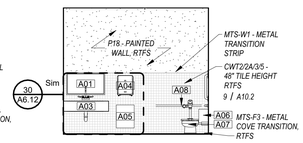
10 A6.12 **TOILET 109A-110A ELEVATION 1**
1/4" = 1'-0"



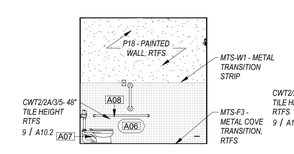
2 A6.12 **TYP CLASSROOM BATHROOMS 109A-110A**
1/4" = 1'-0"



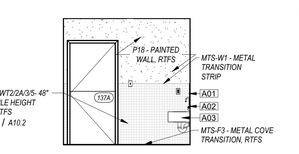
21 A6.12 **TOILET 137A-140A ELEVATION 4**
1/4" = 1'-0"



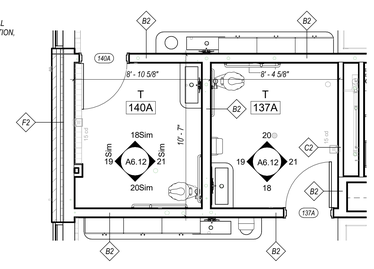
19 A6.12 **TOILET 137A-140A ELEVATION 2**
1/4" = 1'-0"



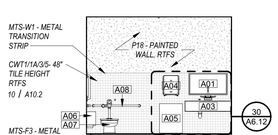
20 A6.12 **TOILET 137A-140A ELEVATION 3**
1/4" = 1'-0"



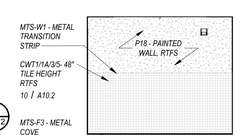
18 A6.12 **TOILET 137A-140A ELEVATION 1**
1/4" = 1'-0"



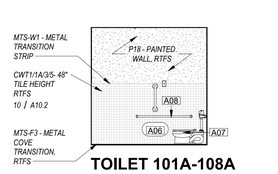
4 A6.12 **TYP CLASSROOM BATHROOMS 137A-140A**
1/4" = 1'-0"



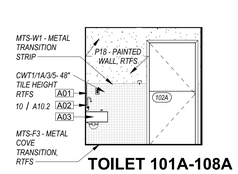
9 A6.12 **TOILET 101A-108A ELEVATION 4**
1/4" = 1'-0"



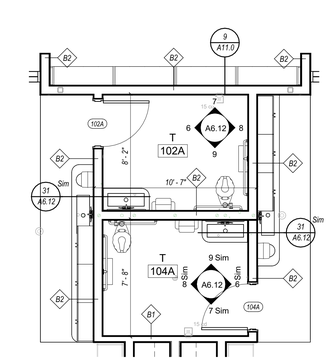
7 A6.12 **TOILET 101A-108A ELEVATION 2**
1/4" = 1'-0"



8 A6.12 **TOILET 101A-108A ELEVATION 3**
1/4" = 1'-0"



6 A6.12 **TOILET 101A-108A ELEVATION 1**
1/4" = 1'-0"



1 A6.12 **TYP CLASSROOM BATHROOMS 101A-108A**
1/4" = 1'-0"

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

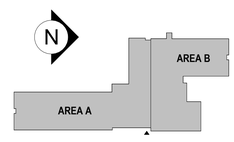
STATE OF CONNECTICUT · DAVID MALIK · 21827 · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

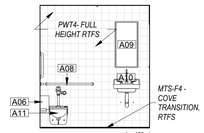
ENLARGED BATHROOM PLANS AND ELEVATIONS

A6.12

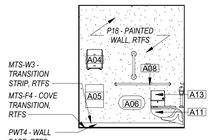
6/5/2026 12:10:54 PM C:\Users\mlane\AppData\Local\Autodesk\Revit\Autodesk Revit 2026\Collaboration\Cache\NX65LUDAB6UY145df9e2f-f51b-43ed-9bb5-be23aeaea7a2\de447a5db-6fb6-4165-af3f-95f22f20c489.rvt

BATHROOM KEYNOTE LEGEND

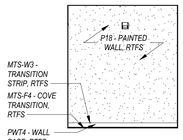
Key Value	Keynote Text
A01	SMALL MIRROR. REFER TO ARCH SPEC.
A02	WALL MOUNTED FAUCET. REFER TO ARCH SPEC.
A03	CUSTOM SS2 SINK. REFER TO ARCH SPEC.
A04	PAPER TOWEL DISPENSER. REFER TO ARCH SPEC.
A05	WALL MOUNTED WASTE RECEPTACLE. REFER TO ARCH SPEC.
A06	TOILET PAPER DISPENSER. REFER TO ARCH SPEC.
A07	SMALL TOILET. REFER TO ARCH SPEC.
A08	SMALL ADA GRAB BARS. REFER TO ARCH SPEC.
A09	LARGE MIRROR. REFER TO ARCH SPEC.
A10	WALL HUNK SINK. REFER TO ARCH SPEC.
A11	LARGE TOILET. REFER TO ARCH SPEC.
A12	LARGE ADA GRAB BARS. REFER TO ARCH SPEC.
A13	NAPKIN DISPOSAL CONTAINER. REFER TO ARCH SPEC.



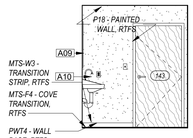
TOILET 143 - ELEVATION 4
33 A6.13 1/4" = 1'-0"



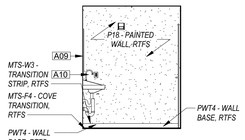
TOILET 143 - ELEVATION 3
32 A6.13 1/4" = 1'-0"



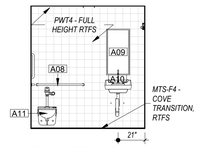
TOILET 143 - ELEVATION 2
31 A6.13 1/4" = 1'-0"



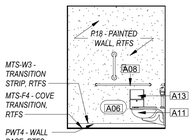
TOILET 143 - ELEVATION 1
30 A6.13 1/4" = 1'-0"



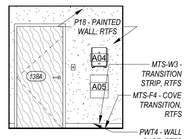
TOILET 138A - ELEVATION 4
29 A6.13 1/4" = 1'-0"



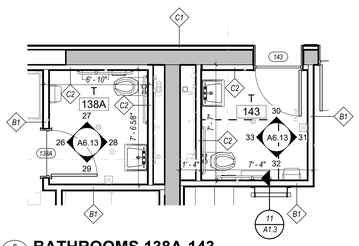
TOILET 138A - ELEVATION 3
28 A6.13 1/4" = 1'-0"



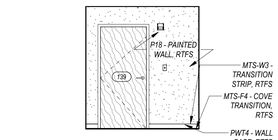
TOILET 138A - ELEVATION 2
27 A6.13 1/4" = 1'-0"



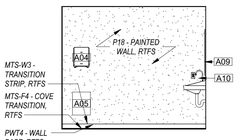
TOILET 138A - ELEVATION 1
26 A6.13 1/4" = 1'-0"



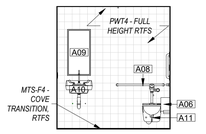
5 A6.13 BATHROOMS 138A-143
1/4" = 1'-0"



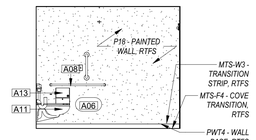
TOILET 139 - ELEVATION 4
25 A6.13 1/4" = 1'-0"



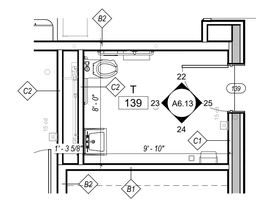
TOILET 139 - ELEVATION 3
24 A6.13 1/4" = 1'-0"



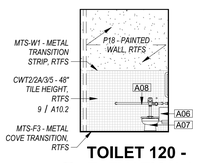
TOILET 139 - ELEVATION 2
23 A6.13 1/4" = 1'-0"



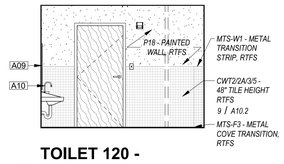
TOILET 139 - ELEVATION 1
22 A6.13 1/4" = 1'-0"



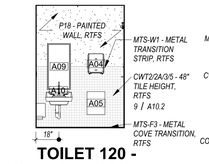
4 A6.13 TOILET 139
1/4" = 1'-0"



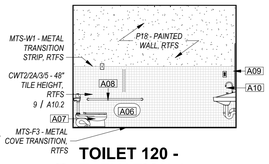
TOILET 120 - ELEVATION 4
21 A6.13 1/4" = 1'-0"



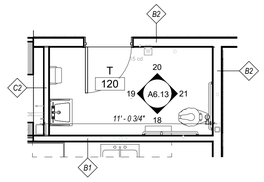
TOILET 120 - ELEVATION 3
20 A6.13 1/4" = 1'-0"



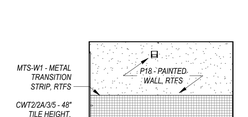
TOILET 120 - ELEVATION 2
19 A6.13 1/4" = 1'-0"



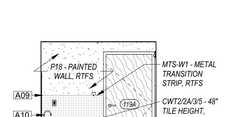
TOILET 120 - ELEVATION 1
18 A6.13 1/4" = 1'-0"



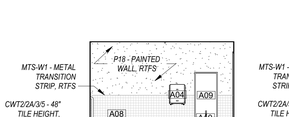
2 A6.13 BATHROOM 120
1/4" = 1'-0"



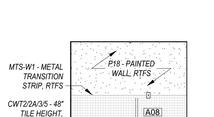
TOILET 119A - ELEVATION 4
17 A6.13 1/4" = 1'-0"



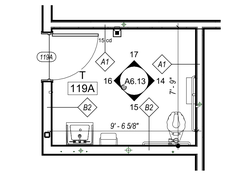
TOILET 119A - ELEVATION 3
16 A6.13 1/4" = 1'-0"



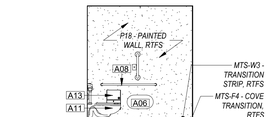
TOILET 119A - ELEVATION 2
15 A6.13 1/4" = 1'-0"



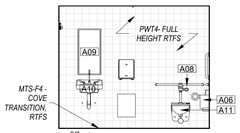
TOILET 119A - ELEVATION 1
14 A6.13 1/4" = 1'-0"



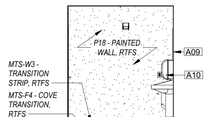
3 A6.13 NURSE BATHROOMS 119A
1/4" = 1'-0"



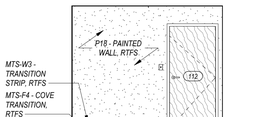
TOILET 112 - ELEVATION 4
13 A6.13 1/4" = 1'-0"



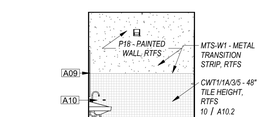
TOILET 112 - ELEVATION 3
12 A6.13 1/4" = 1'-0"



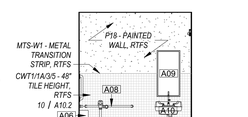
TOILET 112 - ELEVATION 2
11 A6.13 1/4" = 1'-0"



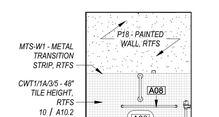
TOILET 112 - ELEVATION 1
10 A6.13 1/4" = 1'-0"



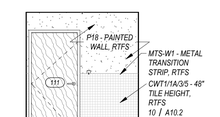
TOILET 111 - ELEVATION 4
9 A6.13 1/4" = 1'-0"



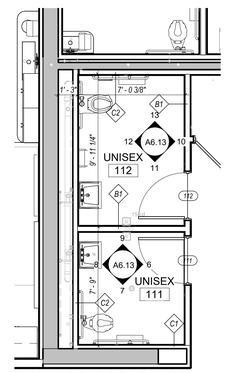
TOILET 111 - ELEVATION 3
8 A6.13 1/4" = 1'-0"



TOILET 111 - ELEVATION 2
7 A6.13 1/4" = 1'-0"



TOILET 111 - ELEVATION 1
6 A6.13 1/4" = 1'-0"



1 A6.13 FACULTY BATHROOMS 111-112
1/4" = 1'-0"

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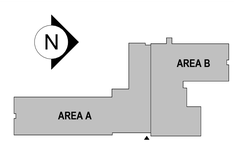
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED BATHROOM PLANS AND ELEVATIONS

A6.13

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GENERAL NOTES

1- REFER TO SPECIFICATION 09 00 00 FOR FINISH SCHEDULE AND INTERIOR FINISHES PRODUCT LIST (RTFS).

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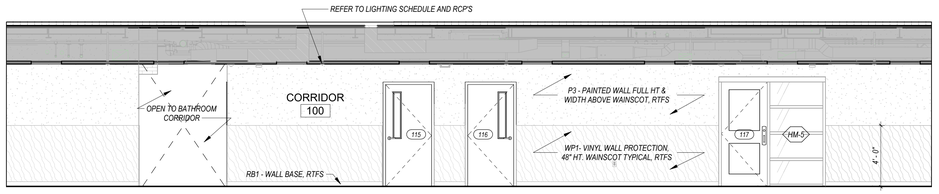
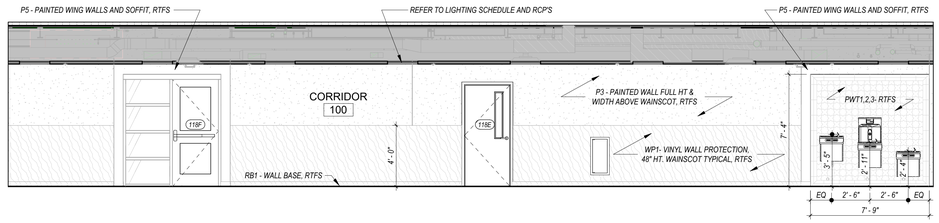
3-REFER TO MEP PLANS/SPECS FOR PLUMBING INFORMATION.

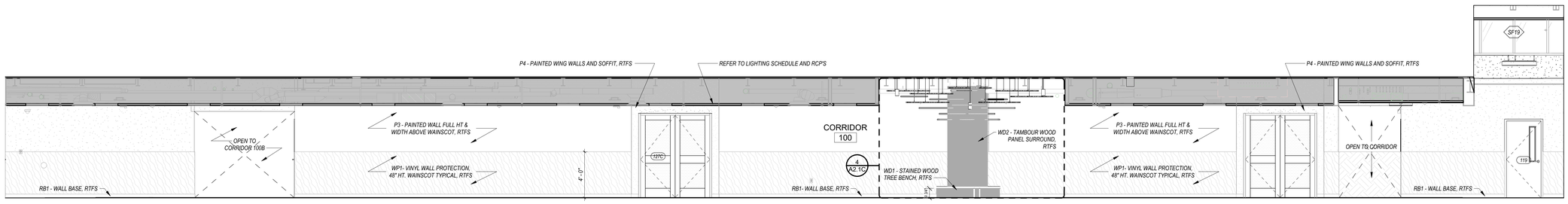
4- DO NOT SCALE DRAWINGS, REFER TO WRITTEN DIMENSIONS AND NOTES.



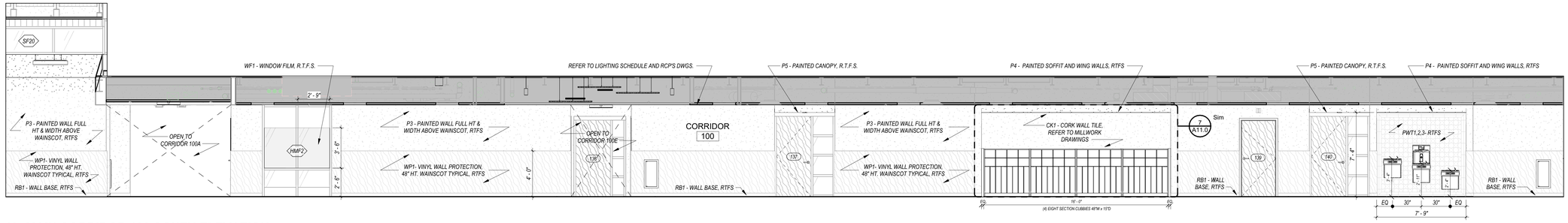
2A / A7.0 **CORRIDOR 100-WEST ELEVATION**
1/4" = 1'-0"



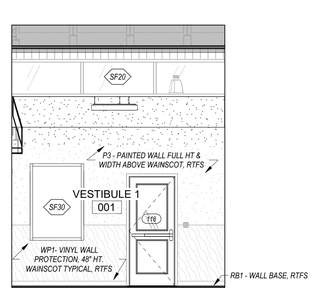
1A / A7.0 **CORRIDOR 100-EAST ELEVATION**
1/4" = 1'-0"



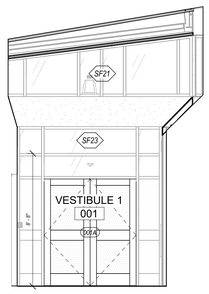
6 / A7.0 **MAIN CORRIDOR 100 NORTH ELEVATION**
1/4" = 1'-0"



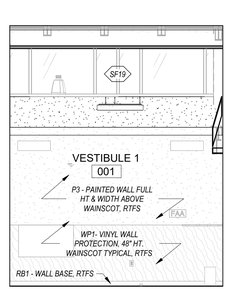
5 / A7.0 **MAIN CORRIDOR 100 SOUTH ELEVATION**
1/4" = 1'-0"



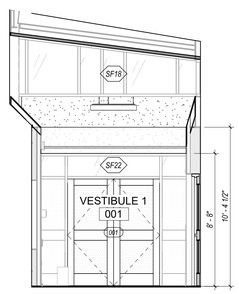
4 / A7.0 **VESTIBULE 1- SOUTH ELEVATION**
1/4" = 1'-0"



3 / A7.0 **VESTIBULE 1- WEST ELEVATION**
1/4" = 1'-0"



2 / A7.0 **VESTIBULE 1- NORTH ELEVATION**
1/4" = 1'-0"



1 / A7.0 **VESTIBULE 1- EAST ELEVATION**
1/4" = 1'-0"

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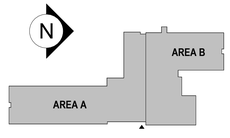
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MAIN CORRIDOR INTERIOR ELEVATIONS

A7.0

GENERAL NOTES

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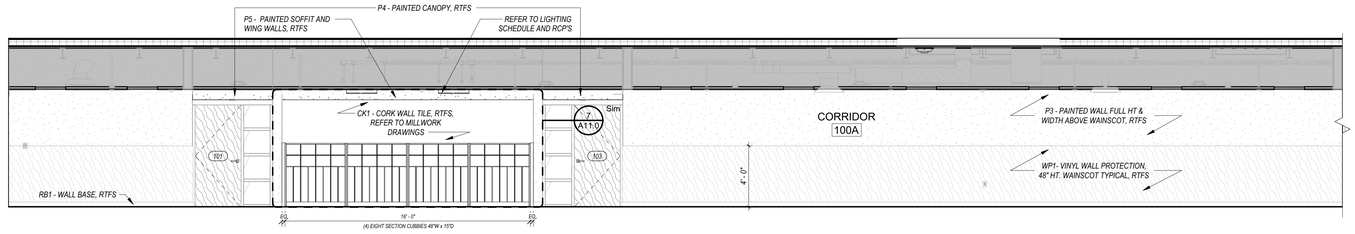
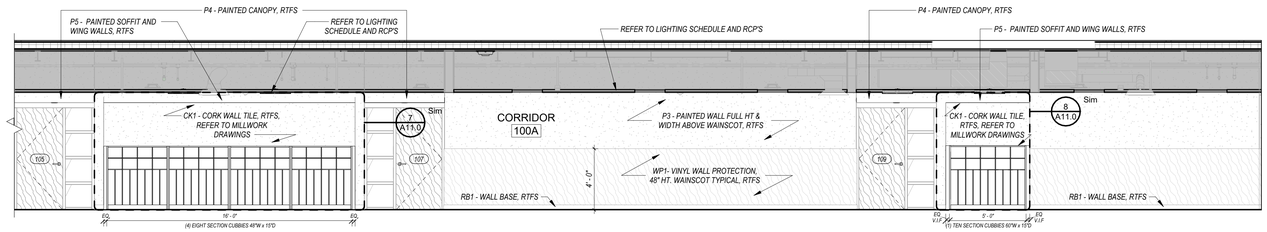
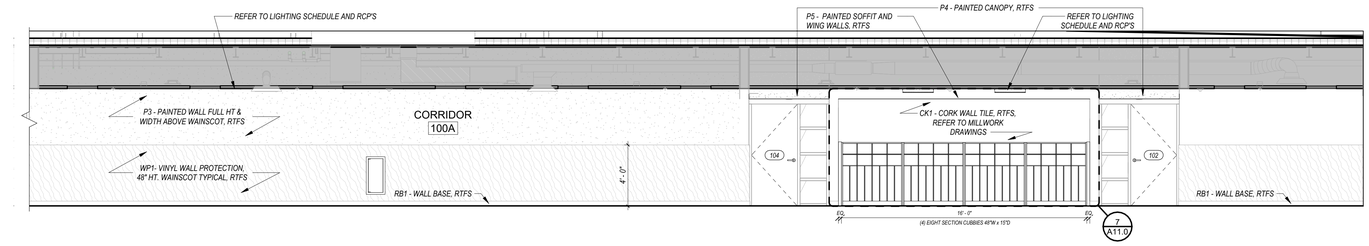


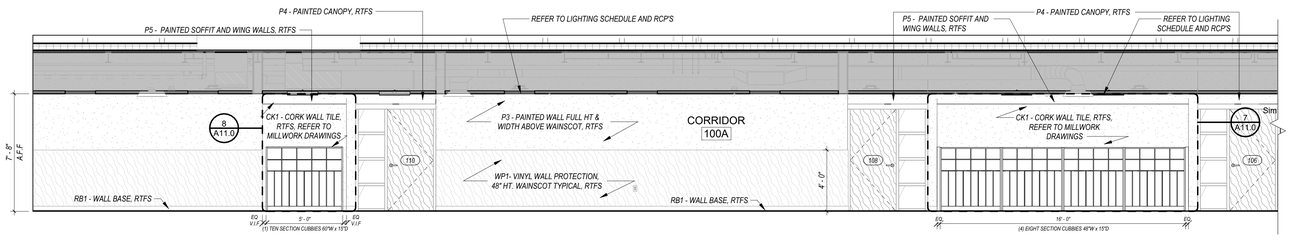
2C A7.1 **CORRIDOR 104A-WEST ELEVATION 2C**
1/4" = 1'-0"



2B A7.1 **CORRIDOR 100A-WEST ELEVATION 2B**
1/4" = 1'-0"



1C A7.1 **CORRIDOR 100A-EAST ELEVATION 1C**
1/4" = 1'-0"



1B A7.1 **CORRIDOR 100A-EAST ELEVATION 1B**
1/4" = 1'-0"

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RENOVATIONS TO:
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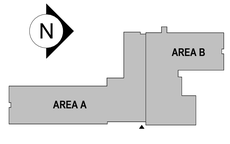
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MAIN CORRIDOR INTERIOR ELEVATIONS

A7.1

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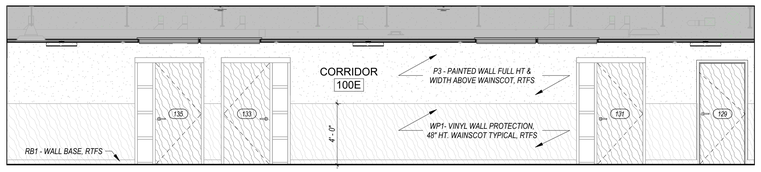
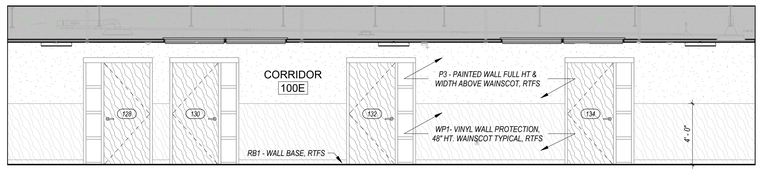
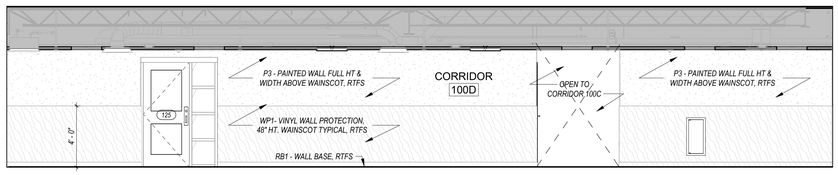


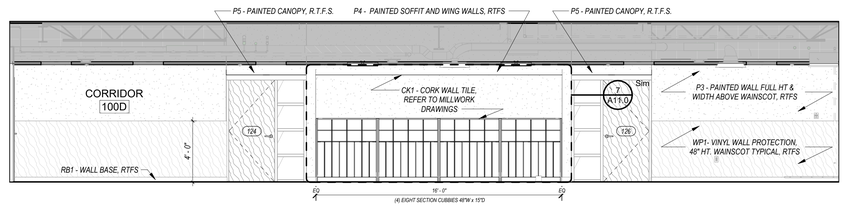
10 A7.2 **CORRIDOR 100E- WEST ELEVATION**
1/4" = 1'-0"



9 A7.2 **CORRIDOR 100E- EAST ELEVATION**
1/4" = 1'-0"

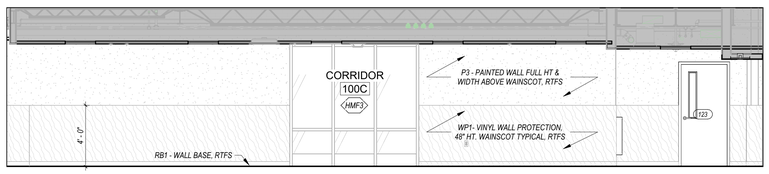


8 A7.2 **CORRIDOR 100D -SOUTH ELEVATION**
1/4" = 1'-0"

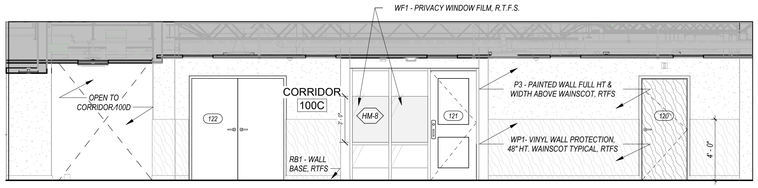


7 A7.2 **CORRIDOR 100D -NORTH ELEVATION**
1/4" = 1'-0"

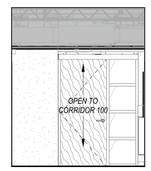
CORRIDOR 100B- SOUTH ELEVATION
4 A7.2 1/4" = 1'-0"



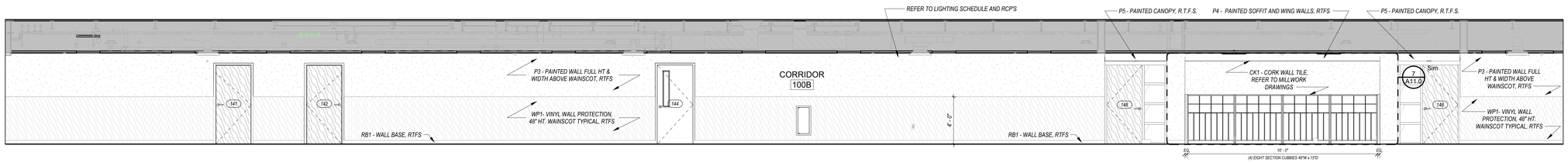
6 A7.2 **CORRIDOR 100C -WEST ELEVATION**
1/4" = 1'-0"



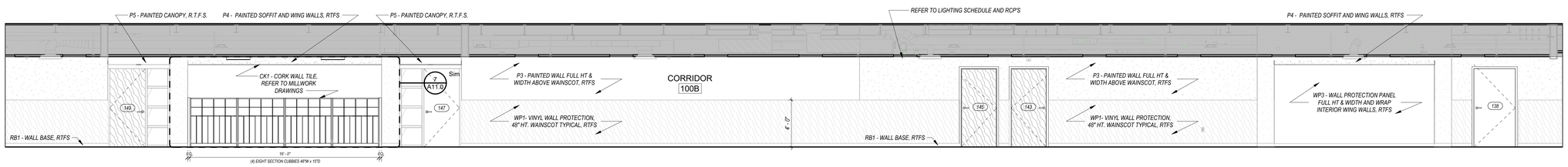
5 A7.2 **CORRIDOR 100C -EAST ELEVATION**
1/4" = 1'-0"



CORRIDOR 100B- NORTH ELEVATION
3 A7.2 1/4" = 1'-0"



2 A7.2 **CORRIDOR 100B- WEST ELEVATION**
1/4" = 1'-0"



1 A7.2 **CORRIDOR 100B-EAST ELEVATION**
1/4" = 1'-0"

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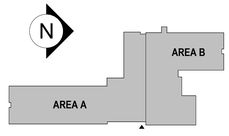

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATION-CORRIDOR

A7.2

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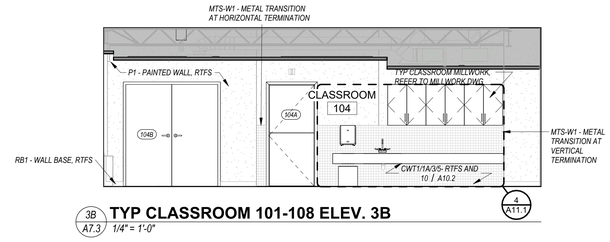
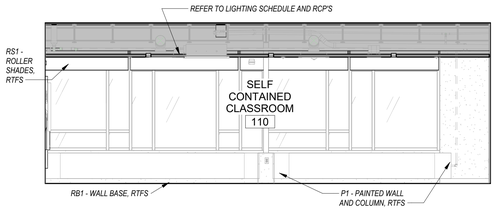
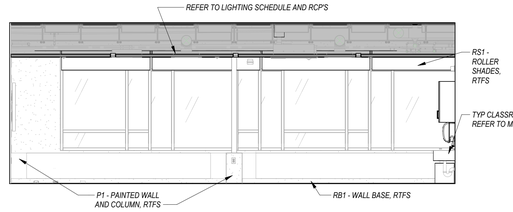


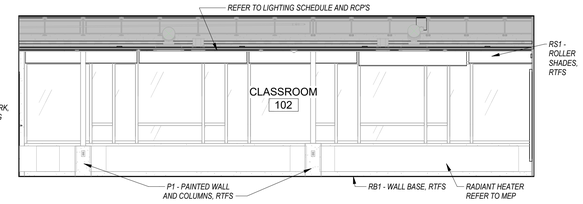
3B A7.3 **TYP CLASSROOM 101-108 ELEV. 3B**
1/4" = 1'-0"



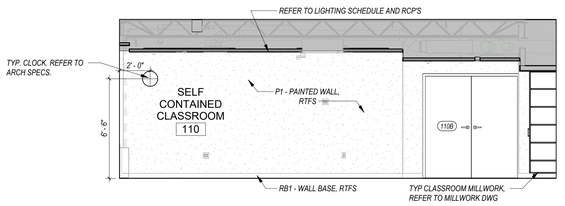
12 A7.3 **SELF CONTAINED CLASSROOM 110 ELEV. 4**
1/4" = 1'-0"



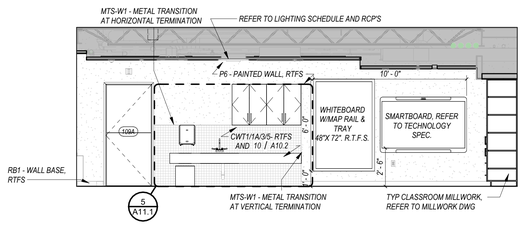
8 A7.3 **SELF CONTAINED CLASSROOM 109 ELEV. 4**
1/4" = 1'-0"



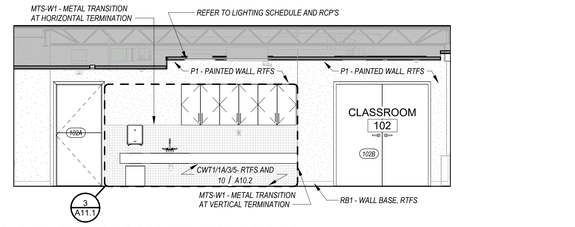
4 A7.3 **TYP CLASSROOM 101-108 ELEV. 4**
1/4" = 1'-0"



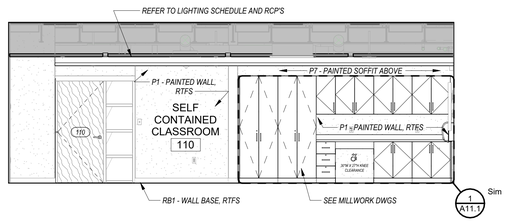
11 A7.3 **SELF CONTAINED CLASSROOM 110 ELEV. 3**
1/4" = 1'-0"



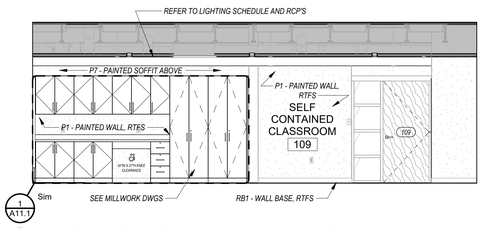
7 A7.3 **SELF CONTAINED CLASSROOM 109 ELEV. 3**
1/4" = 1'-0"



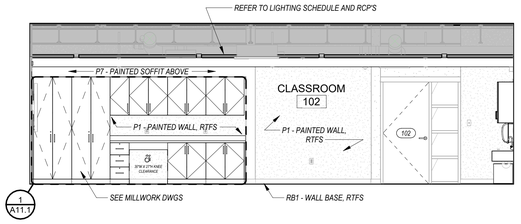
3A A7.3 **TYP CLASSROOM 101-108 ELEV. 3A**
1/4" = 1'-0"



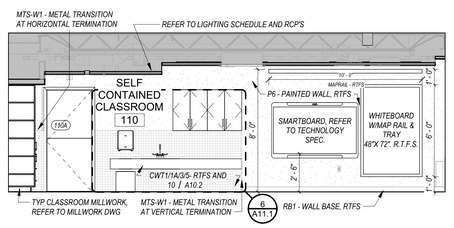
10 A7.3 **SELF CONTAINED CLASSROOM 110 ELEV. 2**
1/4" = 1'-0"



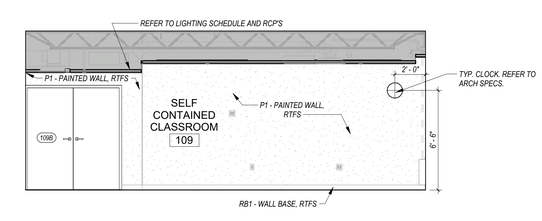
6 A7.3 **SELF CONTAINED CLASSROOM 109 ELEV. 2**
1/4" = 1'-0"



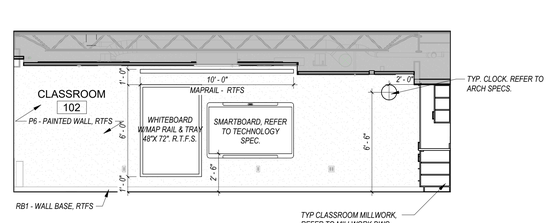
2 A7.3 **TYP CLASSROOM 101-108 ELEV. 2**
1/4" = 1'-0"



9 A7.3 **SELF CONTAINED CLASSROOM 110 ELEV. 1**
1/4" = 1'-0"



5 A7.3 **SELF CONTAINED CLASSROOM 109 ELEV. 1**
1/4" = 1'-0"



1 A7.3 **TYP CLASSROOM 101-108 ELEV. 1**
1/4" = 1'-0"

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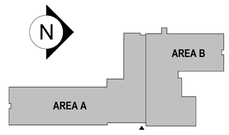
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS - CLASSROOMS

A7.3

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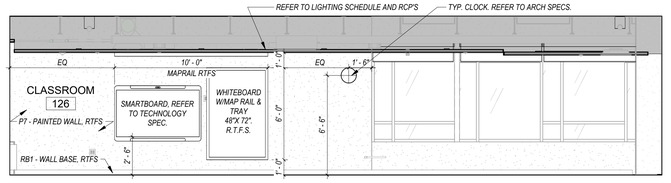
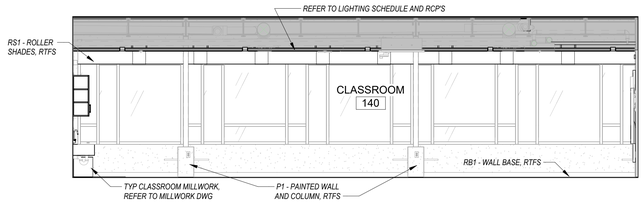
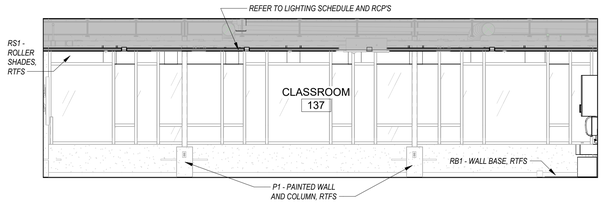


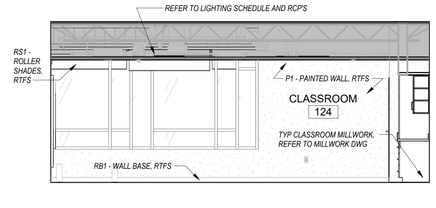
1B A7.4 **CLASSROOM 124-126 ELEVATION 1B**
1/4" = 1'-0"



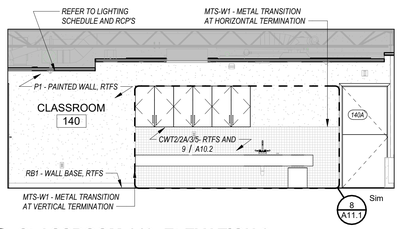
12 A7.4 **CLASSROOM 140- ELEVATION 4**
1/4" = 1'-0"



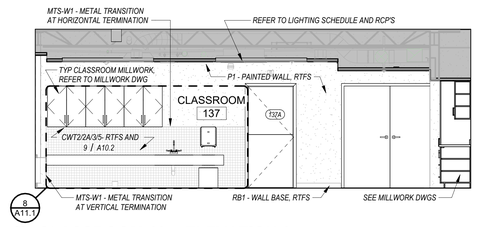
8 A7.4 **CLASSROOM 137- ELEVATION 4**
1/4" = 1'-0"



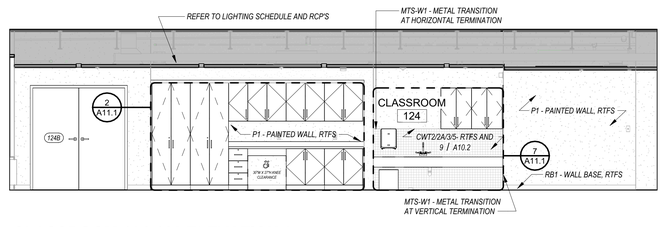
4 A7.4 **CLASSROOM 124-126 ELEVATION 4**
1/4" = 1'-0"



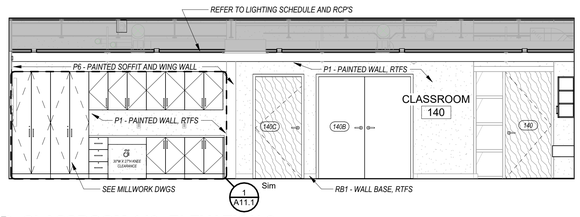
11 A7.4 **CLASSROOM 140- ELEVATION 3**
1/4" = 1'-0"



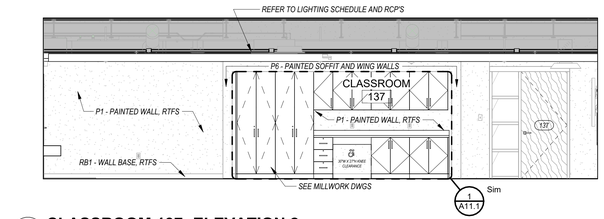
7 A7.4 **CLASSROOM 137- ELEVATION 3**
1/4" = 1'-0"



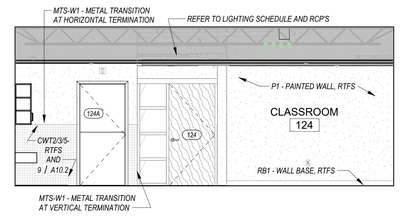
3 A7.4 **CLASSROOM 124-126 ELEVATION 3**
1/4" = 1'-0"



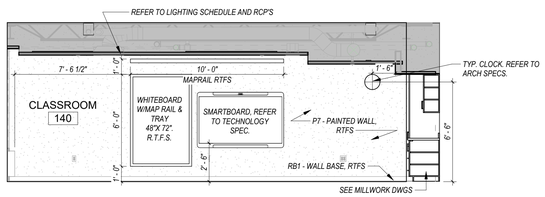
10 A7.4 **CLASSROOM 140- ELEVATION 2**
1/4" = 1'-0"



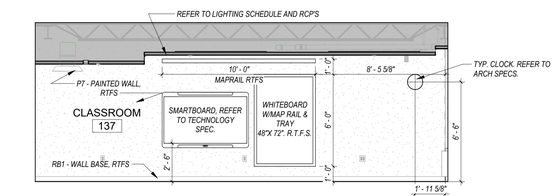
6 A7.4 **CLASSROOM 137- ELEVATION 2**
1/4" = 1'-0"



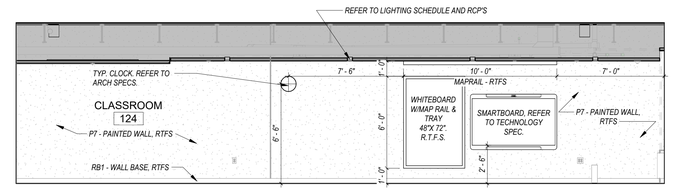
2 A7.4 **CLASSROOM 124-126 ELEVATION 2**
1/4" = 1'-0"



9 A7.4 **CLASSROOM 140- ELEVATION 1**
1/4" = 1'-0"



5 A7.4 **CLASSROOM 137- ELEVATION 1**
1/4" = 1'-0"



1A A7.4 **CLASSROOM 124-126 ELEVATION 1A**
1/4" = 1'-0"

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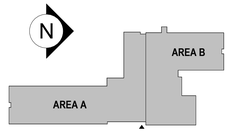
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

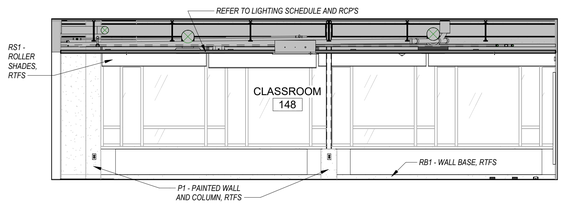
Revisions



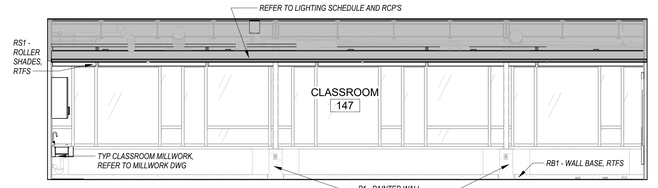
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS - CLASSROOMS

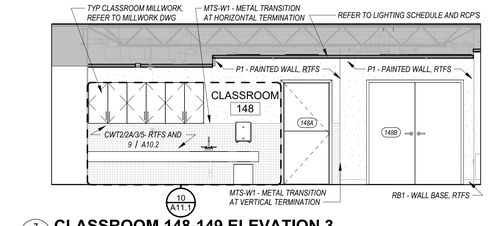
A7.4



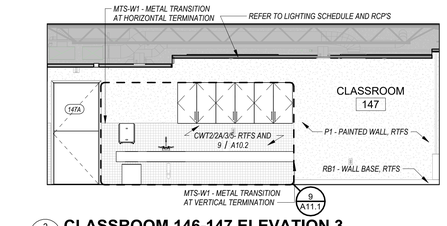
8 A7.5 **CLASSROOM 148-149 ELEVATION 4**
1/4" = 1'-0"



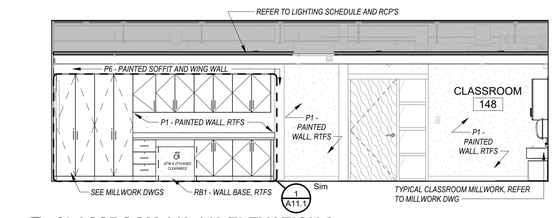
4 A7.5 **CLASSROOM 146-147 ELEVATION 4**
1/4" = 1'-0"



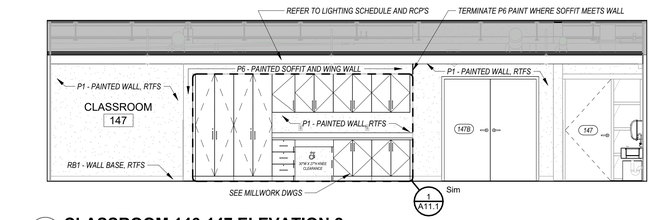
7 A7.5 **CLASSROOM 148-149 ELEVATION 3**
1/4" = 1'-0"



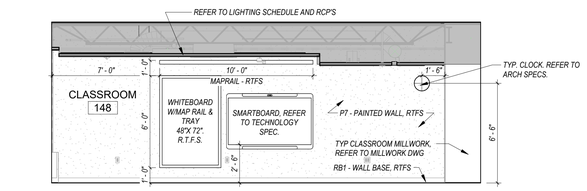
3 A7.5 **CLASSROOM 146-147 ELEVATION 3**
1/4" = 1'-0"



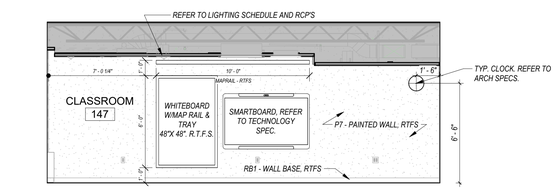
6 A7.5 **CLASSROOM 148-149 ELEVATION 2**
1/4" = 1'-0"



2 A7.5 **CLASSROOM 146-147 ELEVATION 2**
1/4" = 1'-0"



5 A7.5 **CLASSROOM 148-149 ELEVATION 1**
1/4" = 1'-0"



1 A7.5 **CLASSROOM 146-147 ELEVATION 1**
1/4" = 1'-0"

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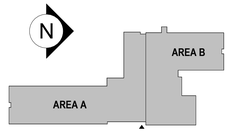
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS - CLASSROOMS

A7.5

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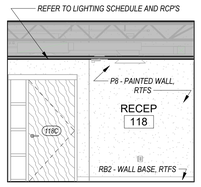
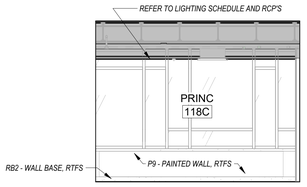
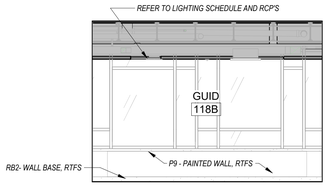


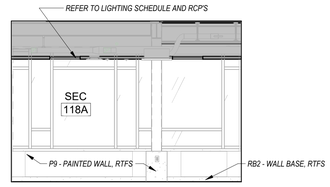
20 A7.6 **RECEPTION 118 - ELEVATION 8**
1/4" = 1'-0"



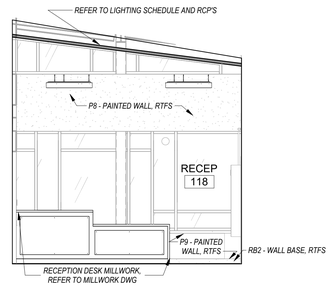
16 A7.6 **PRINC 118C - ELEVATION 4**
1/4" = 1'-0"



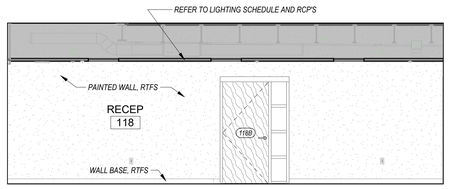
12 A7.6 **GUID 118B - ELEVATION 4**
1/4" = 1'-0"



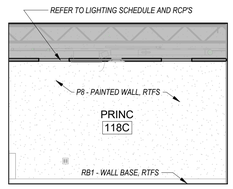
8 A7.6 **SEC 118A - ELEVATION 4**
1/4" = 1'-0"



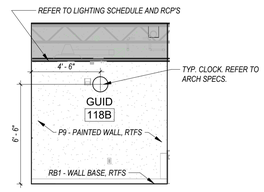
4 A7.6 **RECEPTION 118 - ELEVATION 4**
1/4" = 1'-0"



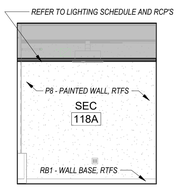
19 A7.6 **RECEPTION 118 - ELEVATION 7**
1/4" = 1'-0"



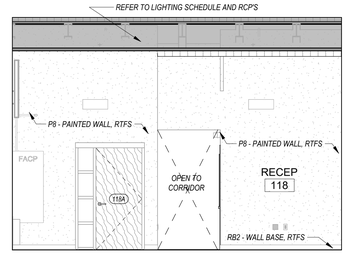
15 A7.6 **PRINC 118C - ELEVATION 3**
1/4" = 1'-0"



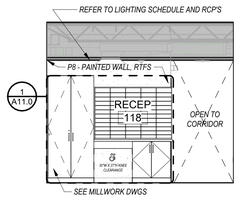
11 A7.6 **GUID 118B - ELEVATION 3**
1/4" = 1'-0"



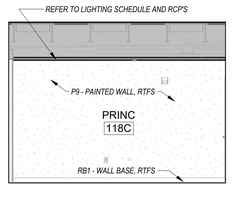
7 A7.6 **SEC 118A - ELEVATION 3**
1/4" = 1'-0"



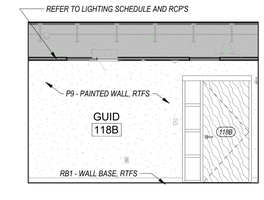
3 A7.6 **RECEPTION 118 - ELEVATION 3**
1/4" = 1'-0"



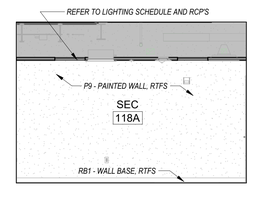
18 A7.6 **RECEPTION 118 - ELEVATION 6**
1/4" = 1'-0"



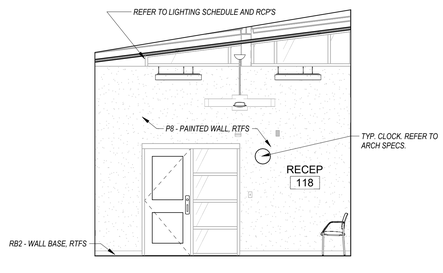
14 A7.6 **PRINC 118C - ELEVATION 2**
1/4" = 1'-0"



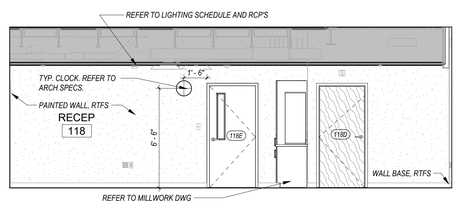
10 A7.6 **GUID 118B - ELEVATION 2**
1/4" = 1'-0"



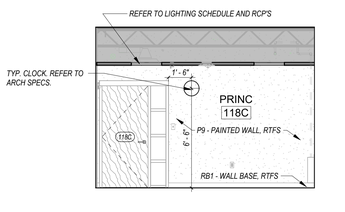
6 A7.6 **SEC 118A - ELEVATION 2**
1/4" = 1'-0"



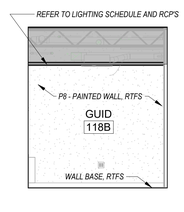
2 A7.6 **RECEPTION 118 - ELEVATION 2**
1/4" = 1'-0"



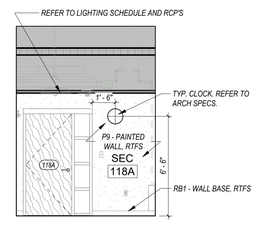
17 A7.6 **RECEPTION 118 - ELEVATION 5**
1/4" = 1'-0"



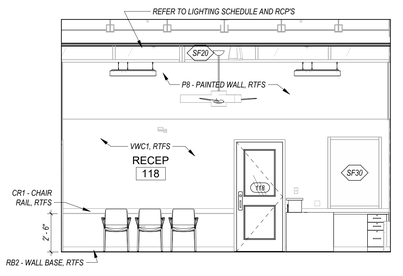
13 A7.6 **PRINC 118C - ELEVATION 1**
1/4" = 1'-0"



9 A7.6 **GUID 118B - ELEVATION 1**
1/4" = 1'-0"



5 A7.6 **SEC 118A - ELEVATION 1**
1/4" = 1'-0"



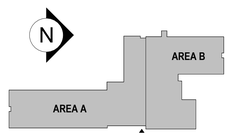
1 A7.6 **RECEPTION 118 - ELEVATION 1**
1/4" = 1'-0"

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

STATE OF CONNECTICUT · DAVID MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS - ADMIN

A7.6

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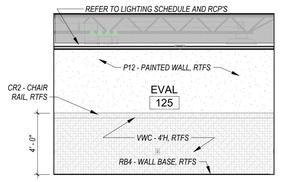
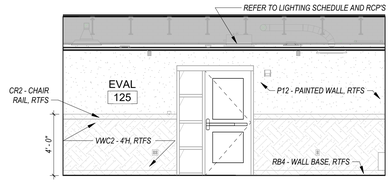


24 A7.7 **EVAL 125 - ELEVATION 4**
1/4" = 1'-0"



23 A7.7 **EVAL 125 - ELEVATION 3**
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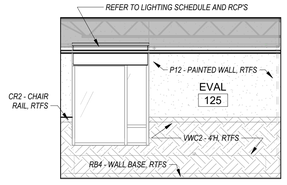

22 A7.7 **EVAL 125 - ELEVATION 2**
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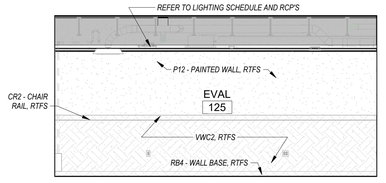
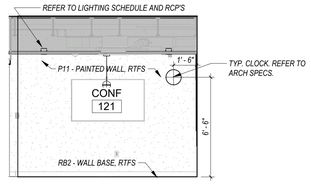
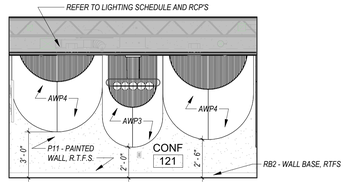


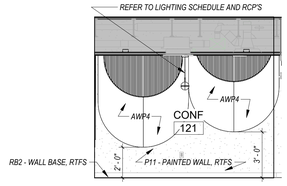
21 A7.7 **EVAL 125 - ELEVATION 1**
1/4" = 1'-0"



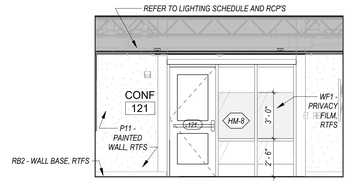
20 A7.7 **CONF 121- ELEVATION 4**
1/4" = 1'-0"



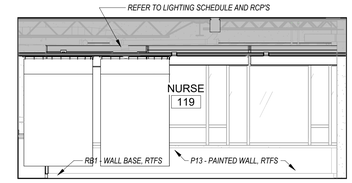
19 A7.7 **CONF 121- ELEVATION 3**
1/4" = 1'-0"



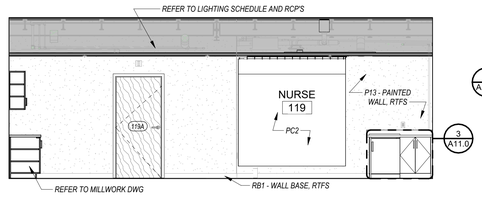
18 A7.7 **CONF 121- ELEVATION 2**
1/4" = 1'-0"



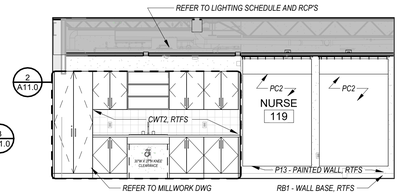
17 A7.7 **CONF 121- ELEVATION 1**
1/4" = 1'-0"



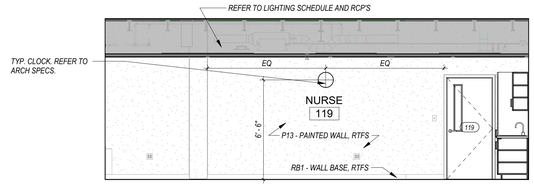
16 A7.7 **NURSE 119- ELEVATION 4**
1/4" = 1'-0"



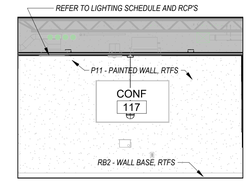
15 A7.7 **NURSE 119- ELEVATION 3**
1/4" = 1'-0"



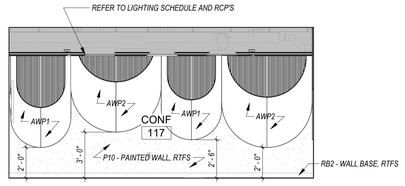
14 A7.7 **NURSE 119- ELEVATION 2**
1/4" = 1'-0"



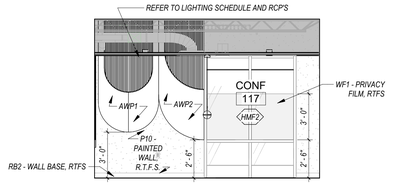
13 A7.7 **NURSE 119- ELEVATION 1**
1/4" = 1'-0"



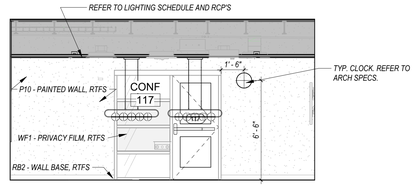
12 A7.7 **CONF 117- ELEVATION 4**
1/4" = 1'-0"



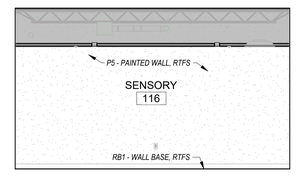
11 A7.7 **CONF 117- ELEVATION 3**
1/4" = 1'-0"



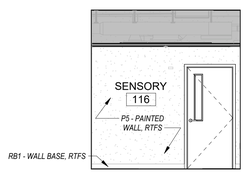
10 A7.7 **CONF 117- ELEVATION 2**
1/4" = 1'-0"



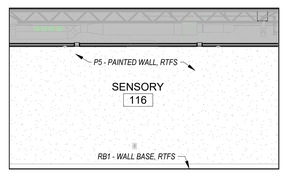
9 A7.7 **CONF 117- ELEVATION 1**
1/4" = 1'-0"



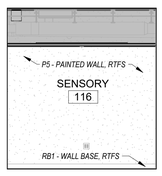
8 A7.7 **SENSORY 116 - ELEVATION 4**
1/4" = 1'-0"



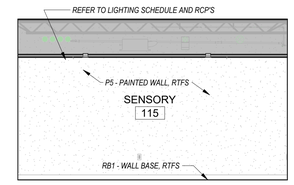
7 A7.7 **SENSORY 116 - ELEVATION 3**
1/4" = 1'-0"



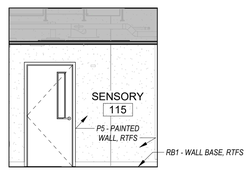
6 A7.7 **SENSORY 116 - ELEVATION 2**
1/4" = 1'-0"



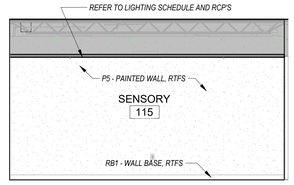
5 A7.7 **SENSORY 116 - ELEVATION 1**
1/4" = 1'-0"



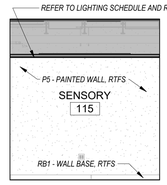
4 A7.7 **SENSORY 115 - ELEVATION 4**
1/4" = 1'-0"



3 A7.7 **SENSORY 115 - ELEVATION 3**
1/4" = 1'-0"



2 A7.7 **SENSORY 115 - ELEVATION 2**
1/4" = 1'-0"



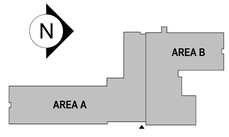
1 A7.7 **SENSORY 115 - ELEVATION 1**
1/4" = 1'-0"

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

STATE OF CONNECTICUT · QUISENBERRY ARCARI MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS - ADMIN

A7.7

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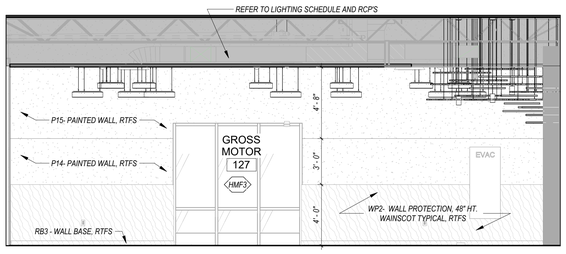
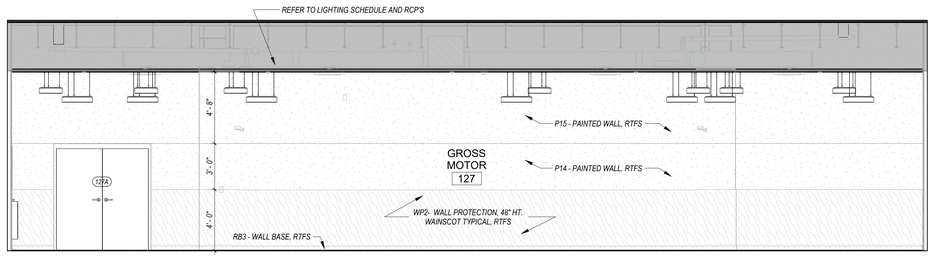
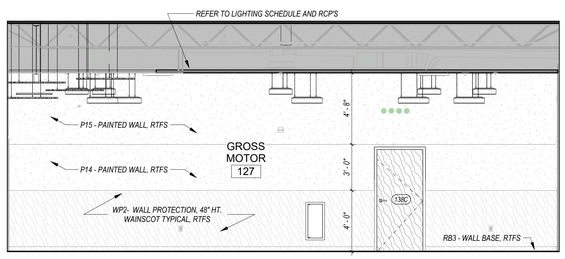


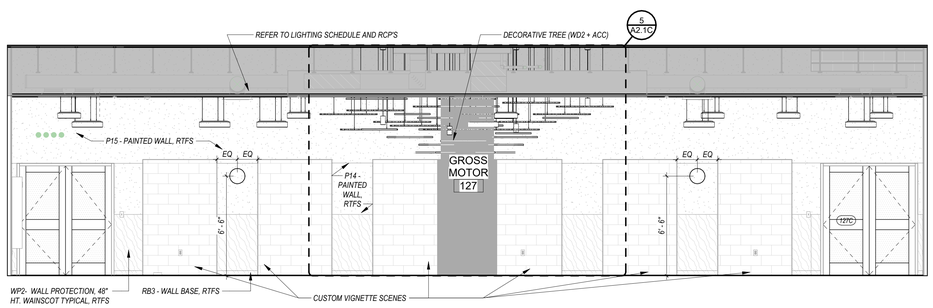
4 A7.8 **GROSS MOTOR 127- ELEVATION 4**
1/4" = 1'-0"



3 A7.8 **GROSS MOTOR 127- ELEVATION 2**
1/4" = 1'-0"



2 A7.8 **GROSS MOTOR 127- ELEVATION 3**
1/4" = 1'-0"

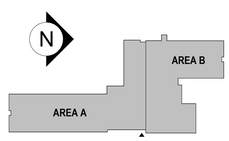


1 A7.8 **GROSS MOTOR 127- ELEVATION 1**
1/4" = 1'-0"

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS-GROSS MOTOR ROOM

A7.8

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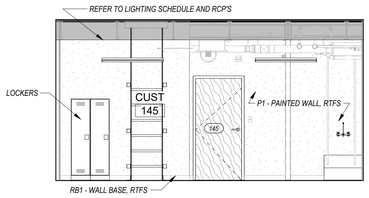
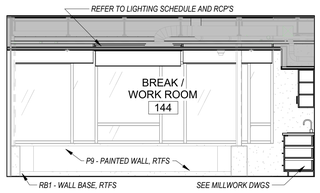
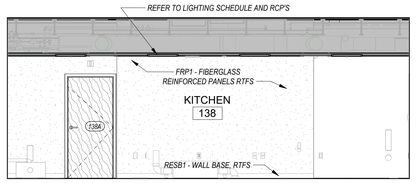


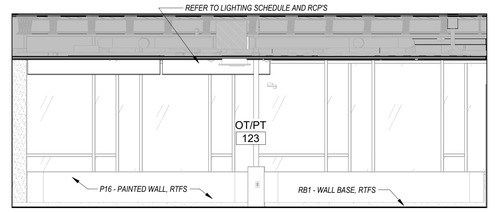
16 A7.9 **CUST 145 - ELEVATION 4**
1/4" = 1'-0"



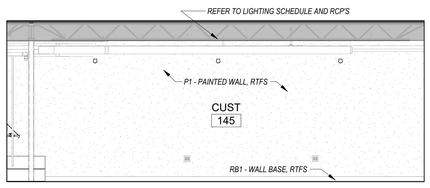
12 A7.9 **BREAK RM 144 - ELEVATION 4**
1/4" = 1'-0"



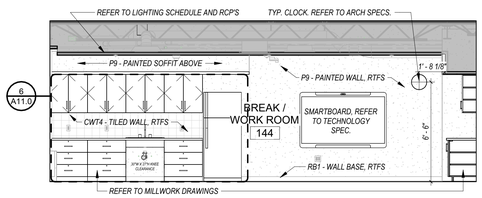
8 A7.9 **KITCHEN 138- ELEVATION 4**
1/4" = 1'-0"



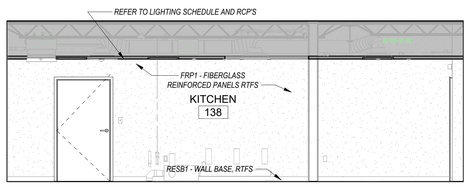
4 A7.9 **OT/PT 123 - ELEVATION 4**
1/4" = 1'-0"



15 A7.9 **CUST 145 - ELEVATION 3**
1/4" = 1'-0"



11 A7.9 **BREAK RM 144 - ELEVATION 3**
1/4" = 1'-0"



7 A7.9 **KITCHEN 138- ELEVATION 3**
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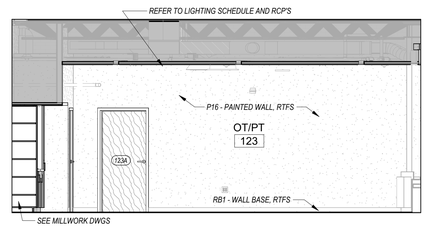
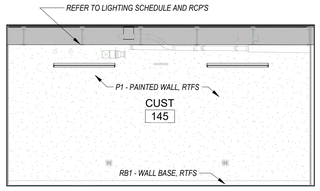
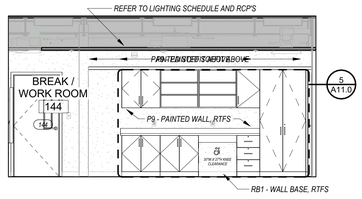


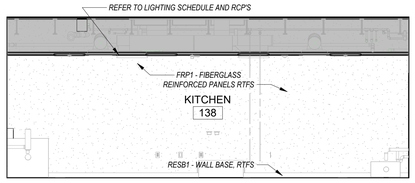
3 A7.9 **OT/PT 123 - ELEVATION 3**
1/4" = 1'-0"



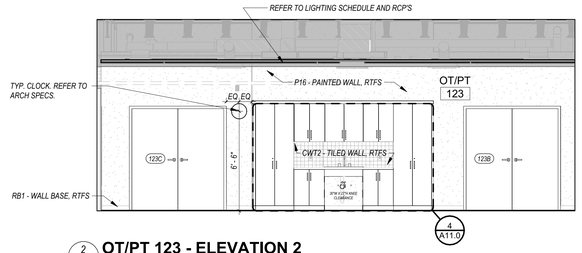
14 A7.9 **CUST 145 - ELEVATION 2**
1/4" = 1'-0"



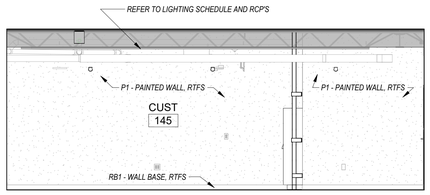
10 A7.9 **BREAK RM 144 - ELEVATION 2**
1/4" = 1'-0"



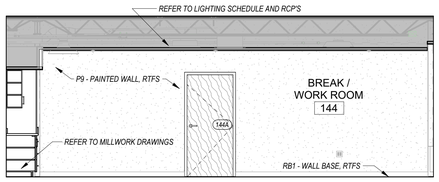
6 A7.9 **KITCHEN 138- ELEVATION 2**
1/4" = 1'-0"



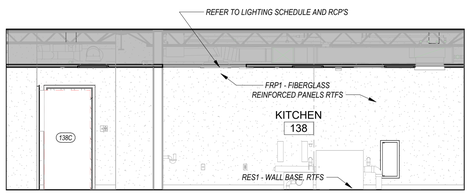
2 A7.9 **OT/PT 123 - ELEVATION 2**
1/4" = 1'-0"



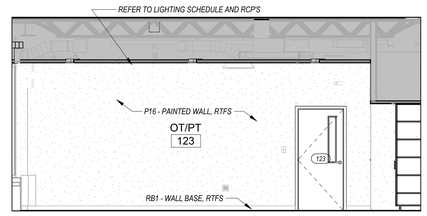
13 A7.9 **CUST 145 - ELEVATION 1**
1/4" = 1'-0"



9 A7.9 **BREAK RM 144 - ELEVATION 1**
1/4" = 1'-0"



5 A7.9 **KITCHEN 138- ELEVATION 1**
1/4" = 1'-0"



1 A7.9 **OT/PT 123 - ELEVATION 1**
1/4" = 1'-0"

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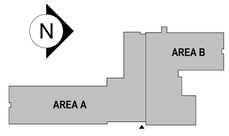
STATE OF CONNECTICUT · STEVEN MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS

A7.9

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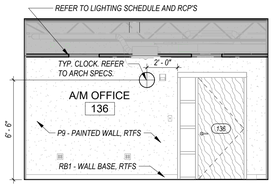
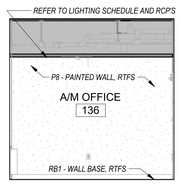
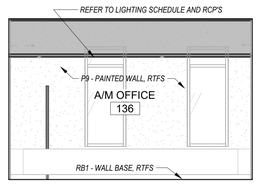


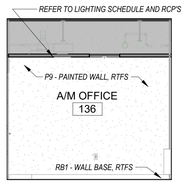
32 A7.10 **A/M OFFICE - ELEVATION 4**
1/4" = 1'-0"



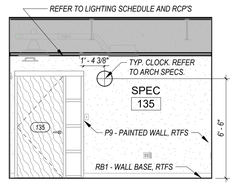
31 A7.10 **A/M OFFICE - ELEVATION 3**
1/4" = 1'-0"



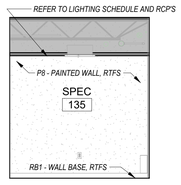
30 A7.10 **A/M OFFICE - ELEVATION 2**
1/4" = 1'-0"



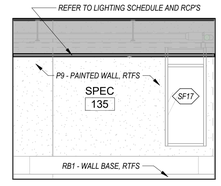
29 A7.10 **A/M OFFICE - ELEVATION 1**
1/4" = 1'-0"



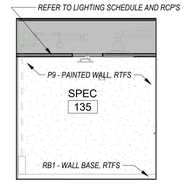
28 A7.10 **SPEC 135 - ELEVATION 4**
1/4" = 1'-0"



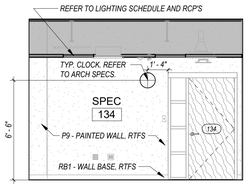
27 A7.10 **SPEC 135 - ELEVATION 3**
1/4" = 1'-0"



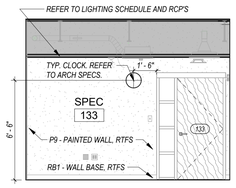
26 A7.10 **SPEC 135 - ELEVATION 2**
1/4" = 1'-0"



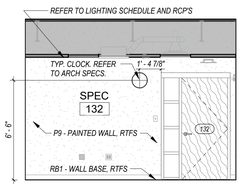
25 A7.10 **SPEC 135 - ELEVATION 1**
1/4" = 1'-0"



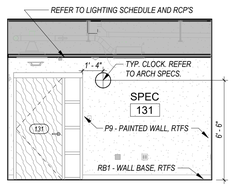
24 A7.10 **SPEC 134 - ELEVATION 4**
1/4" = 1'-0"



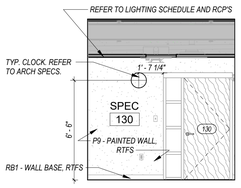
20 A7.10 **SPEC 133 - ELEVATION 4**
1/4" = 1'-0"



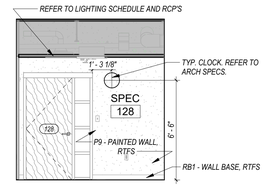
16 A7.10 **SPEC 132 - ELEVATION 4**
1/4" = 1'-0"



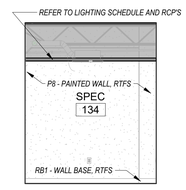
12 A7.10 **SPEC 131 - ELEVATION 4**
1/4" = 1'-0"



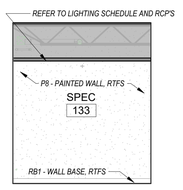
8 A7.10 **SPEC 130 - ELEVATION 4**
1/4" = 1'-0"



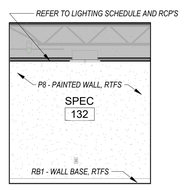
4 A7.10 **SPEC 128 - ELEVATION 4**
1/4" = 1'-0"



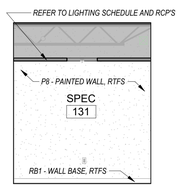
23 A7.10 **SPEC 134 - ELEVATION 3**
1/4" = 1'-0"



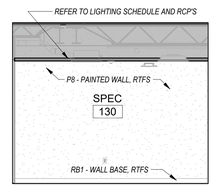
19 A7.10 **SPEC 133 - ELEVATION 3**
1/4" = 1'-0"



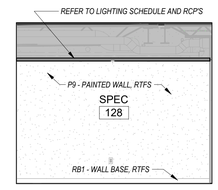
15 A7.10 **SPEC 132 - ELEVATION 3**
1/4" = 1'-0"



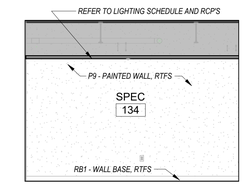
11 A7.10 **SPEC 131 - ELEVATION 3**
1/4" = 1'-0"



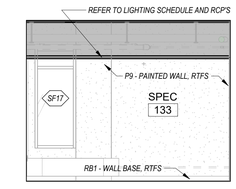
7 A7.10 **SPEC 130 - ELEVATION 3**
1/4" = 1'-0"



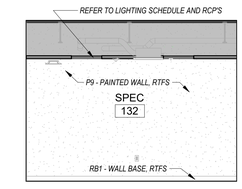
3 A7.10 **SPEC 128 - ELEVATION 3**
1/4" = 1'-0"



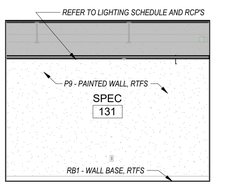
22 A7.10 **SPEC 134 - ELEVATION 2**
1/4" = 1'-0"



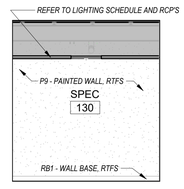
18 A7.10 **SPEC 133 - ELEVATION 2**
1/4" = 1'-0"



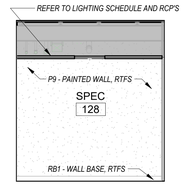
14 A7.10 **SPEC 132 - ELEVATION 2**
1/4" = 1'-0"



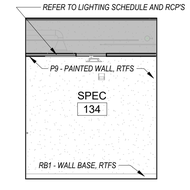
10 A7.10 **SPEC 131 - ELEVATION 2**
1/4" = 1'-0"



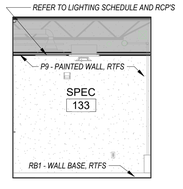
6 A7.10 **SPEC 130 - ELEVATION 2**
1/4" = 1'-0"



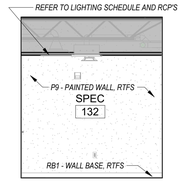
2 A7.10 **SPEC 128 - ELEVATION 2**
1/4" = 1'-0"



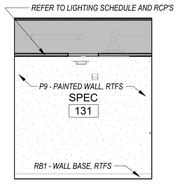
21 A7.10 **SPEC 134 - ELEVATION 1**
1/4" = 1'-0"



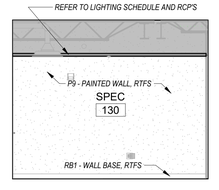
17 A7.10 **SPEC 133 - ELEVATION 1**
1/4" = 1'-0"



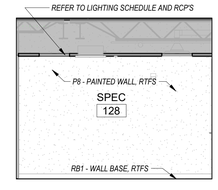
13 A7.10 **SPEC 132 - ELEVATION 1**
1/4" = 1'-0"



9 A7.10 **SPEC 131 - ELEVATION 1**
1/4" = 1'-0"



5 A7.10 **SPEC 130 - ELEVATION 1**
1/4" = 1'-0"



1 A7.10 **SPEC 128 - ELEVATION 1**
1/4" = 1'-0"

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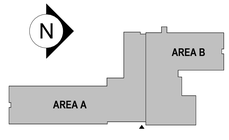
STATE OF CONNECTICUT · QUISENBERRY MALIK · NO. 21027 · NO. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

INTERIOR ELEVATIONS

A7.10

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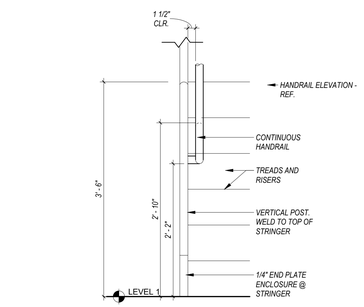
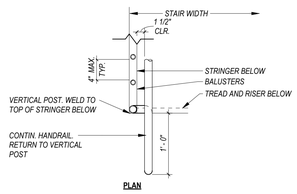
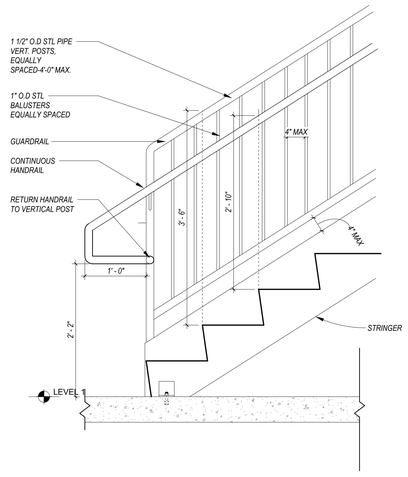


FRONT ELEVATION

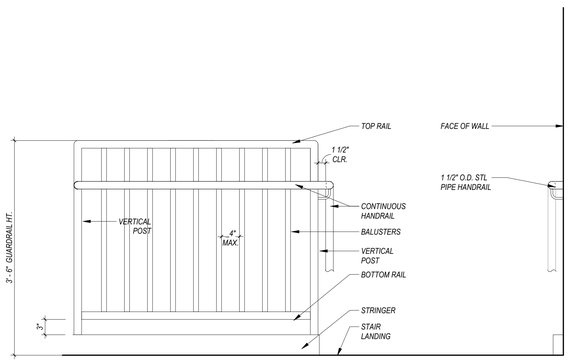


PLAN

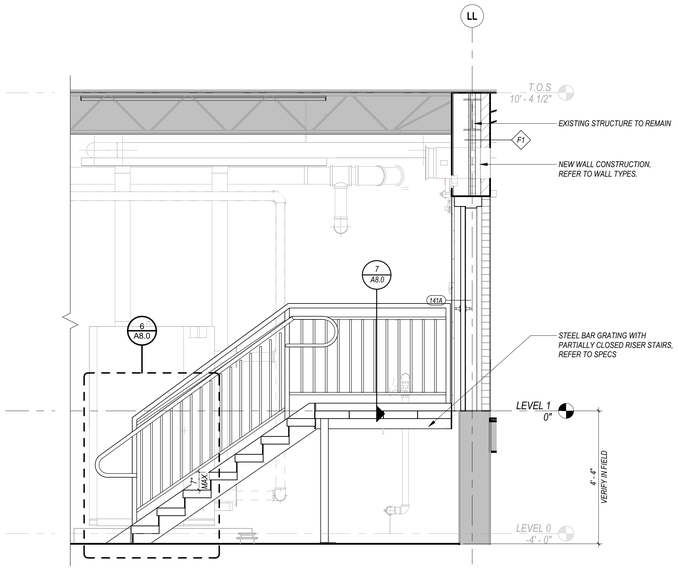
7 / A8.0 HANDRAIL/GUARDRAIL DETAIL
1" = 1'-0"



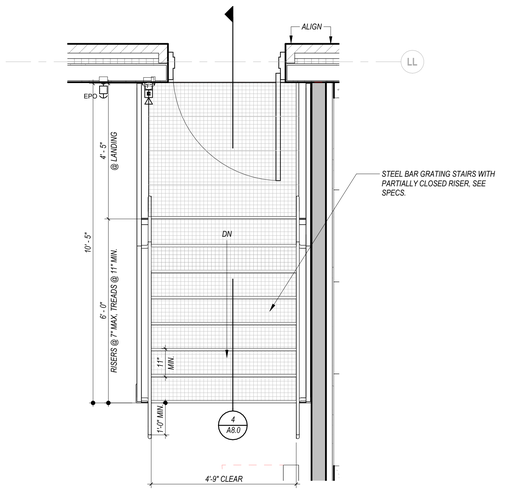
6 / A8.0 HANDRAIL/GUARDRAIL DETAIL 1
1" = 1'-0"



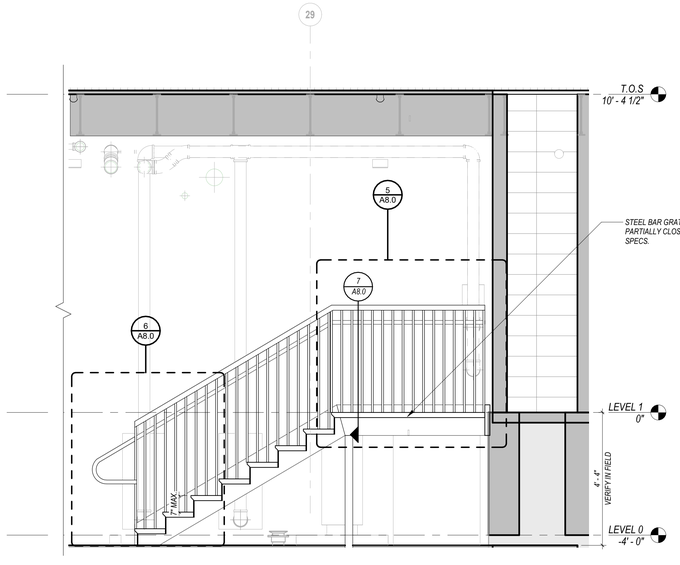
5 / A8.0 TOP LANDING DETAIL
1" = 1'-0"



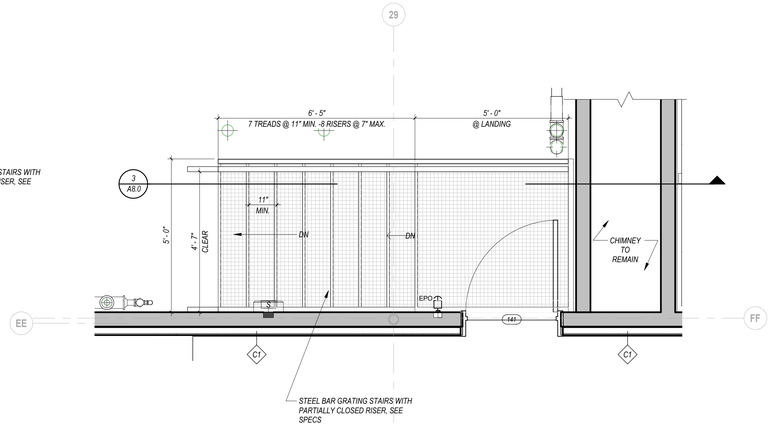
4 / A8.0 MECH. ROOM STAIR 02-SECTION 1
1/2" = 1'-0"



2 / A8.0 MECH. ROOM STAIR 02 PLAN
1/2" = 1'-0"



3 / A8.0 MECH. ROOM STAIR 01-SECTION 1
1/2" = 1'-0"



1 / A8.0 MECH. L ROOM STAIR 01 PLAN
1/2" = 1'-0"

STAIR HANDRAIL AND GUARDRAIL NOTES:

1. STAIRS INCLUDING GUARDRAIL AND HANDRAIL ARE ILLUSTRATIVE OF DESIGN INTENT ONLY. COMPLETE DETAILS OF ALL STRUCTURAL PARTS, THEIR CONNECTIONS, AND ALL CALCULATIONS, SHALL BE DETERMINED AND DETAILED BY THE FABRICATOR ON THE SHOP DRAWINGS. STRUCTURAL DRAWINGS AND CALCULATIONS SHALL BE PREPARED AND STAMPED BY A STRUCTURAL ENGINEER LICENSED TO PRACTICE IN THE STATE/PROVINCE WHERE PROJECT IS LOCATED.
2. GRIND SMOOTH ALL WELDS.
3. HANDRAILS AND BRACKETS TO COMPLY WITH MOST-STRINGENT OF REQUIREMENTS BETWEEN THE AMERICANS WITH DISABILITIES ACT (ADA), UNIFORM FEDERAL ACCESSIBILITY STANDARDS (UFAS), AND NFPA 101 AS MODIFIED BY THE AUTHORITY HAVING JURISDICTION (AHJ) FOR MAXIMUM SIZE AND CLEARANCES.
4. SEE FINISH SCHEDULE FOR PAINTING OR OTHER FINISHES OF RAILINGS.
5. UNLESS SPECIFIED OTHERWISE, RAILINGS SHOWN TO BE EXTRA STRONG 1 1/2" NOMINAL DIAMETER STEEL PIPE. SEE STAIR HANDRAIL AND GUARDRAIL NOTE 3 FOR SIZE CONSTRAINTS.
6. COMPLY WITH APPLICABLE CODE REQUIREMENTS FOR SIZE, SPACING AND ORIENTATION OF GUARDRAIL INFILL.
7. EXIT WIDTH IS TO BE MAINTAINED AND PROVIDED AS INDICATED REGARDLESS OF MANUFACTURER'S OR DETAILER'S CHOICE OF FABRICATION.

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STATE OF CONNECTICUT · DAVID MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B
AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MECHANICAL ROOM STAIR PLANS

A8.0

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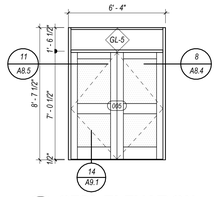
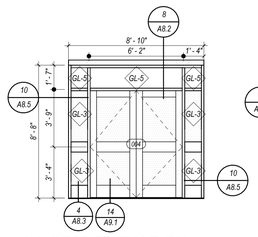
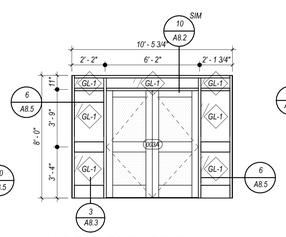
GLAZING TYPES		
TYPE	THICKNESS	DESCRIPTION
GL-1	1"	INSULATED TEMPERED, LOW E
GL-2	1/4"	TEMPERED GLAZING , CLEAR
GL-3	1"	SCHOOL GUARD, INSULATED SECURITY GLAZING - LEVEL 3, LAMINATED
GL-4	1/2"	SECURITY GLAZING - LEVEL 4
GL-5	1"	INSULATED SPANDREL GLAZING
MP-1	2"	INSULATED METAL PANEL - SMOOTH



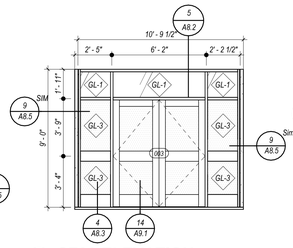
29 A8.1 **SF29-ELEVATION** 1/4" = 1'-0"



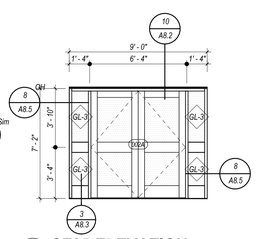
28 A8.1 **SF28-ELEVATION** 1/4" = 1'-0"



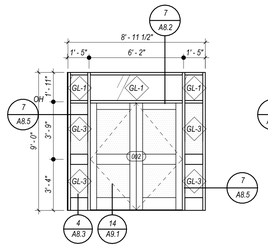
27 A8.1 **SF27-ELEVATION** 1/4" = 1'-0"



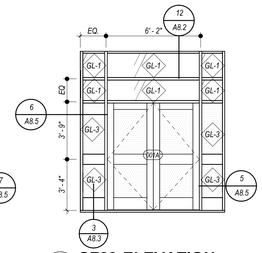
26 A8.1 **SF26-ELEVATION** 1/4" = 1'-0"



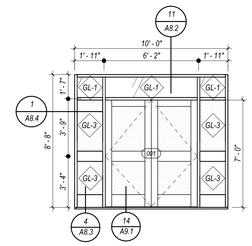
25 A8.1 **SF25-ELEVATION** 1/4" = 1'-0"



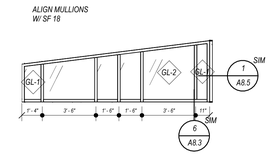
24 A8.1 **SF24-ELEVATION** 1/4" = 1'-0"



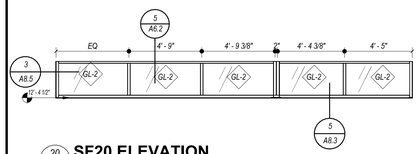
23 A8.1 **SF23-ELEVATION** 1/4" = 1'-0"



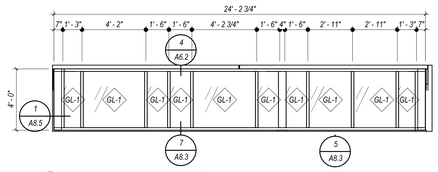
22 A8.1 **SF22-ELEVATION** 1/4" = 1'-0"



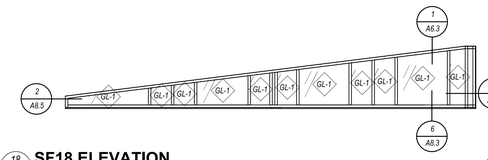
21 A8.1 **SF21-ELEVATION1** 1/4" = 1'-0"



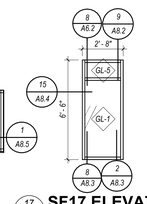
20 A8.1 **SF20 ELEVATION** 1/4" = 1'-0"



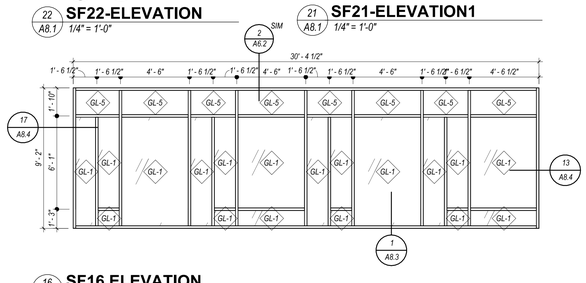
19 A8.1 **SF19 ELEVATION** 1/4" = 1'-0"



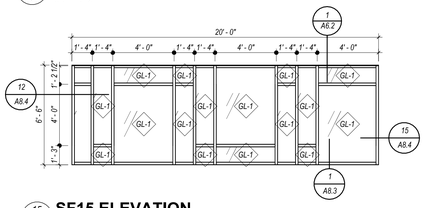
18 A8.1 **SF18 ELEVATION** 1/4" = 1'-0"



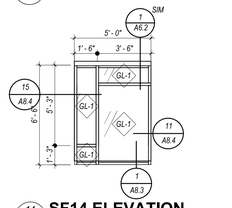
17 A8.1 **SF17 ELEVATION** 1/4" = 1'-0"



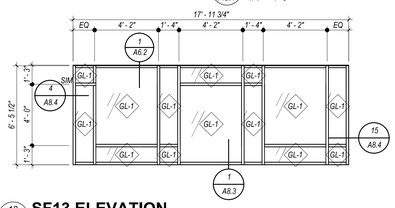
16 A8.1 **SF16 ELEVATION** 1/4" = 1'-0"



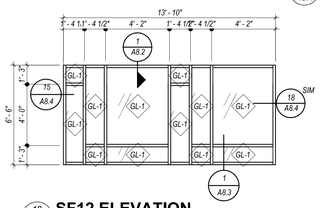
15 A8.1 **SF15 ELEVATION** 1/4" = 1'-0"



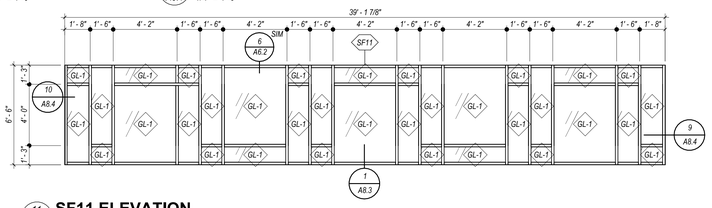
14 A8.1 **SF14 ELEVATION** 1/4" = 1'-0"



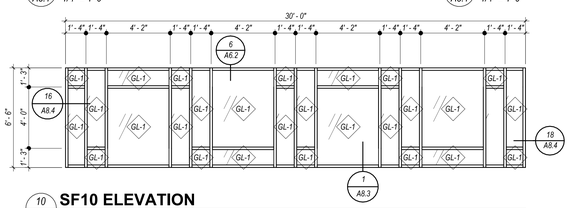
13 A8.1 **SF13 ELEVATION** 1/4" = 1'-0"



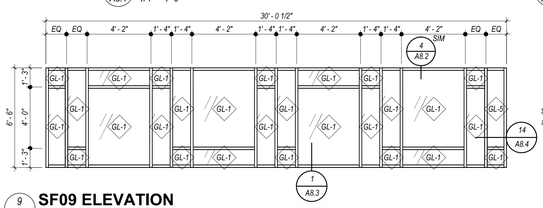
12 A8.1 **SF12 ELEVATION** 1/4" = 1'-0"



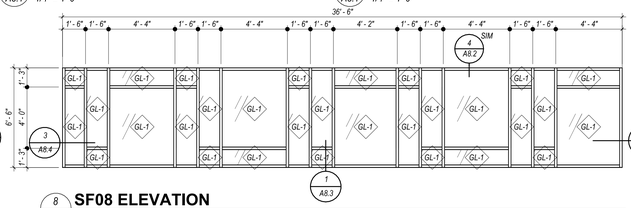
11 A8.1 **SF11 ELEVATION** 1/4" = 1'-0"



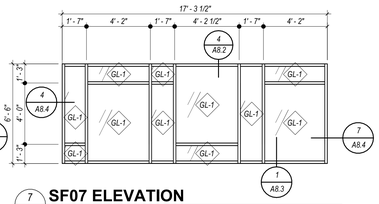
10 A8.1 **SF10 ELEVATION** 1/4" = 1'-0"



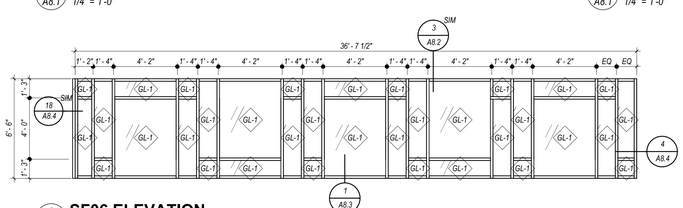
9 A8.1 **SF09 ELEVATION** 1/4" = 1'-0"



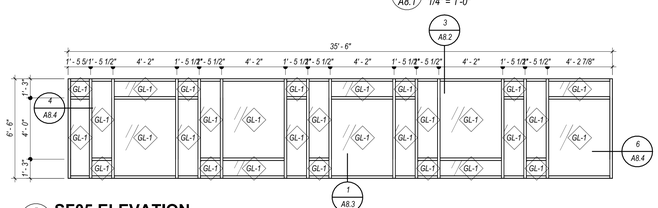
8 A8.1 **SF08 ELEVATION** 1/4" = 1'-0"



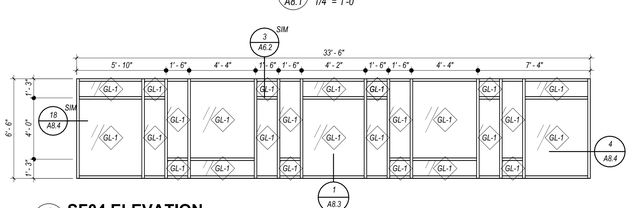
7 A8.1 **SF07 ELEVATION** 1/4" = 1'-0"



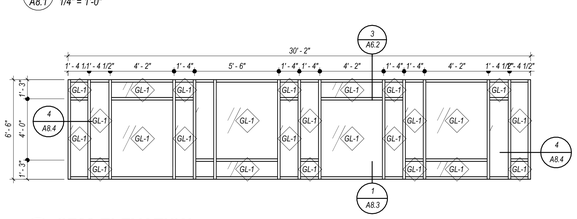
6 A8.1 **SF06 ELEVATION** 1/4" = 1'-0"



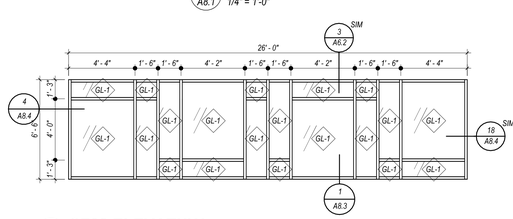
5 A8.1 **SF05 ELEVATION** 1/4" = 1'-0"



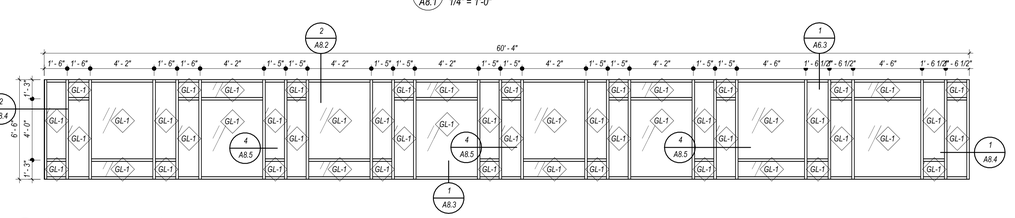
4 A8.1 **SF04 ELEVATION** 1/4" = 1'-0"



3 A8.1 **SF03 ELEVATION** 1/4" = 1'-0"



2 A8.1 **SF02 ELEVATION** 1/4" = 1'-0"



1 A8.1 **SF01 ELEVATION** 1/4" = 1'-0"

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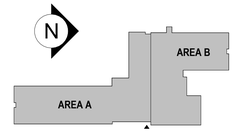
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25060

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

STOREFRONT ELEVATIONS

A8.1

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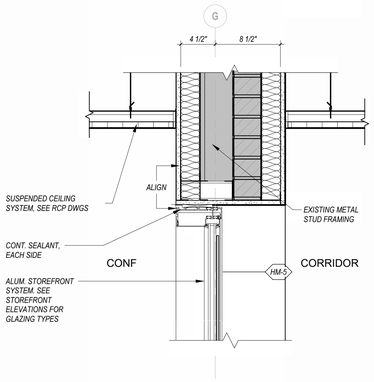
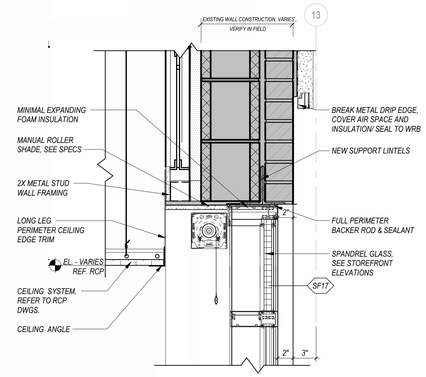
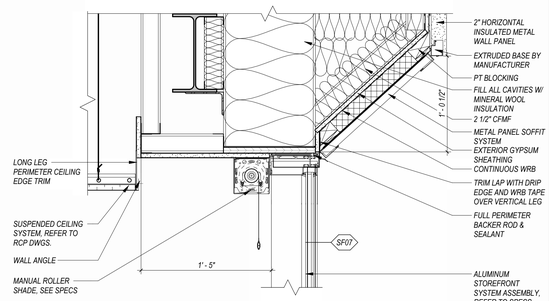


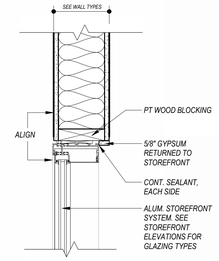
13 A8.2 **HEAD DETAIL- SFH13**
1 1/2" = 1'-0"



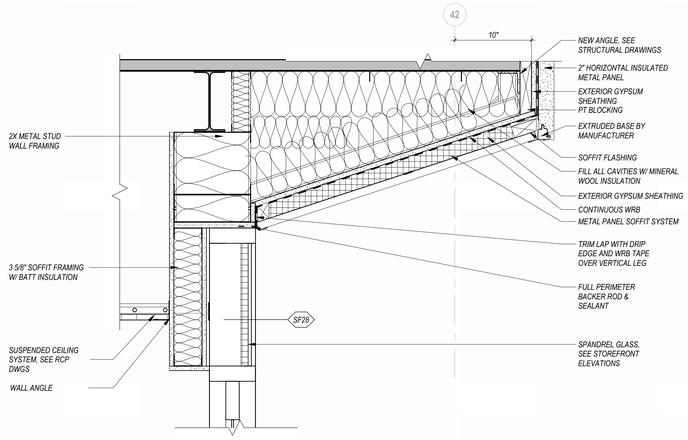
9 A8.2 **HEAD DETAIL- SFH9**
1 1/2" = 1'-0"



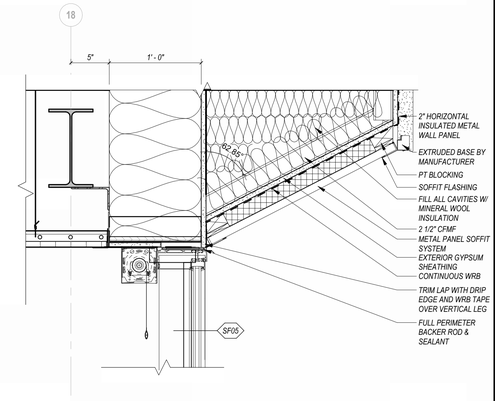
4 A8.2 **HEAD DETAIL-SFH4**
1 1/2" = 1'-0"



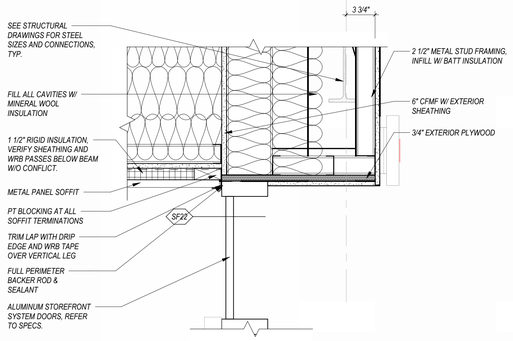
12 A8.2 **HEAD DETAIL- SFH12**
1 1/2" = 1'-0"



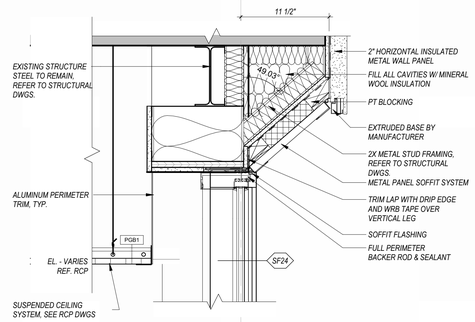
8 A8.2 **HEAD DETAIL- SFH8**
1 1/2" = 1'-0"



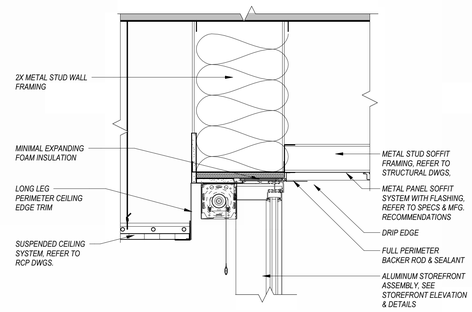
3 A8.2 **HEAD DETAIL-SF18**
1 1/2" = 1'-0"



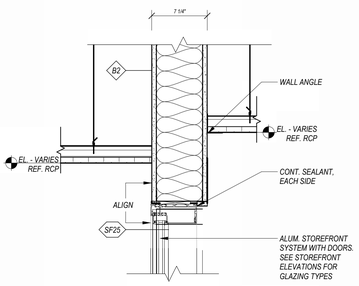
11 A8.2 **HEAD DETAIL SFH11**
1 1/2" = 1'-0"



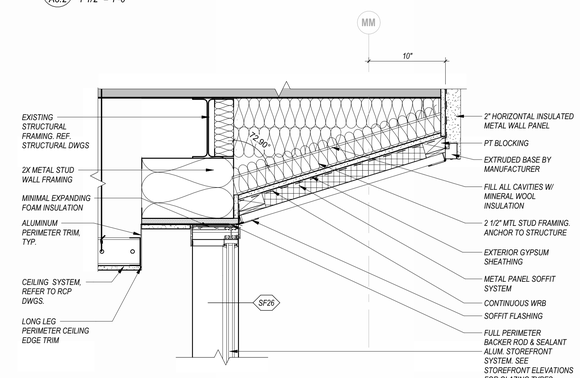
7 A8.2 **HEAD DETAIL- SFH7**
1 1/2" = 1'-0"



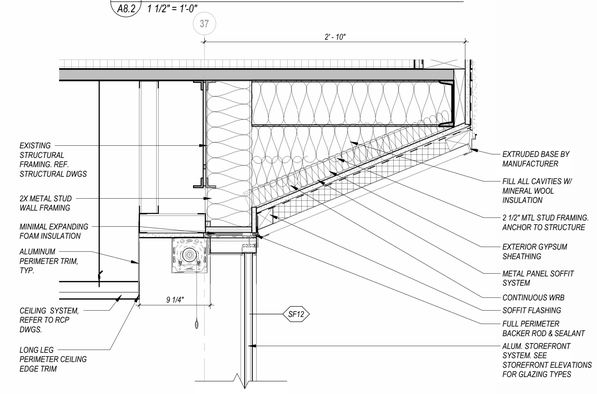
2 A8.2 **HEAD DETAIL- SFH2**
1 1/2" = 1'-0"



10 A8.2 **HEAD DETAIL- SFH10**
1 1/2" = 1'-0"



5 A8.2 **HEAD DETAIL SFH5**
1 1/2" = 1'-0"



1 A8.2 **HEAD DETAIL-SFH1**
1 1/2" = 1'-0"

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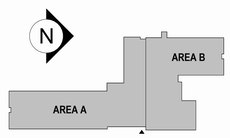
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

STOREFRONT DETAILS

A8.2

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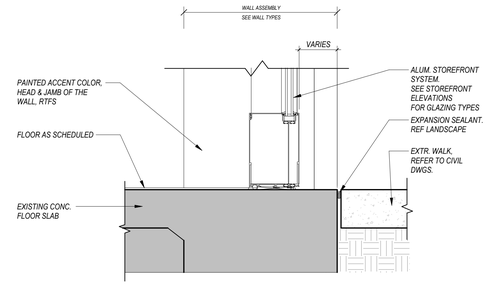
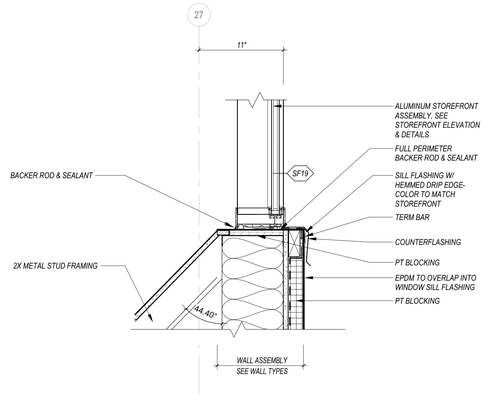


4 A8.3 **SF SILL DETAIL S4**
1 1/2" = 1'-0"



7 A8.3 **SILL DETAIL- SFS4G**
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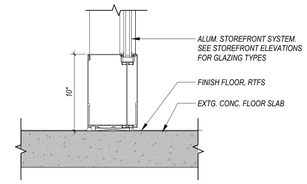
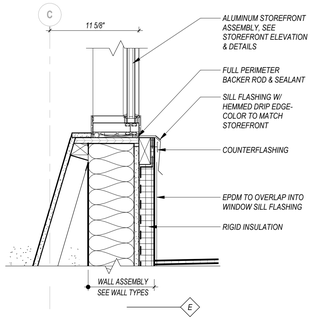
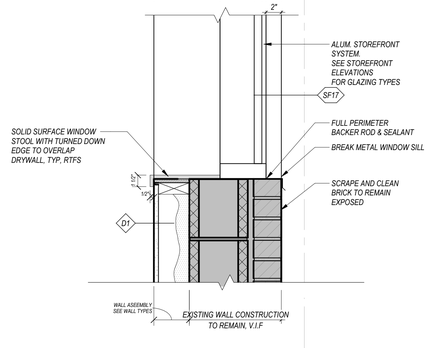


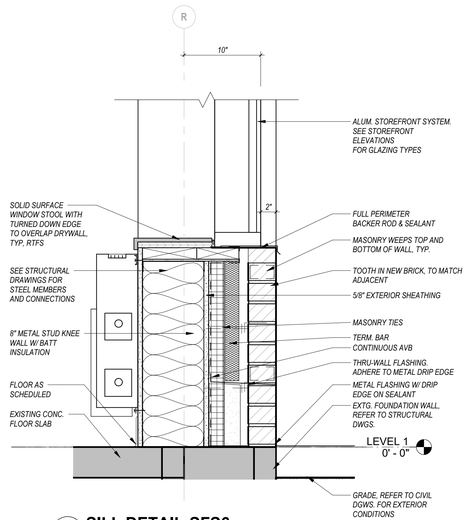
3 A8.3 **SILL DETAIL SFS3**
1 1/2" = 1'-0"



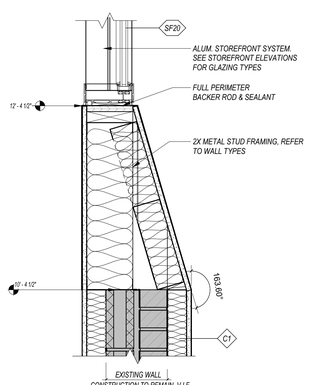
6 A8.3 **SILL DETAIL- SFS3-G**
1 1/2" = 1'-0"



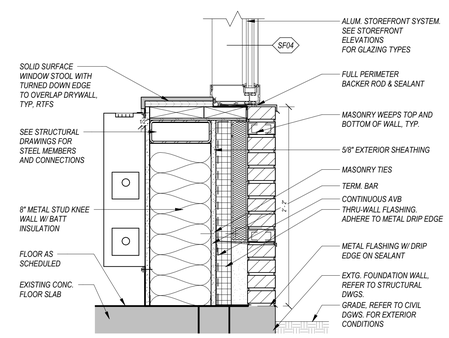
2 A8.3 **SILL DETAIL- SFS2**
1 1/2" = 1'-0"



8 A8.3 **SILL DETAIL-SFS6**
1 1/2" = 1'-0"



5 A8.3 **SILL DETAIL- SFS5**
1 1/2" = 1'-0"



1 A8.3 **SILL DETAIL- SFS1**
1 1/2" = 1'-0"

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RENOVATIONS TO:
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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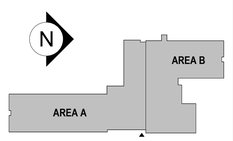
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

STOREFRONT DETAILS

A8.3

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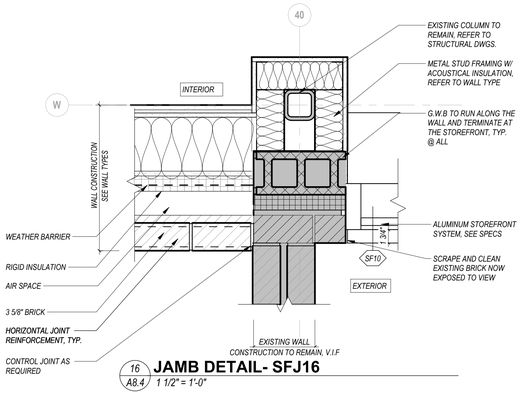
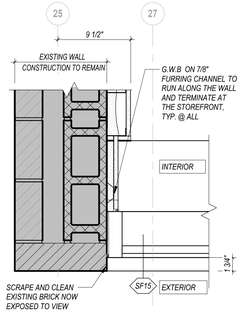
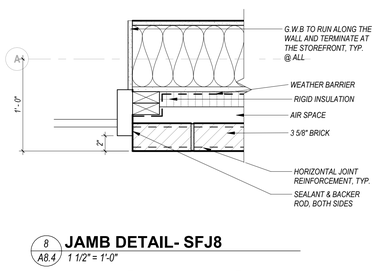


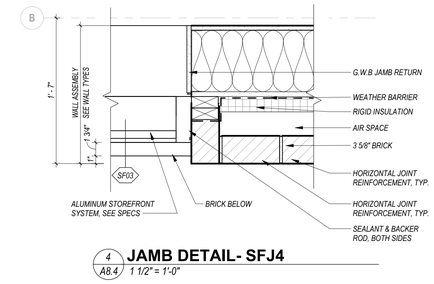
16 A8.4 **JAMB DETAIL- SFJ16**
1 1/2" = 1'-0"



12 A8.4 **JAMB DETAIL- SFJ12**
1 1/2" = 1'-0"



8 A8.4 **JAMB DETAIL- SFJ8**
1 1/2" = 1'-0"



4 A8.4 **JAMB DETAIL- SFJ4**
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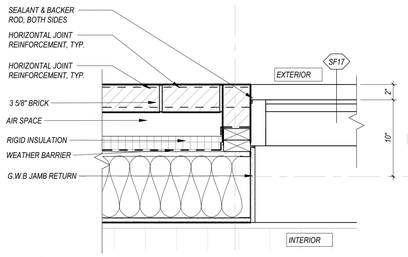
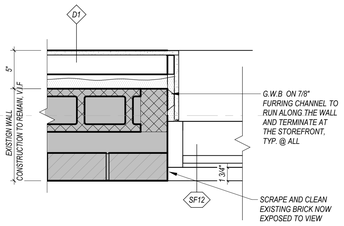
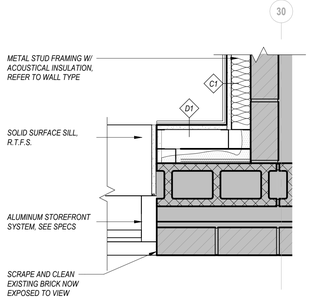


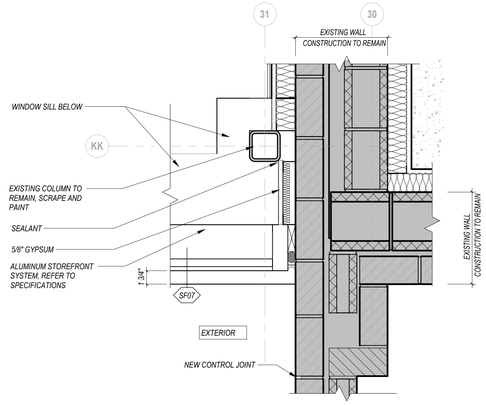
19 A8.4 **JAMB DETAIL-SF19**
1 1/2" = 1'-0"



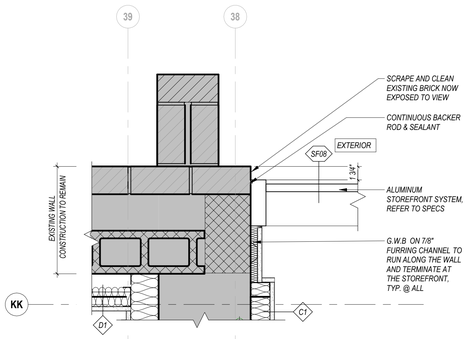
15 A8.4 **JAMB DETAIL- SFJ15**
1 1/2" = 1'-0"



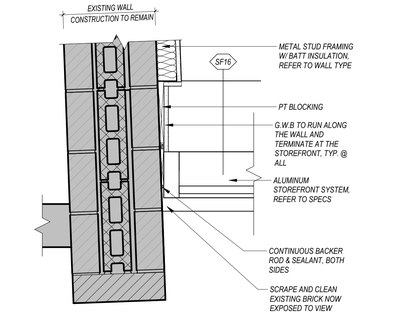
11 A8.4 **JAMB DETAIL- SFJ11**
1 1/2" = 1'-0"



7 A8.4 **JAMB DETAIL- SFJ7**
1 1/2" = 1'-0"



3 A8.4 **JAMB DETAIL-SFJ3**
1 1/2" = 1'-0"



17 A8.4 **JAMB DETAIL- SFJ17**
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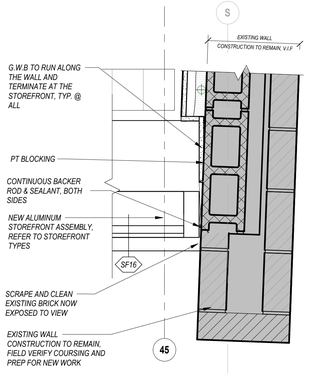

13 A8.4 **JAMB DETAIL 3-SFJ13-**
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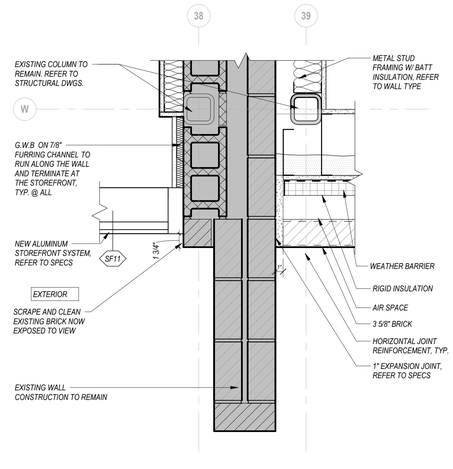

9 A8.4 **JAMB DETAIL- SFJ9**
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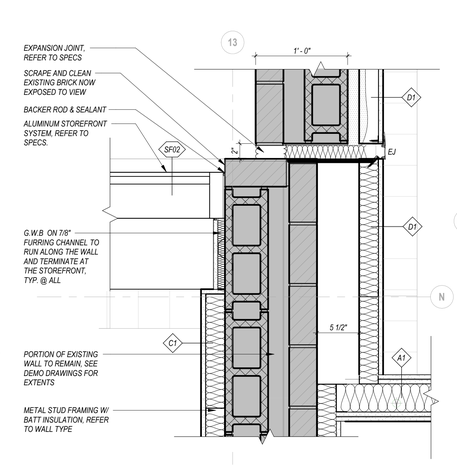
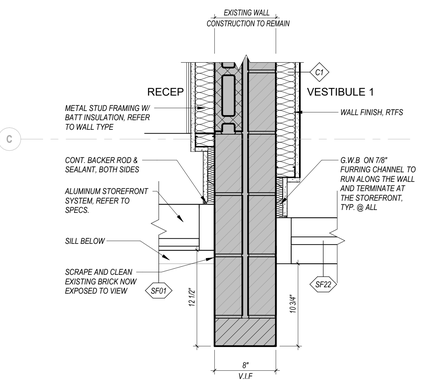
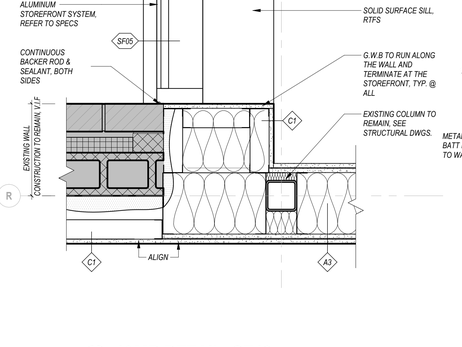


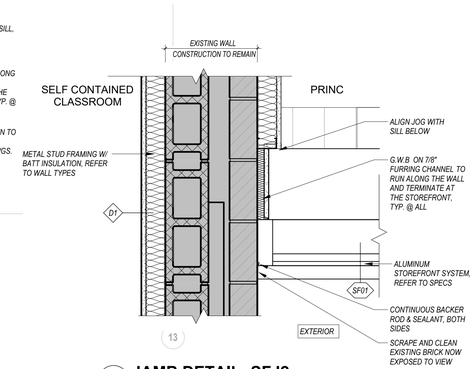
5 A8.4 **JAMB DETAIL- SFJ5**
1 1/2" = 1'-0"



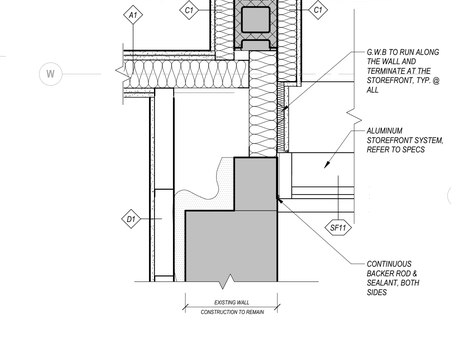
1 A8.4 **JAMB DETAIL- SFJ1**
1 1/2" = 1'-0"



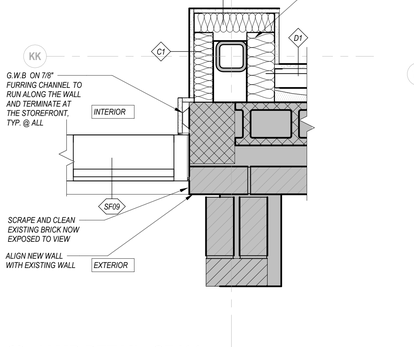
6 A8.4 **JAMB DETAIL- SFJ6**
1 1/2" = 1'-0"



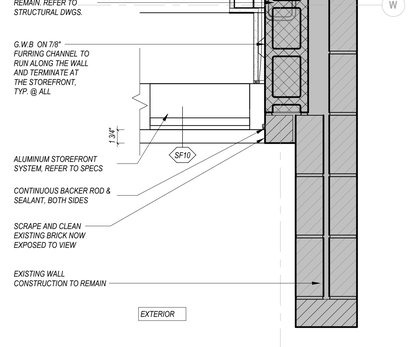
2 A8.4 **JAMB DETAIL- SFJ2**
1 1/2" = 1'-0"



10 A8.4 **JAMB DETAIL- SFJ10**
1 1/2" = 1'-0"



14 A8.4 **JAMB DETAIL- SFJ14**
1 1/2" = 1'-0"



18 A8.4 **JAMB DETAIL- SFJ18**
1 1/2" = 1'-0"

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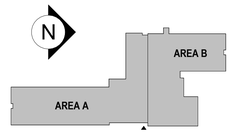
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

STOREFRONT DETAILS

A8.4

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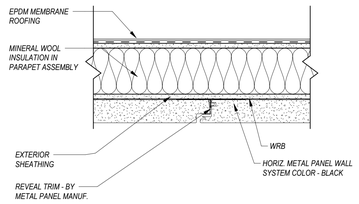
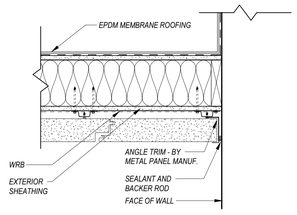
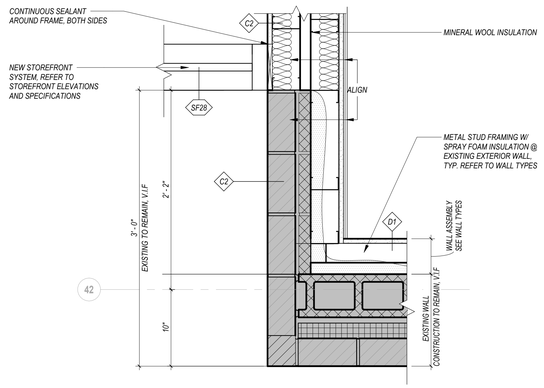


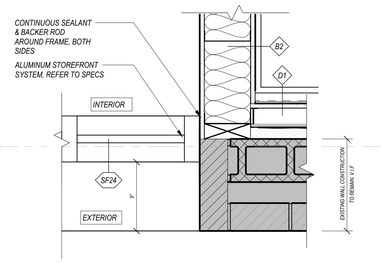
14 A8.5 **VERTICAL REVEAL DETAIL @ PARAPET**
1 1/2" = 1'-0"



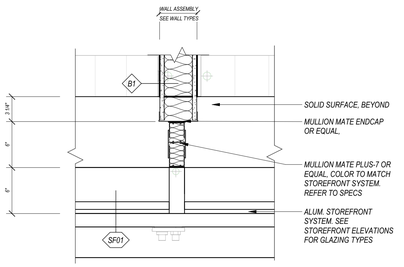
13 A8.5 **PANEL END WALL PLAN DETAIL**
1 1/2" = 1'-0"



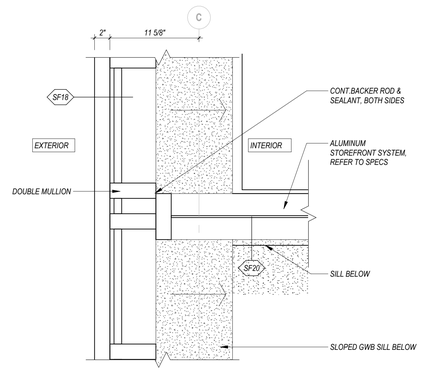
10 A8.5 **JAMB DETAIL- SFJ28**
1 1/2" = 1'-0"



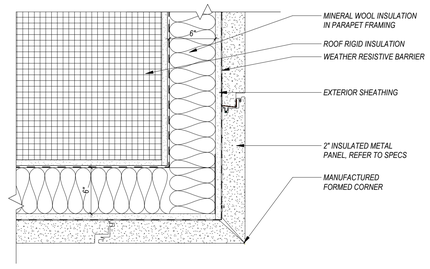
7 A8.5 **JAMB DETAIL- SFJ25.**
1 1/2" = 1'-0"



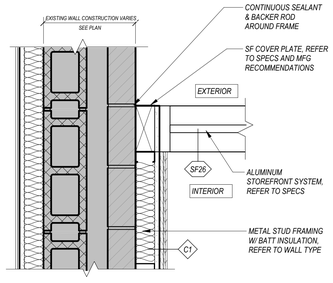
4 A8.5 **JAMB DETAIL-SF22**
1 1/2" = 1'-0"



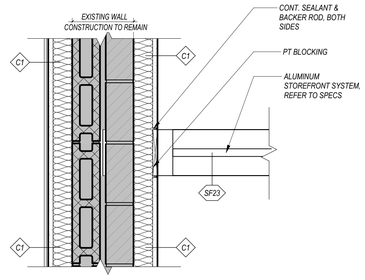
3 A8.5 **JAMB DETAIL- SFJ21**
1 1/2" = 1'-0"



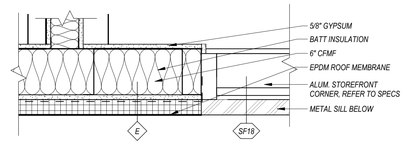
12 A8.5 **OUTSIDE CORNER @ PARAPET**
1 1/2" = 1'-0"



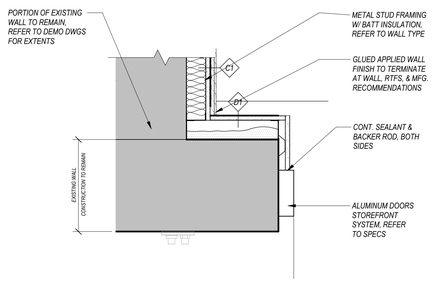
9 A8.5 **JAMB DETAIL-J27**
1 1/2" = 1'-0"



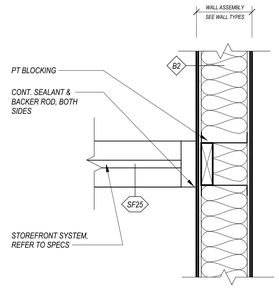
6 A8.5 **JAMB DETAIL- SFJ24**
1 1/2" = 1'-0"



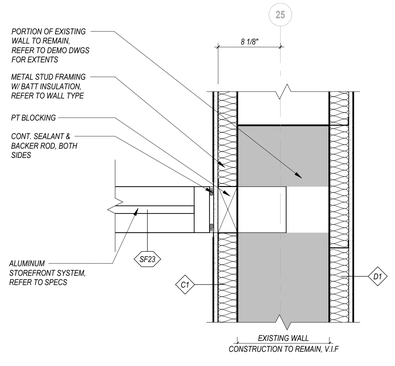
2 A8.5 **JAMB DETAIL- SFJ20**
1 1/2" = 1'-0"



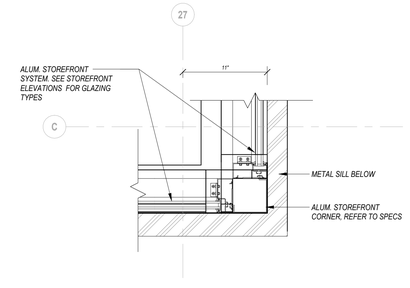
11 A8.5 **JAMB DETAIL- SFJ29**
1 1/2" = 1'-0"



8 A8.5 **JAMB DETAIL- SFJ26**
1 1/2" = 1'-0"



5 A8.5 **JAMB DETAIL- SFJ23**
1 1/2" = 1'-0"



1 A8.5 **JAMB DETAIL- SFJ19**
1 1/2" = 1'-0"

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Revisions

N
AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

STOREFRONT & METAL PANEL DETAILS

A8.5

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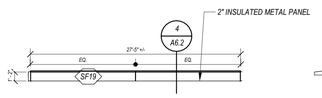
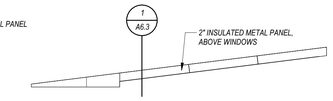
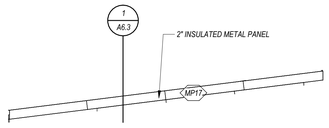


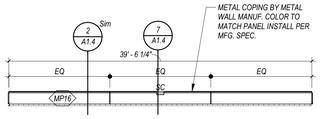
19 A8.6 **MP19-ELEVATION**
1/8" = 1'-0"



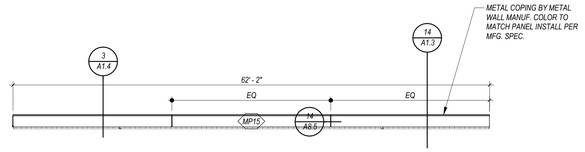
18 A8.6 **MP18 ELEVATION**
1/8" = 1'-0"



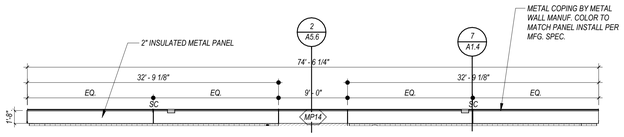
17 A8.6 **MP17 ELEVATION**
1/8" = 1'-0"



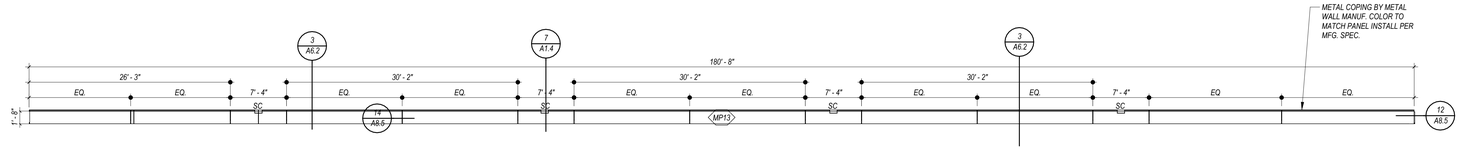
16 A8.6 **MP16 ELEVATION**
1/8" = 1'-0"



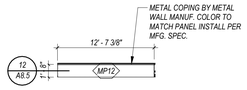
15 A8.6 **MP15 ELEVATION**
1/8" = 1'-0"



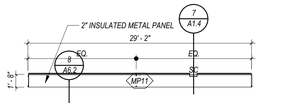
14 A8.6 **MP14 ELEVATION**
1/8" = 1'-0"



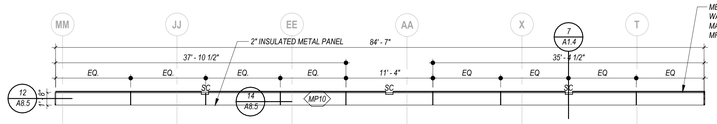
13 A8.6 **MP13 ELEVATION**
1/8" = 1'-0"



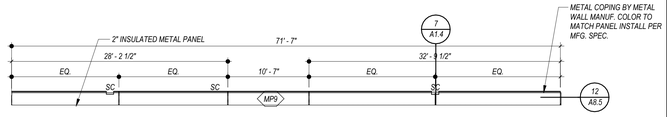
12 A8.6 **MP12 ELEVATION**
1/8" = 1'-0"



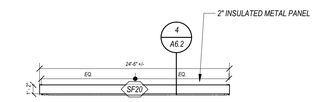
11 A8.6 **MP11 ELEVATION**
1/8" = 1'-0"



10 A8.6 **MP10 ELEVATION**
1/8" = 1'-0"



9B A8.6 **MP9 B-ELEVATION**
1/8" = 1'-0"



20 A8.6 **MP20-ELEVATION**
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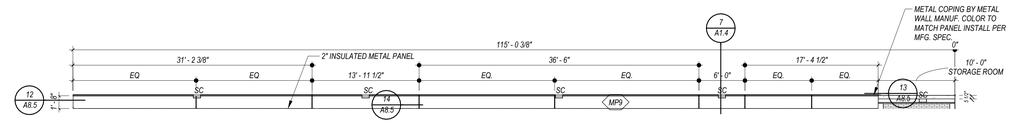
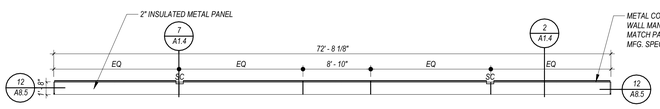
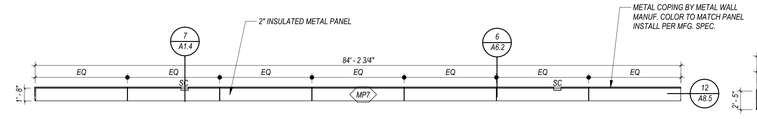


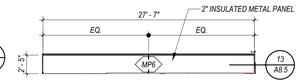
9A A8.6 **MP9 A -ELEVATION**
1/8" = 1'-0"



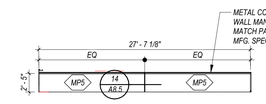
8 A8.6 **MP8 - ELEVATION**
1/8" = 1'-0"



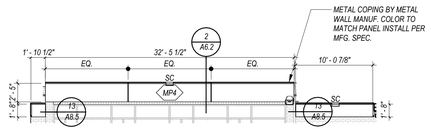
7 A8.6 **MP7 - ELEVATION**
1/8" = 1'-0"



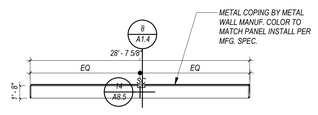
6 A8.6 **MP6**
1/8" = 1'-0"



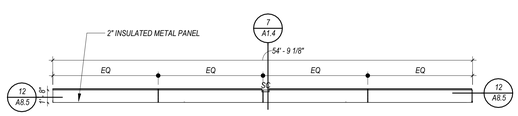
5 A8.6 **MP5 - ELEVATION**
1/8" = 1'-0"



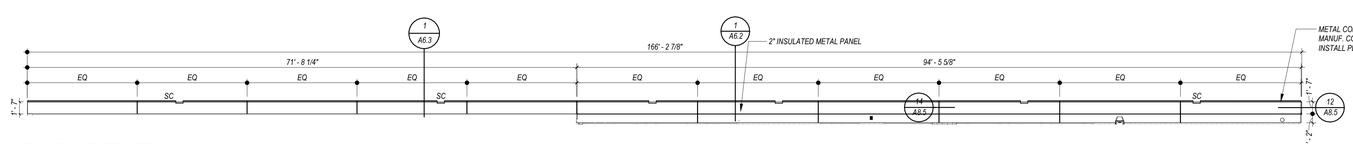
4 A8.6 **MP4 - ELEVATION**
1/8" = 1'-0"



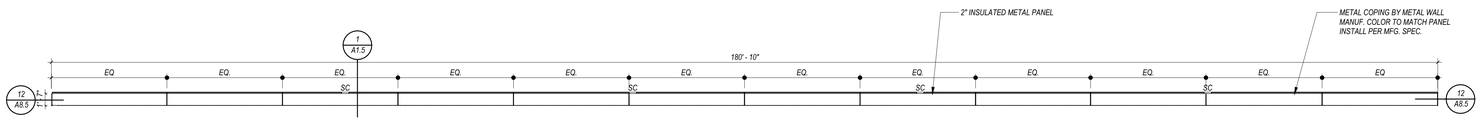
3 A8.6 **MP3 - ELEVATION**
1/8" = 1'-0"



2 A8.6 **MP2 - ELEVATION**
1/8" = 1'-0"



1B A8.6 **MP1 - B - ELEVATION**
1/8" = 1'-0"



1A A8.6 **MP1 - A - ELEVATION**
1/8" = 1'-0"

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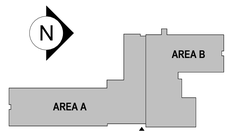
Project #:25064

Revisions

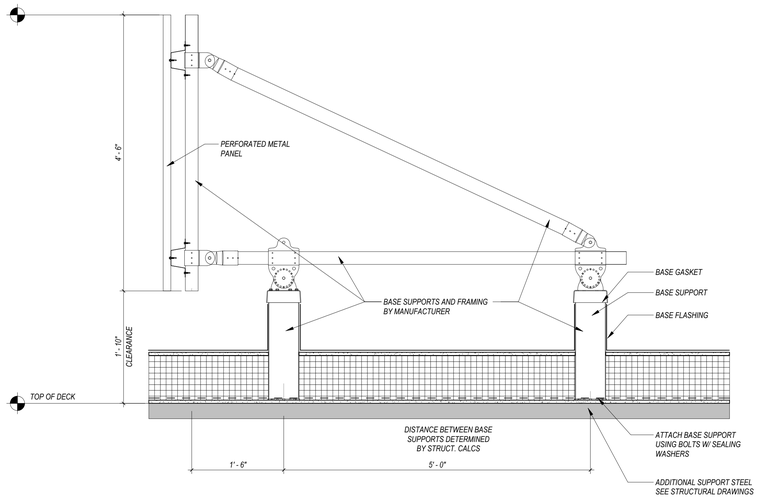


CONSTRUCTION DOCUMENTS
JUNE 5, 2026

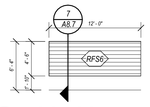
METAL PANEL ELEVATIONS

A8.6

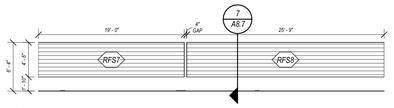
6/5/2026 12:20:58 PM C:\Users\mlane\AppData\Local\Autodesk\Revit\Autodesk Revit 2026\CollaborationCache\NX65LUDAB6UY45df9e2f-f51b-43ed-9bb5-be23aeaea7a2\de47a5db-6fb6-4165-af3f-95f22f20c489.rvt



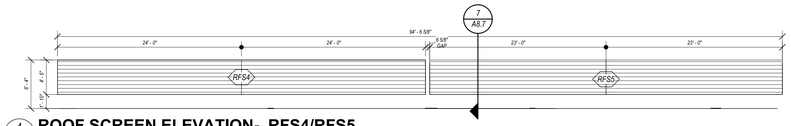
7 A8.7 **ROOF FRAME SECTION**
1" = 1'-0"



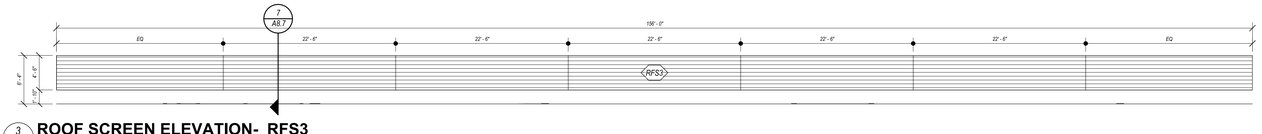
5 A8.7 **ROOF SCREEN ELEVATION- RFS6**
1/8" = 1'-0"



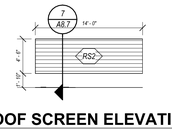
6 A8.7 **ROOF SCREEN ELEVATION- RFS7/RFS8**
1/8" = 1'-0"



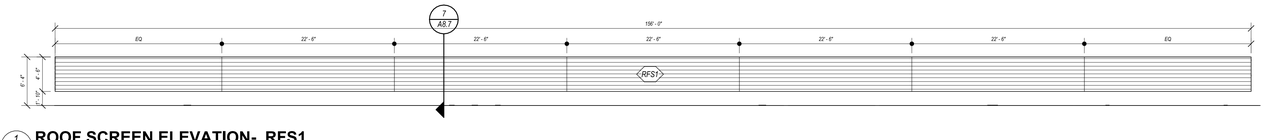
4 A8.7 **ROOF SCREEN ELEVATION- RFS4/RFS5**
1/8" = 1'-0"



3 A8.7 **ROOF SCREEN ELEVATION- RFS3**
1/8" = 1'-0"



2 A8.7 **ROOF SCREEN ELEVATION- RFS2**
1/8" = 1'-0"



1 A8.7 **ROOF SCREEN ELEVATION- RFS1**
1/8" = 1'-0"

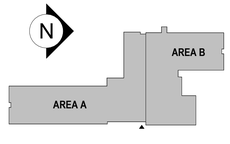
QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF SCREEN ELEVATIONS

A8.7

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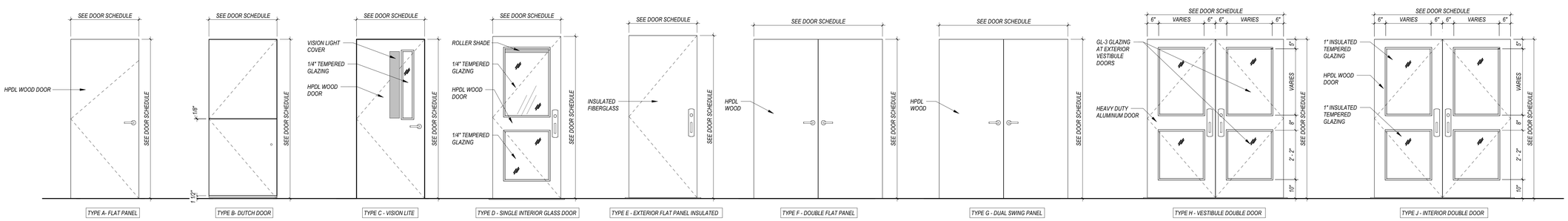
DOOR SCHEDULE

RL	ROOM #	ROOM NAME	DOUBLE LEAF DOOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR GLAZING	HARDWARE SET #	FRAME TYPE	FRAME MATERIAL	FRAME HEAD	FRAME JAMB	FRAME SILL	RATING UL	RATING STC	COMMENTS
001	001	VESTIBULE 1	●	6' - 0"	7' - 0"	H	AL	GL-3	2	AL-1	AL	SFH11	SFJ1/J5	S3			
001A	001	VESTIBULE 1	●	6' - 0"	7' - 0"	H	AL	GL-3	4	AL-1	AL	H7	J5/SFJ23	S4			
002	002	VESTIBULE 2	●	6' - 0"	7' - 0"	H	AL	GL-3	1	AL-1	AL	SFH7	J1/J2/J5	S3			
002A	002	VESTIBULE 2	●	6' - 2"	7' - 0"	H	AL	GL-1	5	AL-1	AL	SFH10	J5/J26	S4			
003	003	VESTIBULE 3	●	6' - 0"	7' - 0"	H	AL	GL-3	2	AL-1	AL		J27/J5	S3			
003A	003	VESTIBULE 3	●	6' - 0"	7' - 0"	H	AL	GL-1	6	AL-1	AL	H7	J5/SFJ23	S4			
004	100B	CORRIDOR	●	6' - 0"	7' - 0"	H	AL	GL-3	1	AL-1	AL		J5/SFJ28	S3			
005	100D	CORRIDOR	●	6' - 0"	7' - 0"	H	AL	GL-3	1	AL-1	AL		SFJ29/J5				
101	101	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
101A	101A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
101B	101	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
102	102	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
102A	102A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
102B	102	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
103	103	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
103A	103A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
103B	103	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
104	104	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
104A	104A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
104B	104	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
105	105	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
105A	105A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
105B	105	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
106	106	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
106A	106A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
106B	106	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
107	107	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
107A	107A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
107B	107	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
108	108	SELF CONTAINED CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
108A	108A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
108B	108	SELF CONTAINED CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
109	109	SELF CONTAINED CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
109A	109A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H5	J9	S7			
109B	109	SELF CONTAINED CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
110	110	SELF CONTAINED CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J7/HMFJ-1	S4/HMFS-1		30	
110A	110A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H5	J9	S7			
110B	110	SELF CONTAINED CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
111	111	UNISEX		3' - 0"	6' - 8"	A	HPDL		21	HM-1	HM	H14	J3	S2			
112	112	UNISEX		3' - 0"	6' - 8"	A	HPDL		21	HM-1	HM	H13	J12	S4			
113	113	C	●	5' - 4"	6' - 8"	F	HPDL		11	HM-1	HM	H13	J12	S4			
114A	114	DATA	●	5' - 4"	6' - 8"	F	HPDL		11	HM-1	HM	H13	J12	S4			
114B	114	DATA	●	5' - 4"	6' - 8"	F	HPDL		11	HM-1	HM	H13	J12	S4			
115	115	SENSORY		3' - 0"	6' - 8"	C	HPDL	GL-2	23	HM-1	HM	H11	J27	S4			
116	116	SENSORY		3' - 0"	6' - 8"	C	HPDL	GL-2	23	HM-1	HM	H11	J27	S4			
117	117	CONF		3' - 0"	6' - 10"	A	HPDL		23	HM-5	HM	H11	J14/HMJ5	S4			
118	118	RECEP		3' - 0"	7' - 2"	D	HPDL	GL-2	9	HM-1	HM	H5	J10	S4			
118A	118A	SEC		3' - 0"	6' - 8"	A	HPDL		13	HM-4	HM	H15	J12	S4		30	
118B	118B	GUID		3' - 0"	6' - 8"	A	HPDL		13	HM-4	HM	H3	J3	S4/HMFS-1		30	
118C	118C	PRINC		3' - 0"	6' - 8"	A	HPDL		13	HM-4	HM	H15	J12	S4		30	
118D	118D	T		3' - 0"	6' - 8"	A	HPDL		19	HM-1	HM	H13	J12	S2			
118E	118	RECEP		3' - 0"	6' - 8"	C	HPDL	GL-2	24	HM-1	HM	H5	J10	S4			
118F	118	RECEP		3' - 0"	7' - 0"	D	HPDL	GL-2	24	HM-7	HM	H14	J11/J7/HMFJ-4	S4/HMFS-1			
119	119	NURSE		3' - 0"	6' - 8"	C	HPDL	GL-2	23	HM-1	HM	H14	J3/J13	S4			
119A	119A	T		3' - 0"	6' - 8"	A	HPDL		20	HM-1	HM	H14	J3	S2			
120	120	T		3' - 0"	6' - 8"	A	HPDL		22	HM-1	HM	H14	J3	S2			
121	121	CONF		3' - 0"	7' - 2"	A	HPDL		23	HM-8	HM	H14	J25/J7	S4/S6		30	
122	122	S	●	6' - 0"	6' - 8"	F	HPDL		10	HM-1	HM	H14	J3	S4			
123	123	OT/PT		3' - 0"	6' - 8"	C	HPDL	GL-2	23	HM-1	HM	H5	J4	S4		30	
123A	123	OT/PT		3' - 0"	6' - 8"	A	HPDL		15	HM-1	HM	H5	J4	S4			
123B	123	OT/PT	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H13	J12	S4			
123C	123	OT/PT	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H13	J12	S4			
124	124	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J26	S4/S6		30	
124A	124A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H13	J12	S7			
124B	124	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			

DOOR SCHEDULE

RL	ROOM #	ROOM NAME	DOUBLE LEAF DOOR	DOOR WIDTH	DOOR HEIGHT	DOOR TYPE	DOOR MATERIAL	DOOR GLAZING	HARDWARE SET #	FRAME TYPE	FRAME MATERIAL	FRAME HEAD	FRAME JAMB	FRAME SILL	RATING UL	RATING STC	COMMENTS
125	125	EVAL		3' - 0"	6' - 10"	D	HPDL	GL-2	23	HM-6	HM	H5	J14	S4/S6			
126	126	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J26	S4/S6		30	
126A	126A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H13	J12	S7			
126B	126	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
127A	127A	S	●	6' - 0"	6' - 8"	F	HPDL		10	HM-1	HM	H5	J4	S4			
127B	127	GROSS MOTOR	●	6' - 0"	7' - 2"	J	HPDL		11	HM-1	HM	H12	J17/J18	S4			
127C	127	GROSS MOTOR	●	6' - 0"	7' - 2"	J	HPDL		11	HM-1	HM	H12	J17/J18	S4			
128	128	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
129	129	STOR		3' - 0"	6' - 8"	A	HPDL		25	HM-1	HM	H3	J3	S4		30	
130	130	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
131	131	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
132	132	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
133	133	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
134	134	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
135	135	SPEC		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H13	J12/J7	S4/HMFS-1		30	
136	136	A/M OFFICE		3' - 0"	6' - 8"	A	HPDL		25	HM-4	HM	H15	J12/J7	S4/HMFS-1		30	
137	137	CLASSROOM		3' - 0"	7' - 0"	A	HPDL	GL-2	23	HM-3	HM	H3	J16/HMFJ3	S4/HMFS-1		30	
137A	137A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
137B	137	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H15	J12	S4			
138	138	KITCHEN		3' - 6"	6' - 8"	A	HPDL		13	HM-1	HM	H5	J4	S4			
138A	138A	T		3' - 0"	6' - 8"	A	HPDL		19	HM-1	HM	H3	J3	S2			
138B	138	KITCHEN		3' - 0"	6' - 8"	A	HPDL		15	HM-1	HM	H13	J12	S4			
138C	138	KITCHEN		3' - 0"	6' - 8"	A	HPDL		17	HM-1	HM	H4	J4	S4			
139	139	T		3' - 0"	6' - 8"	A	HPDL		22	HM-1	HM	H5	J9	S2			
140	140	CLASSROOM		3' - 0"	7' - 0"	A	HPDL	GL-2	23	HM-3	HM	H3	J16/J18/HMFJ3	S4/HMFS-1		30	
140A	140A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H14	J3	S7			
140B	140	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
140C	140	CLASSROOM		3' - 0"	6' - 8"	A	HPDL		15	HM-1	HM	H14	J3	S4			
141	141	MECH		3' - 0"	6' - 8"	A	HPDL		12	HM-1	HM	H5	J4	S4	SMOKE		
141A	141	MECH		3' - 6"	6' - 8"	E	FG		3	HM-1	HM	H1	J1				
142	142	DATA		3' - 0"	6' - 8"	A	HPDL		12	HM-1	HM	H5	J4	S5			
143	143	T		3' - 0"	6' - 8"	A	HPDL		21	HM-1	HM	H5	J4	S2			
144	144	BREAK / WORK ROOM		3' - 0"	6' - 8"	C	HPDL	GL-2	17	HM-1	HM	H3	J3/J21	S4			
144A	144A	ELEC		3' - 0"	6' - 8"	A	HPDL		7	HM-1	HM	H5	J4	S5			
145	145	CUST		3' - 0"	6' - 8"	A	HPDL		15	HM-1	HM	H4	J22/J28	S4			
146	146	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J3/J7/6/A6.0	S4/HMFS-1		30	
146A	146A	T		3' - 0"	6' - 8"	B	HPDL			HM-1		H5	J9	S7			
146B	146B	STORAGE	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
147	147	CLASSROOM		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J3/J7/6/A6.0	S4/HMFS-1		30	
147A	147A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H5	J9	S7			
147B	147	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
148	100B	CORRIDOR		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J24/J7/HMFJ-1	S4/HMFS-1		30	
148A	148A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H3	J3	S7			
148B	148	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
149	100B	CORRIDOR		3' - 0"	6' - 8"	A	HPDL	GL-2	23	HM-3	HM	H3	J6/J24/J7/HMFJ-1	S4/HMFS-1		30	
149A	149A	T		3' - 0"	6' - 8"	B	HPDL		18	HM-1		H3	J3	S7			
149B	149	CLASSROOM	●	6' - 0"	6' - 8"	F	HPDL		14	HM-1	HM	H14	J3	S4			
150	150	STORAGE		3' - 6"	6' - 8"	E	FG		3	HM-1	HM	H8					PAINTED INSULATED METAL DOOR
R100				3' - 0"	1' - 0 5/8"							-	-	-			ROOF HATCH



DOOR ELEVATIONS

1/2" = 1'-0"

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

STATE OF CONNECTICUT · LANCE MALIK · REG. 9193 · REGISTERED ARCHITECT

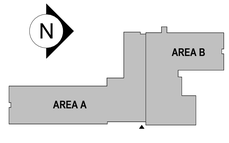
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

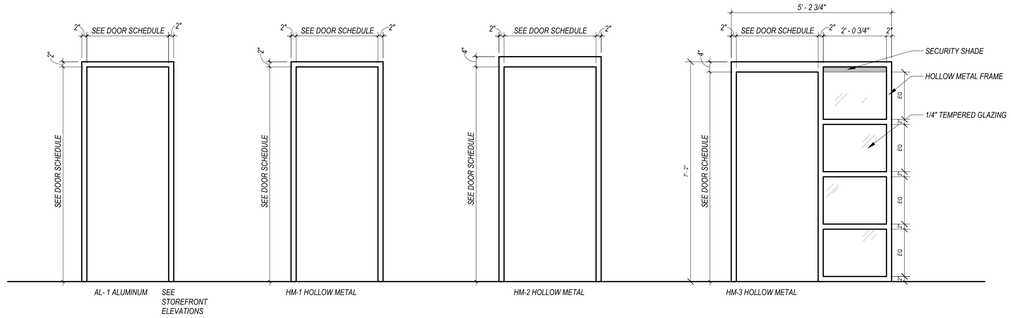
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DOOR SCHEDULE & ELEVATIONS

A9.0



DOOR FRAME ELEVATIONS
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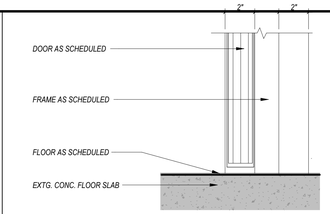

15 A9.1 DOOR DETAIL-S4
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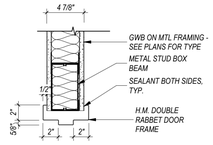

17 A9.1 DOOR HEAD DETAIL-H13
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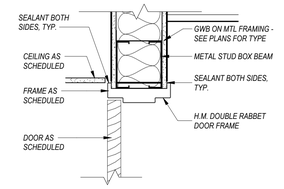

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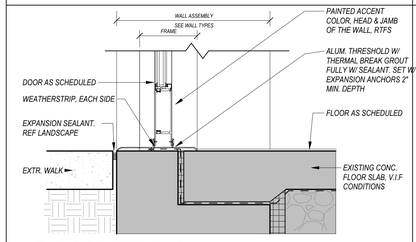

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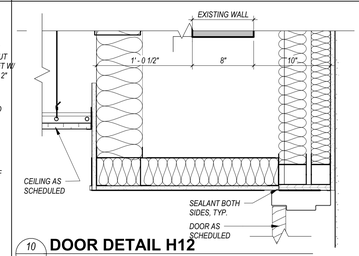
1 1/2" = 1'-0"



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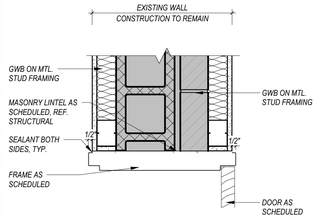

5 A9.1 DOOR HEAD DETAIL-H5
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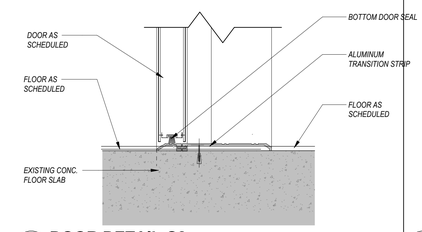

13 A9.1 DOOR DETAIL-S2
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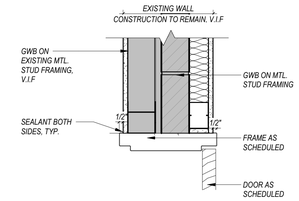

11 A9.1 DOOR HEAD DETAIL-H11
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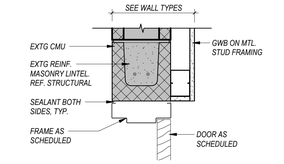

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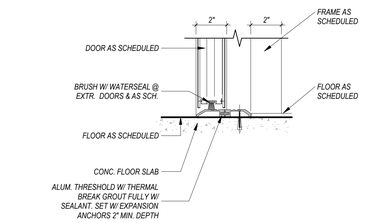

12 A9.1 DOOR DETAIL-S1
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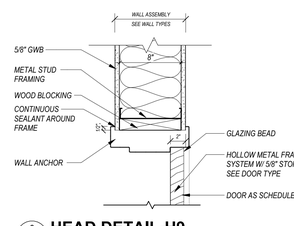

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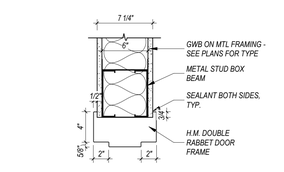

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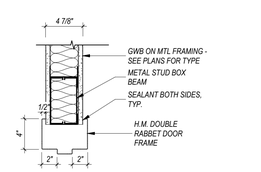

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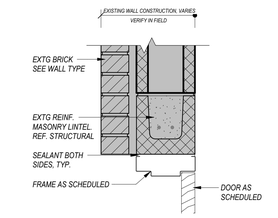

8 A9.1 DOOR HEAD DETAIL -H8
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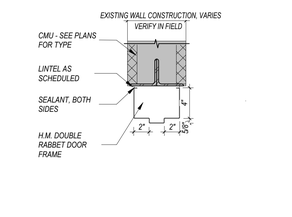
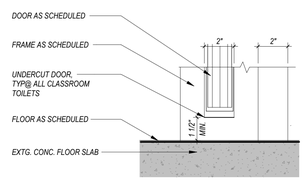


2 A9.1 DOOR HEAD DETAIL-H2
1 1/2" = 1'-0"



18 A9.1 DOOR DETAIL-S7
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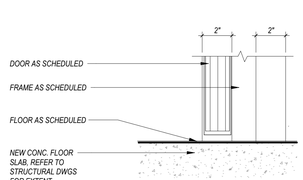

16 A9.1 DOOR DETAIL-S5
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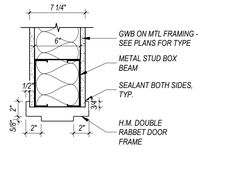

19 A9.1 DOOR HEAD DETAIL-H14
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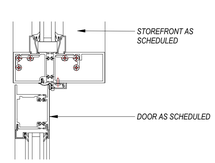
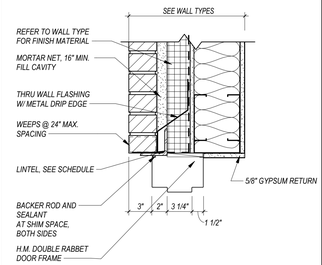


7 A9.1 DOOR HEAD DETAIL-H7
3" = 1'-0"



1 A9.1 DOOR DETAIL-H1
1 1/2" = 1'-0"

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
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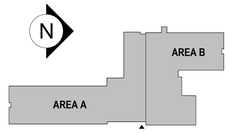
STATE OF CONNECTICUT · QUISENBERRY ARCARI MALIK · REG. 9193 · REGISTERED ARCHITECT

RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DOOR DETAILS

A9.1

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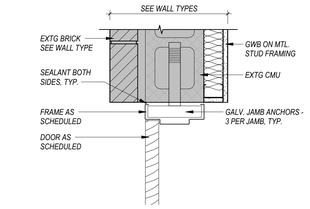

25 A9.2 **JAMB DETAIL-J28**
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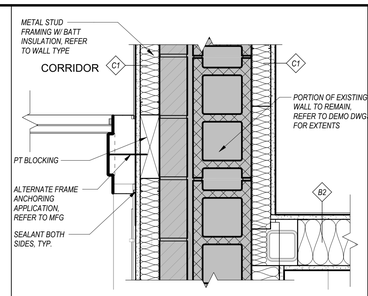

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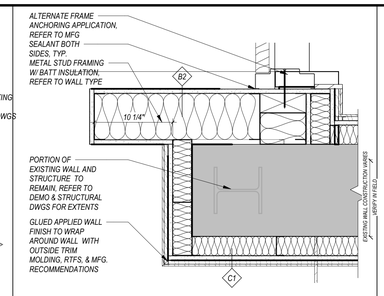

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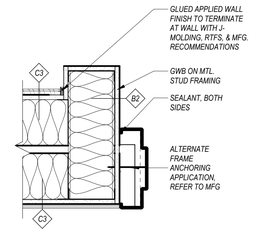

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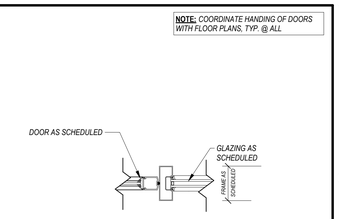

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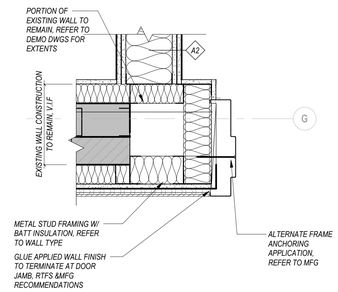

24 A9.2 **JAMB DETAIL-J27**
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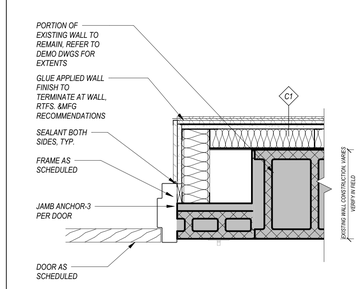

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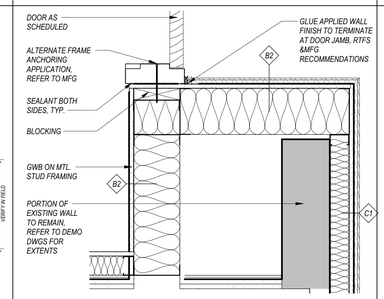

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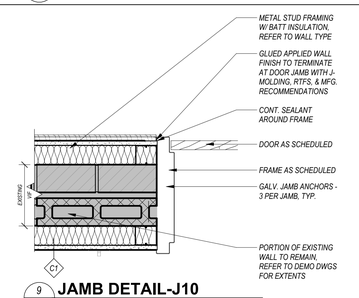

9 A9.2 **JAMB DETAIL-J10**
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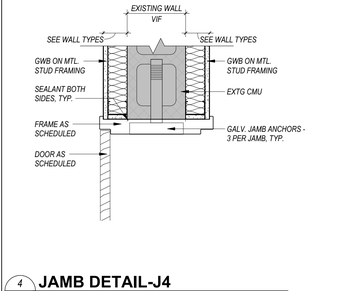

4 A9.2 **JAMB DETAIL-J4**
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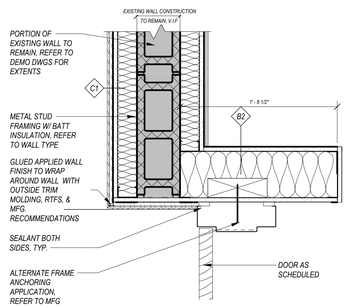

23 A9.2 **JAMB DETAIL-J26**
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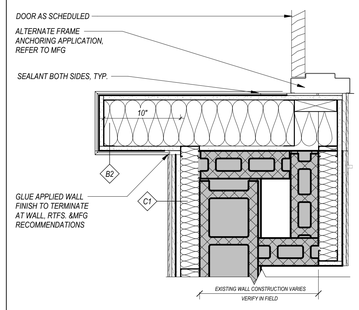

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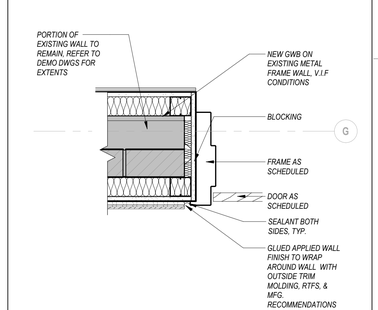

12 A9.2 **JAMB DETAIL J14**
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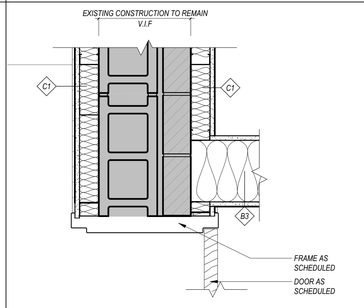

8 A9.2 **JAMB DETAIL J9 (TOILET)**
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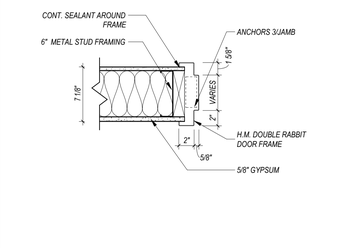

3 A9.2 **JAMB DETAIL-J3**
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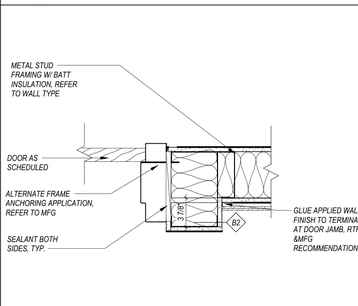

21 A9.2 **JAMB DETAIL-J25**
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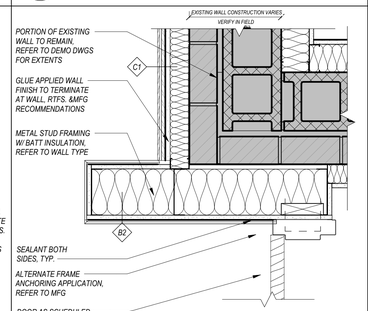

16 A9.2 **JAMB DETAIL-J19**
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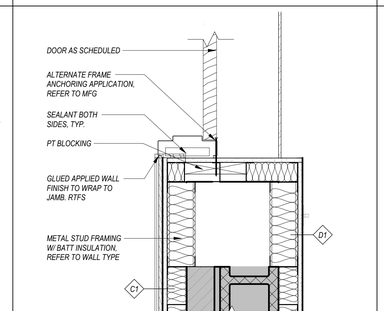

11 A9.2 **JAMB DETAIL-13**
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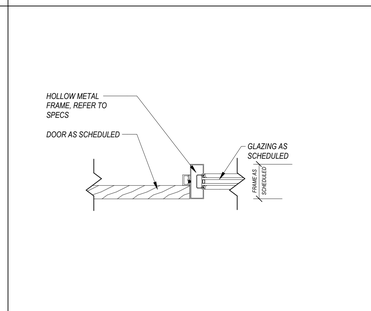

7 A9.2 **JAMB DETAIL-J7**
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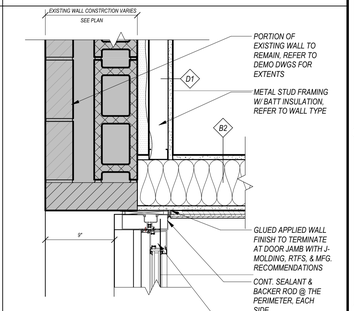

2 A9.2 **JAMB DETAIL -J2**
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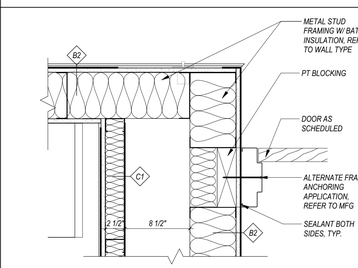
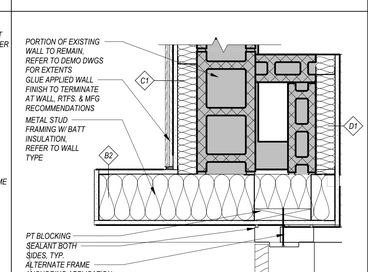
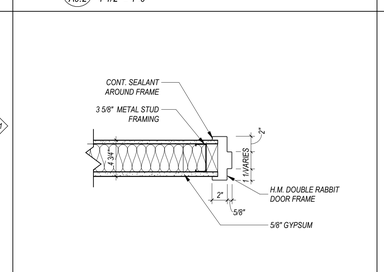


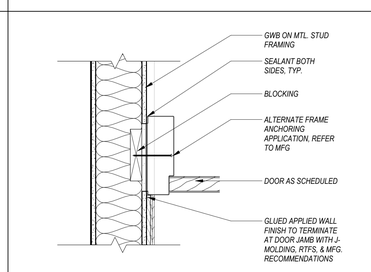
20 A9.2 **JAMB DETAIL J24**
1 1/2" = 1'-0"



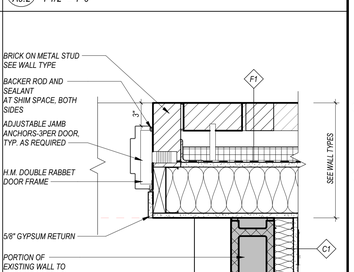
15 A9.2 **JAMB DETAIL J18**
1 1/2" = 1'-0"



10. A9.2 **JAMB DETAIL-J12**
1 1/2" = 1'-0"



6 A9.2 **JAMB DETAIL J6 (CLASS)**
1 1/2" = 1'-0"



1 A9.2 **JAMB DETAIL-J1**
1 1/2" = 1'-0"

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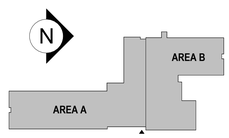
STATE OF CONNECTICUT
REGISTERED ARCHITECT
NO. 9193

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

DOOR JAMB DETAILS

A9.2

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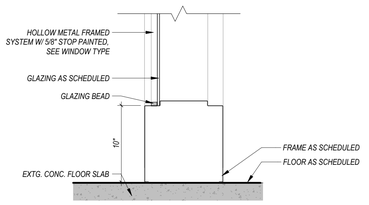
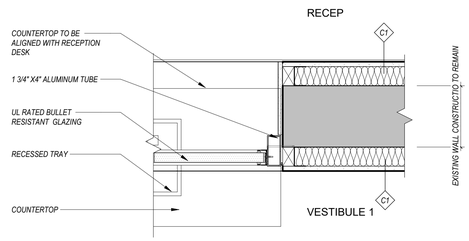
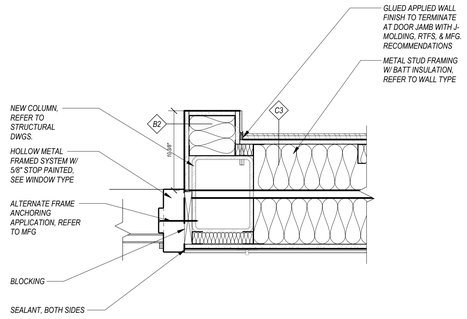


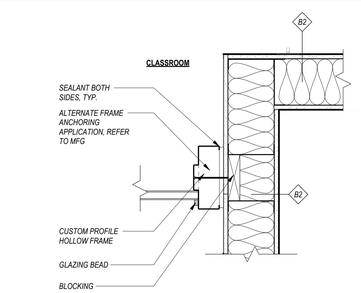
14 DOOR DETAIL-HMFS-2
A9.3 1 1/2" = 1'-0"



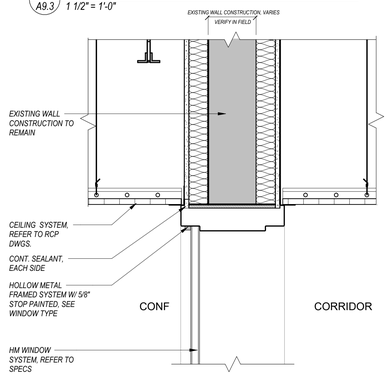
11 JAMB DETAIL- HMJ7 (TRANSACTION WINDOW)
A9.3 1 1/2" = 1'-0"

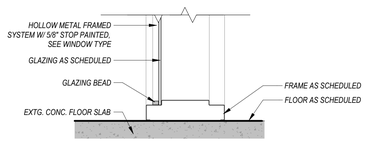


9 JAMB DETAIL HMFJ4
A9.3 1 1/2" = 1'-0"

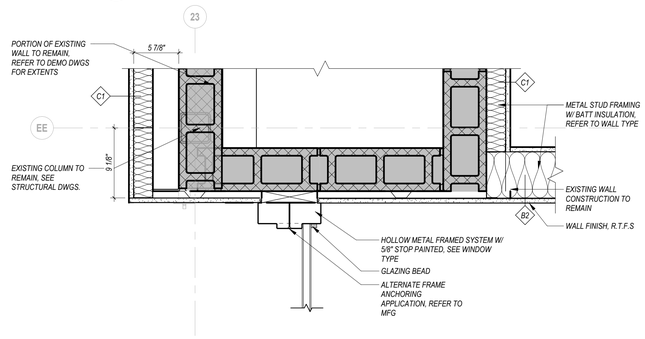


6 JAMB DETAIL-HMFJ-1
A9.3 1 1/2" = 1'-0"

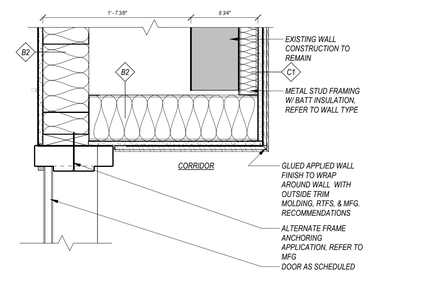




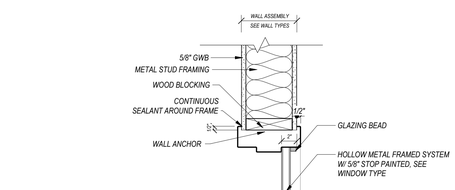
13 DOOR DETAIL-HMFS-1
A9.3 1 1/2" = 1'-0"



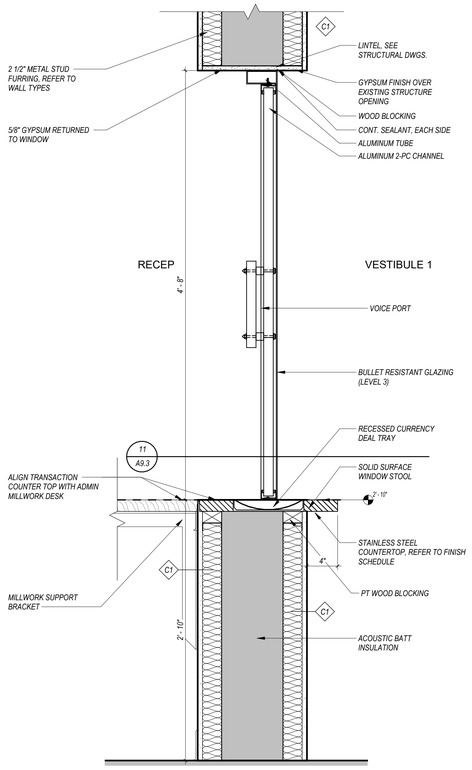
15 JAMB DETAIL-HMJ6
A9.3 1 1/2" = 1'-0"



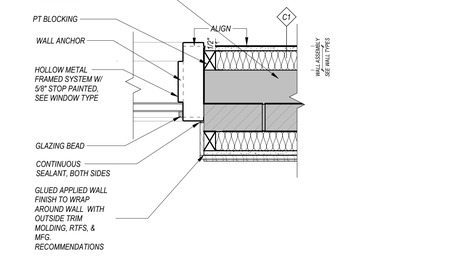
8 JAMB DETAIL-HMFJ3
A9.3 1 1/2" = 1'-0"



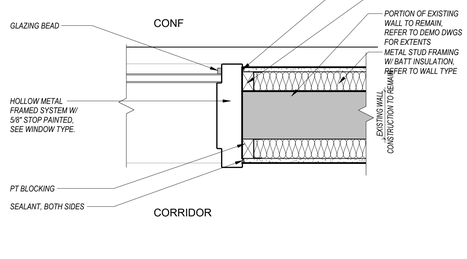
5 HEAD DETAIL- HMFH-2
A9.3 1 1/2" = 1'-0"



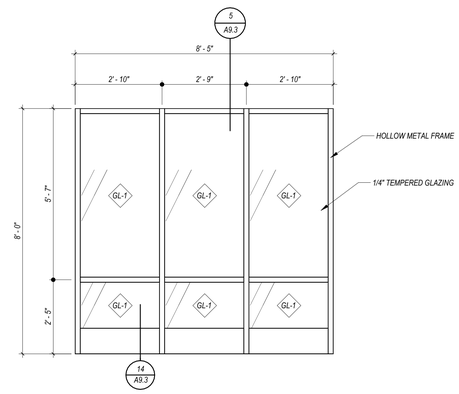
12 SILL DETAIL- SFS12
A9.3 1 1/2" = 1'-0"



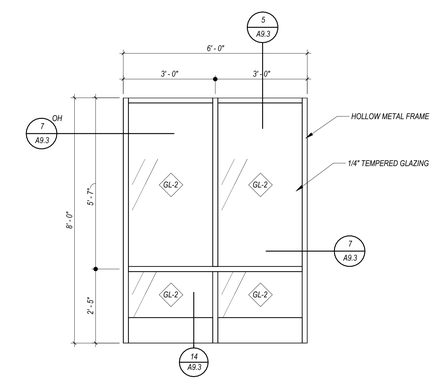
10 HM-JAMB DETAIL-HMJ-5
A9.3 1 1/2" = 1'-0"



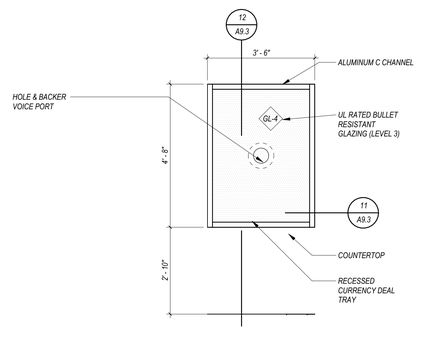
7 JAMB DETAIL-HMFJ-2
A9.3 1 1/2" = 1'-0"



3 HMF3- ELEVATION
A9.3 1/2" = 1'-0"



2 HMF2- ELEVATION
A9.3 1/2" = 1'-0"



1 HMF1- ELEVATION
A9.3 1/2" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
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State Project #: 017-0090 RNV
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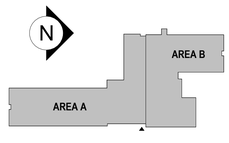
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

HOLLOW METAL TYPES AND DETAILS

A9.3

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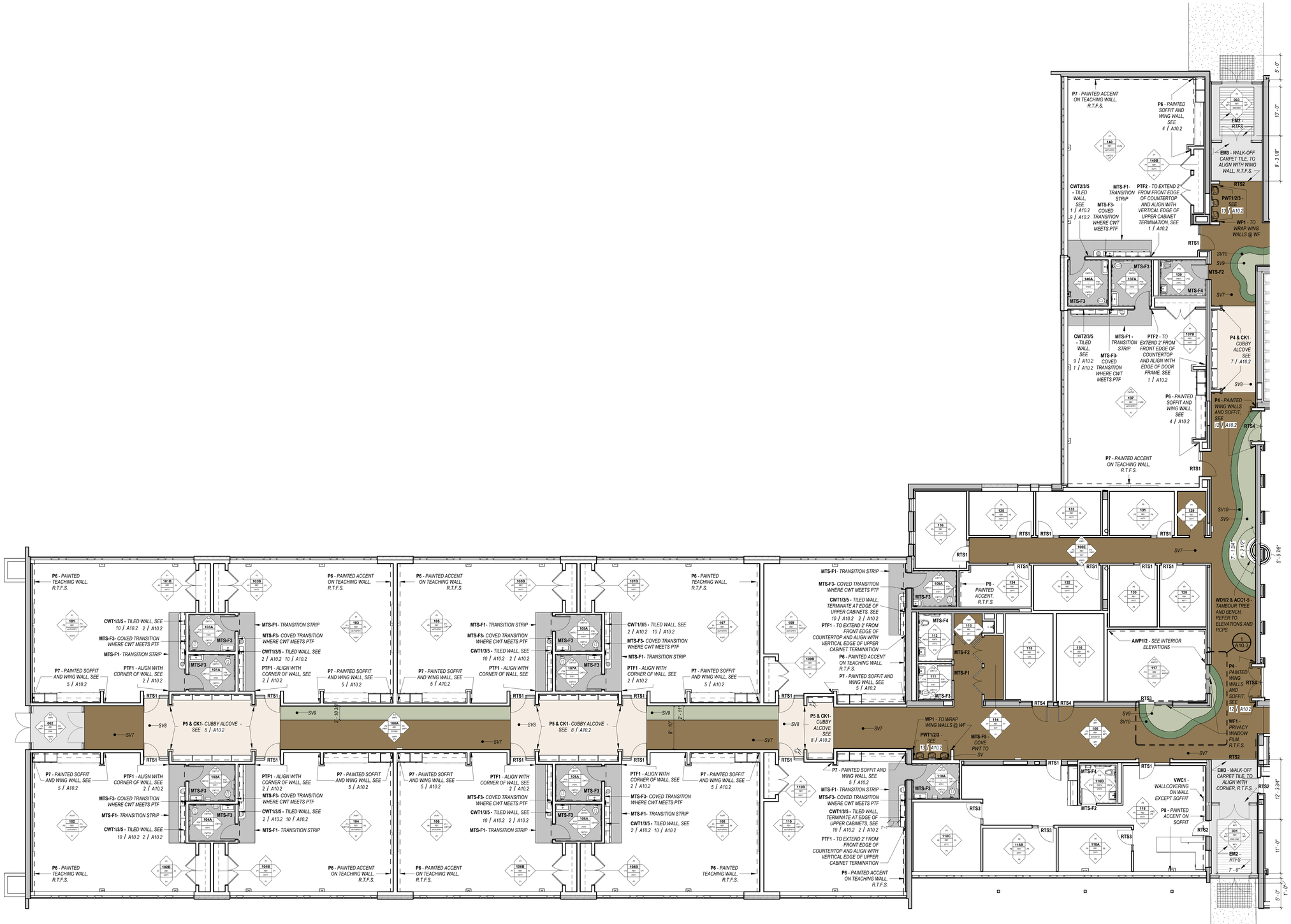

1 A10.0 FIRST FLOOR PLAN-AREA A FINISHES
1/8" = 1'-0"

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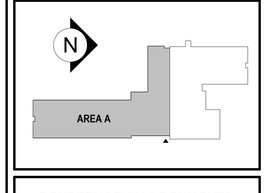

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED FINISH PLAN - AREA A

A10.0

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ROOM FINISH SCHEDULE

Room Number	Room Name	Floor Finish	Base Finish	WALL FINISH - (N)	WALL FINISH - (E)	WALL FINISH - (S)	WALL FINISH - (W)
001	VESTIBULE 1	EM2 / EM3	RB1	P3/ WP1	P3/ WP1	WP1/ P3	P3/ WP1
002	VESTIBULE 2	EM4	RB1	P3/ VWP1	P3/ VWP1	VWP1/ P3	P3/ VWP1
003	VESTIBULE 3	EM2/EM3	RB1	P3	P3/ WP1	P3	P3/ WP1
100	CORRIDOR	SV7/8/9/10	RB1	P3/ WP1	P3/ WP1	WP1 /P3	P3/ WP1
100A	CORRIDOR	SV7/8/9	RB1	P3/ VWP1	P3/ VWP1	VWP1 /P3	P3/ VWP1
100B	CORRIDOR	SV7/8/9/10	RB1	P3/ WP1	P3/ WP1	WP1 /P3	P3/ WP1
100C	CORRIDOR	SV7	RB1	P3/ VWP1	P3/ VWP1	VWP1 /P3	P3/ VWP1
100D	CORRIDOR	SV7/8/9	RB1	P3/ VWP1	P3/ VWP1	VWP1 /P3	P3/ VWP1
100E	CORRIDOR	SV7	RB1	P3/ VWP1	P3/ VWP1	VWP1/ P3	P3/ VWP1
101	CLASSROOM	HVT1/PTF1	RB1	P1	P1 / CWT1/3	P1/P7	P6
101A	T	PTF1	--	P18/ CWT1/3	P18/ CWT1/3	CWT1/3./P18	CWT1/3
101B	STORAGE	HVT1	RB1	P1	P1	P1	P1
102	CLASSROOM	HVT1/PTF1	RB1	P1/P7	P1 / CWT1/3	P1	P6
102A	T	PTF1	--	P18/ CWT1/3	P18/ CWT1/3	CWT1/3./P18	CWT1/3
102B	STORAGE	HVT1	RB1	P1	P1	P1	P1
103	CLASSROOM	HVT1/PTF1	RB1	P1	P6	P1/P7	P1 / CWT1/3
103A	T	PTF1	--	P18/ CWT1/3	CWT1/3	CWT1/3./P18	P18/ CWT1/3
103B	STORAGE	HVT1	RB1	P1	P1	P1	P1
104	CLASSROOM	HVT1/PTF1	RB1	P1/P7	P6	P1	P1 / CWT1/3
104A	T	PTF1	--	P18/ CWT1/3	CWT1/3	CWT1/3./P18	P18/ CWT1/3
104B	STORAGE	HVT1	RB1	P1	P1	P1	P1
105	CLASSROOM	HVT1/PTF1	RB1	P1	P1/ CWT1/3	P1/P7	P6
105A	T	PTF1	--	P18/ CWT1/3	P18/ CWT1/3	CWT1/3./P18	CWT1/3
105B	STORAGE	HVT1	RB1	P1	P1	P1	P1
106	CLASSROOM	HVT1/PTF1	RB1	P1/P7	P1 / CWT1/3	P1	P6
106A	T	PTF1	--	P18/ CWT1/3	CWT1/3	CWT1/3./P18	P18/ CWT1/3
106B	STORAGE	HVT1	RB1	P1	P1	P1	P1
107	CLASSROOM	HVT1/PTF1	RB1	P1	P6	P1/P7	P1 / CWT1/3
107A	T	PTF1	--	P18/ CWT1/3	CWT1/3	CWT1/3./P18	P18/ CWT1/3
107B	STORAGE	HVT1	RB1	P1	P1	P1	P1
108	SELF CONTAINED CLASSROOM	HVT1/PTF1	RB1	P1/P7	P6	P1	P1 / CWT1/3
108A	T	PTF1	--	P18/ CWT1/3	CWT1/3	CWT1/3./P18	P18/ CWT1/3
108B	STORAGE	HVT1	RB1	P1	P1	P1	P1
109	SELF CONTAINED CLASSROOM	HVT1/PTF1	RB1	P1	P1 / CWT1/3	P1/P7	P6
109A	T	PTF1	--	P18/ CWT1/3	P18/ CWT1/3	CWT1/3./P18	CWT1/3
109B	STORAGE	HVT1	RB1	P1	P1	P1	P1
110	SELF CONTAINED CLASSROOM	HVT1/PTF1	RB1	P1/P7	P1 / CWT1/3	P1	P6
110A	T	PTF1	--	P18/ CWT1/3	P18/ CWT1/3	CWT1/3./P18	P18/ CWT1/3
110B	STORAGE	HVT1	RB1	P1	P1	P1	P1
111	UNISEX	PTF1	--	P18/ CWT1/3	P18/ CWT1/3	CWT1/3./P18	P18/ CWT1/3
112	UNISEX	PTF3	PWT4	P18	P18	P18	PWT4
113	C	SV7	RB1	FRP1	FRP1	FRP1	FRP1
114	DATA	SV7	RB1	P1	P1	P1	P1
115	SENSORY	SV5	RB1	P5	P5	P5	P5
116	SENSORY	SV5	RB1	P5	P5	P5	P5
117	CONF	CPT2	RB2	P11/ AWP1/2	P11/ AWP1/2	P11	P11
118	RECEP	HVT1	RB2	P8	VWC1./P8	P8/P9	P8
118A	SEC	CPT1	RB1	P9	P9	P9	P8
118B	GUID	CPT1	RB1	P9	P9	P9	P8
118C	PRINC	CPT1	RB1	P9	P9	P9	P8
118D	T	PTF3	PWT4	P18	PWT4	P18	P18
119	NURSE	HVT1	RB1	P13	P13	P13	P13
119A	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3./P18	P18/ CWT2/3
120	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3./P18	P18/ CWT2/3
121	CONF	CPT2	RB2	P11	P11	AWP3/4./P11	P11/ AWP3/4
122	S	SV7	RB1	P1	P1	P1	P1
122B	STORAGE	SV6	RB1	P1	P1	P1	P1
122C	STORAGE	SV6	RB1	P1	P1	P1	P1
123	OT/PT	SV2/4/5/6	RB1	P16	P16	P16	P16
123B	STORAGE	HVT1	RB1	P1	P1	P1	P1
124	CLASSROOM	HVT1/PTF2	RB1	P7	P1	P1/ PWT2	P1/ PWT2
124A	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3./P18	P18/ CWT2/3
125	EVAL	HVT1	RB4	P12/ VWC2	P12/ VWC2	VWC2/ P12	P12/ VWC2
125B	STORAGE	HVT1	RB1	P1	P1	P1	P1
126	CLASSROOM	HVT1/PTF2	RB1	P1/P6/ CWT2/3	P1	P7	P1/ CWT2/3
126A	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3./P18	P18/ CWT2/3
127	GROSS MOTOR	SV1/2/3	RB3	P14/15./WP2	P14/15./WP2	WP2/ P14/15	P14/15./WP2
127A	S	SV1/2/3	RB3	P1	P1	P1	P1
128	SPEC	HVT1	RB1	P9	P9	P9	P8
129	STOR	HVT1	RB1	P1	P1	P1	P1
130	SPEC	HVT1	RB1	P9	P9	P9	P8
131	SPEC	HVT1	RB1	P9	P9	P9	P8
132	SPEC	HVT1	RB1	P9	P9	P9	P8
133	SPEC	HVT1	RB1	P9	P8	P9	P9
134	SPEC	HVT1	RB1	P9	P9	P9	P8
135	SPEC	HVT1	RB1	P9	P9	P9	P8
136	A/M OFFICE	HVT1	RB1	P8	P9	P9	P9
137	CLASSROOM	HVT1/PTF2	RB1	P1/ CWT2/3	P1/P6	P7	P1
137A	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3	P18/ CWT2/3
137B	STORAGE	HVT1	RB1	P1	P1	P1	P1
138	KITCHEN	RES1	RES1	FRP1	FRP1	FRP1	FRP1
138A	T	PTF3	PWT4	P18	PWT4	P18	P18
139	T	PTF3	PWT4	P18	P18	P18	PWT4
140	CLASSROOM	HVT1/PTF2	RB1	P7	P1/P6	CWT2/3./P1	P1
140A	T	PTF2	--	CWT2/3	P18/ CWT2/3	CWT2/3./P18	P18/ CWT2/3
140B	STORAGE	HVT1	RB1	P1	P1	P1	P1
141	MECH	SC1	RB1	P1	P1	P1	P1
142	DATA	SV7	RB1	P1	P1	P1	P1
143	T	PTF3	PWT4	P18	P18	P18	PWT4
144	BREAK / WORK ROOM	HVT1	RB1	P9	P9	P9	P8
144A	ELEC	SC1	RB1	P1	P1	P1	P1
145	CUST	SC1	RB1	P1	P1	P1	P1
146	CLASSROOM	HVT1/PTF2	RB1	P1	P1/ CWT2/3	P1/P6	P7
146A	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3./P18	CWT2/3
146B	STORAGE	HVT1	RB1	P1	P1	P1	P1
147	CLASSROOM	HVT1/PTF2	RB1	P1/P6	P1/ CWT2/3	P1	P7
147A	T	PTF2	--	P18/ CWT2/3	P18/ CWT2/3	CWT2/3./P18	CWT2/3
147B	STORAGE	HVT1	RB1	P1	P1	P1	P1
148	CLASSROOM	HVT1/PTF2	RB1	P1	P7	P1/P6	P1/ CWT2/3
148A	T	PTF2	--	P18/ CWT2/3	CWT2/3	CWT2/3./P18	P18/ CWT2/3
148B	CL	HVT1	RB1	P1	P1	P1	P1
149	CLASSROOM	HVT1/PTF2	RB1	P1/P6	P7	P1	P1/ CWT2/3
149A	T	PTF2	--	P18/ CWT2/3	CWT2/3	CWT2/3./P18	P18/ CWT2/3
149B	CL	HVT1	RB1	P1	P1	P1	P1
150	STORAGE	SC1	RB1	P1	P1	P1	P1

1 / A10.1 FIRST FLOOR PLAN-AREA B FINISHES
1/8" = 1'-0"

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STATE OF CONNECTICUT · LANCE MALIK · REGISTERED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

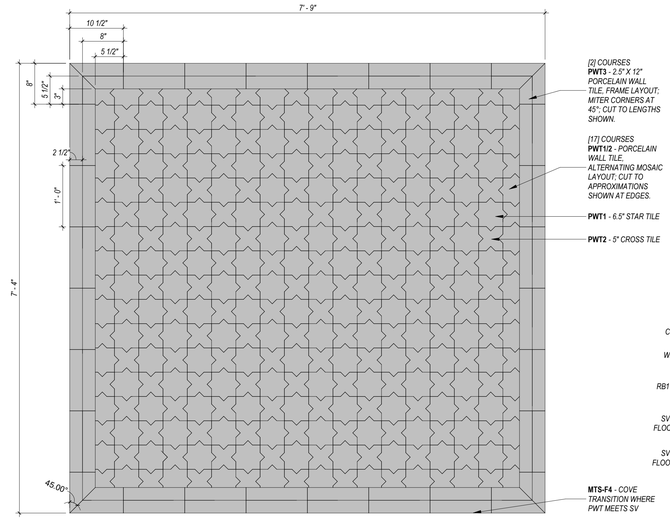
Revisions

AREA B

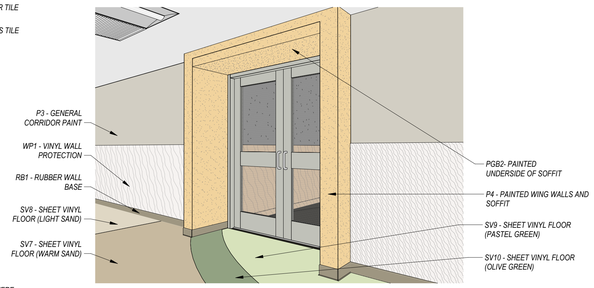
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED FINISH PLAN - AREA B

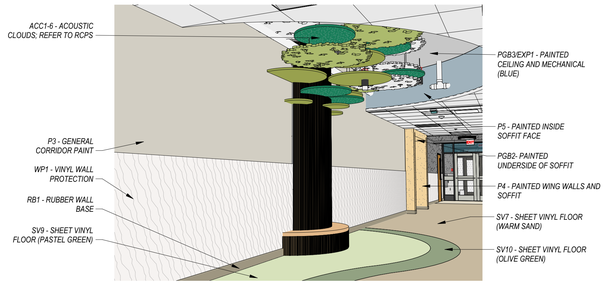
A10.1



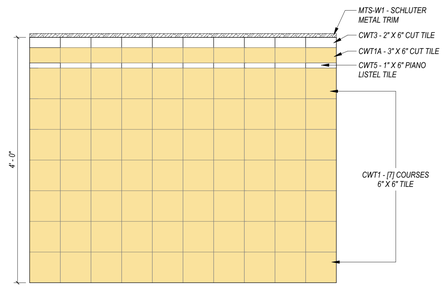
13 A10.2 **TYP. WATER FOUTAIN WALL TILE PATTERN**
1" = 1'-0"



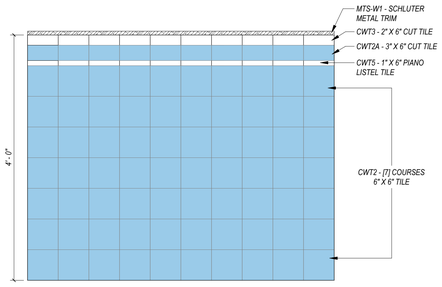
12 A10.2 **TYP. GROSS MOTOR ENTRANCE - MAIN ST**



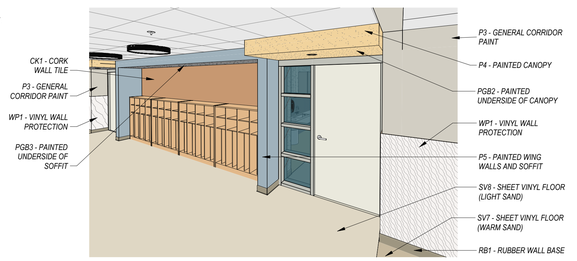
11 A10.2 **TREE BENCH - MAIN ST**



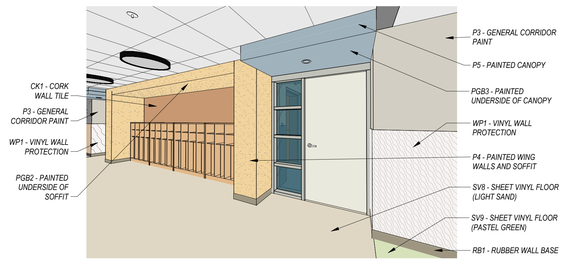
10 A10.2 **RR/SINK WALL TILE - CLASSROOM WING A**
1" = 1'-0"



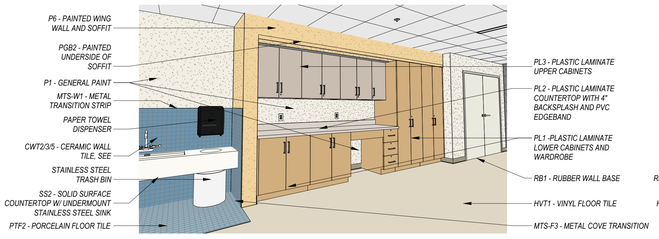
9 A10.2 **RR/SINK WALL TILE - CLASSROOM WING B**
1" = 1'-0"



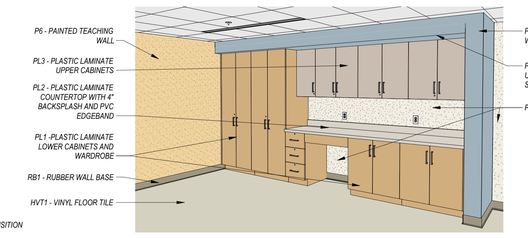
8 A10.2 **CUBBY ALCOVE - CLASSROOM WING A**



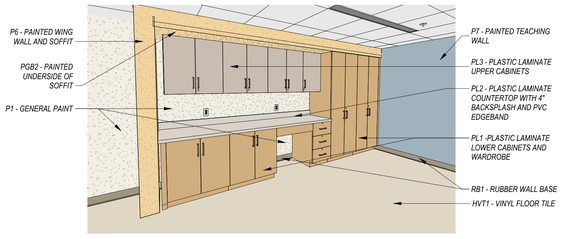
7 A10.2 **CUBBY ALCOVE - CLASSROOM WING B**



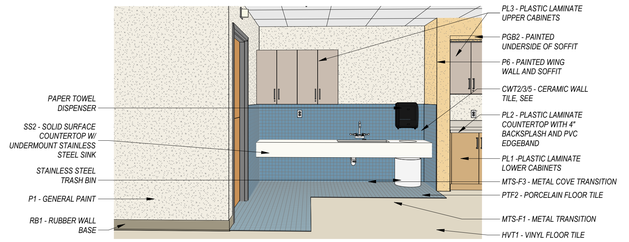
6 A10.2 **TYPICAL MILLWORK - CLASSROOMS 123/125**



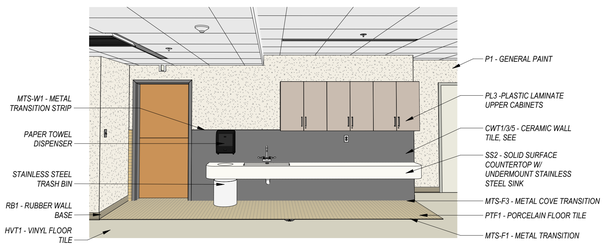
5 A10.2 **TYPICAL MILLWORK - CLASSROOM WING A**



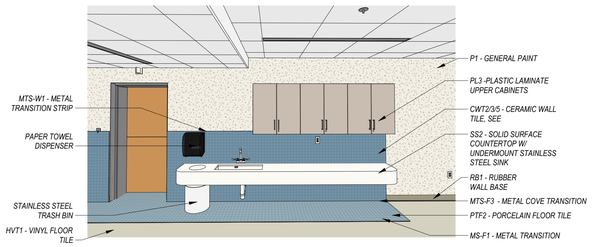
4 A10.2 **TYPICAL MILLWORK - CLASSROOM WING B**



3 A10.2 **RESTROOM MILLWORK - CLASSROOMS 123/125**



2 A10.2 **RESTROOM MILLWORK - CLASSROOM WING A**



1 A10.2 **RESTROOM MILLWORK - CLASSROOM WING B**

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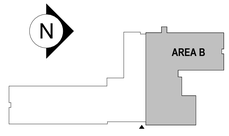
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FINISH DETAILS

A10.2

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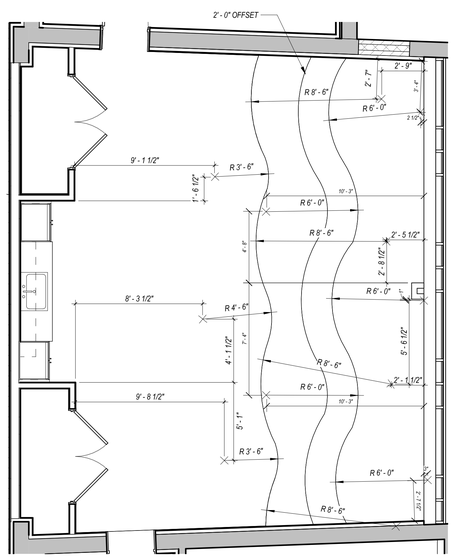
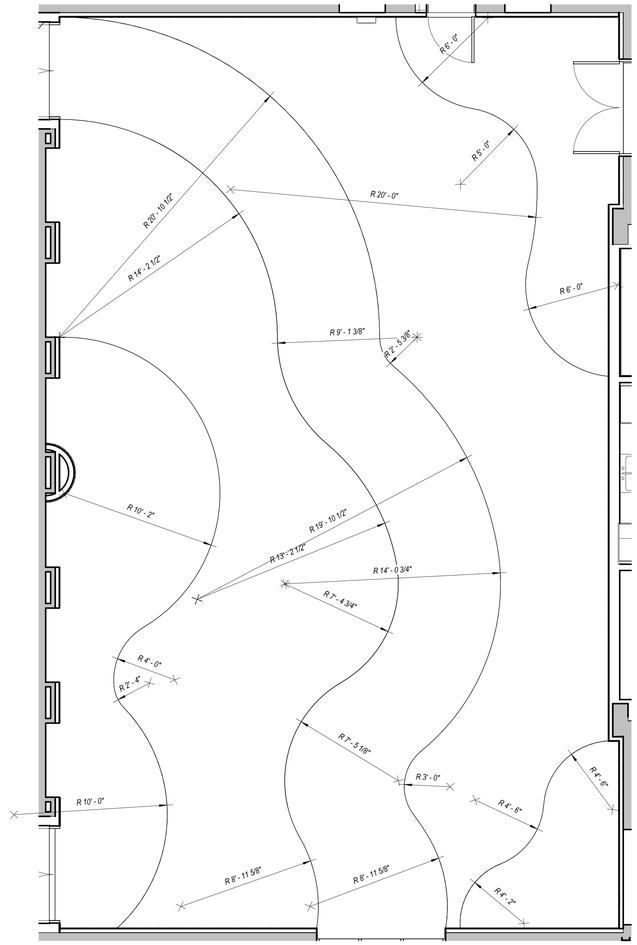
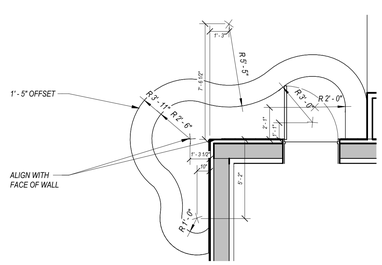


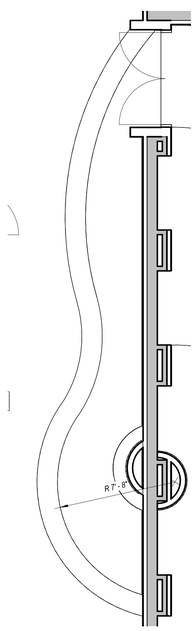
5 A10.3 **FLOOR PATTERN DETAIL - OT/PT**
1/4" = 1'-0"



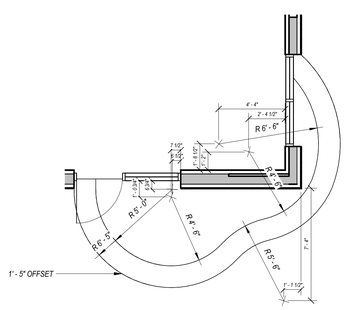
4 A10.3 **FLOOR PATTERN DETAIL - GROSS MOTOR**
1/4" = 1'-0"



3 A10.3 **FLOOR PATTERN DETAIL - CORRIDOR 3**
1/4" = 1'-0"



2 A10.3 **FLOOR PATTERN DETAIL - CORRIDOR 2**
1/4" = 1'-0"



1 A10.3 **FLOOR PATTERN DETAIL - CORRIDOR 1**
1/4" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

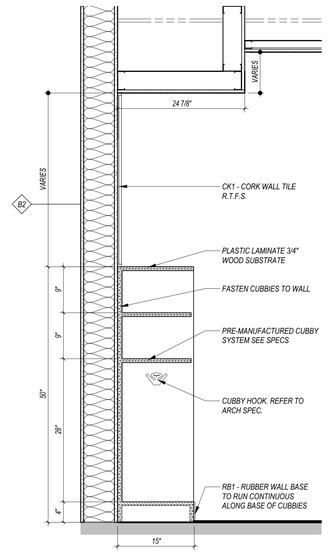
Revisions

N
AREA B

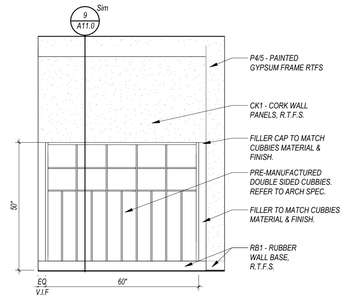
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ENLARGED FLOOR PATTERN DETAILS

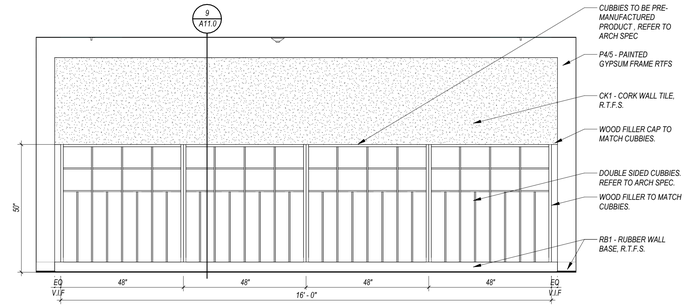
A10.3



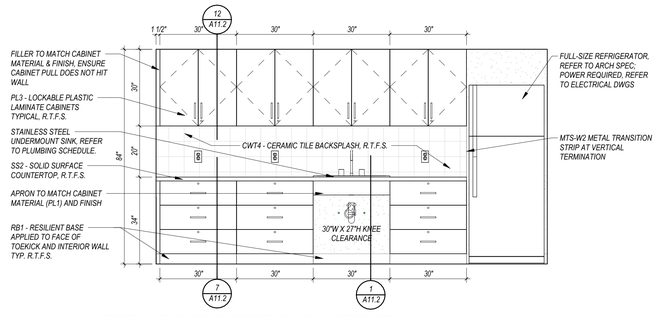
9 / A11.0 **CORRIDOR CUBBIES SECTION**
1" = 1'-0"



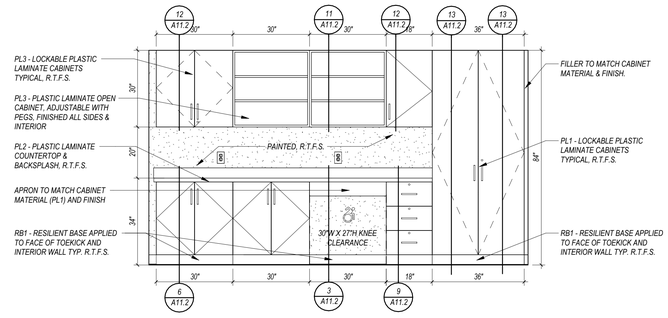
TYPICAL CORRIDOR - CUBBIES ELEVATION 2
8 / A11.0 1/2" = 1'-0"



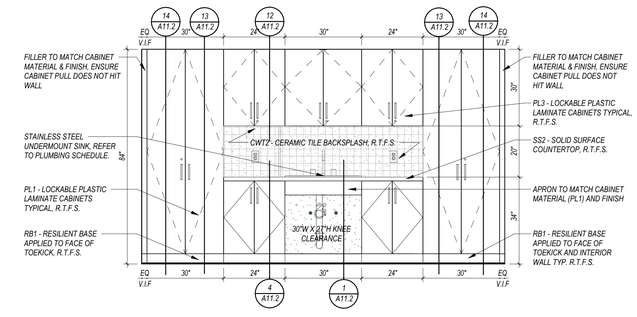
7 / A11.0 **TYPICAL CORRIDOR - CUBBIES ELEVATION 1**
1/2" = 1'-0"



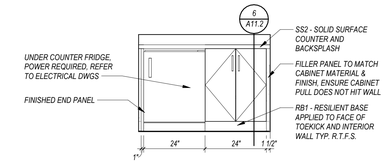
BREAKROOM/WORKROOM - KITCHEN MILLWORK
6 / A11.0 1/2" = 1'-0"



5 / A11.0 **BREAKROOM/WORKROOM - COPY MILLWORK**
1/2" = 1'-0"



4 / A11.0 **OT/PT MILLWORK**
1/2" = 1'-0"



3 / A11.0 **NURSE 118- MILLWORK ELEVATION 2**
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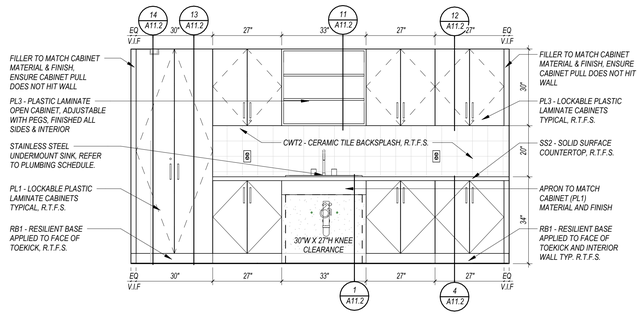
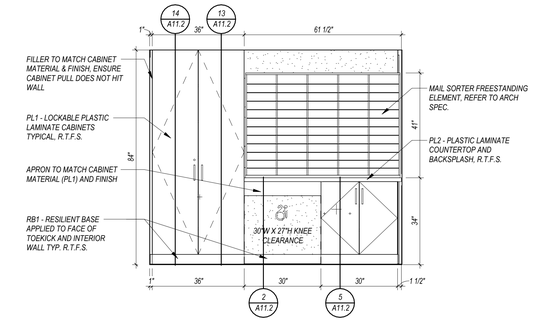


2 / A11.0 **NURSE 118- MILLWORK ELEVATION**
1/2" = 1'-0"



1 / A11.0 **ADMIN SUITE WORKROOM MILLWORK**
1/2" = 1'-0"

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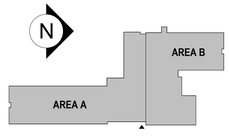
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

GENERAL MILLWORK ELEVATIONS

A11.0

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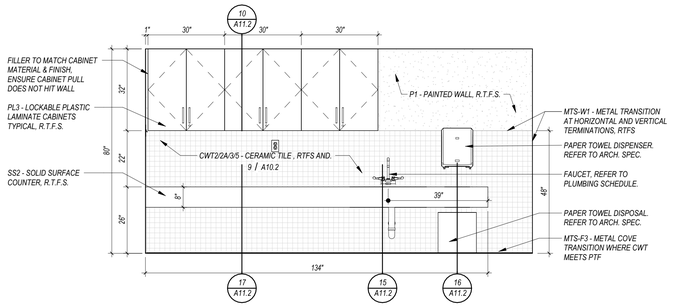
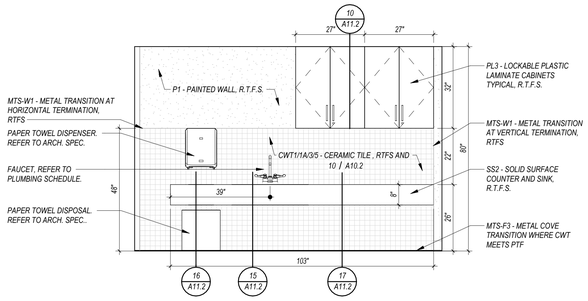


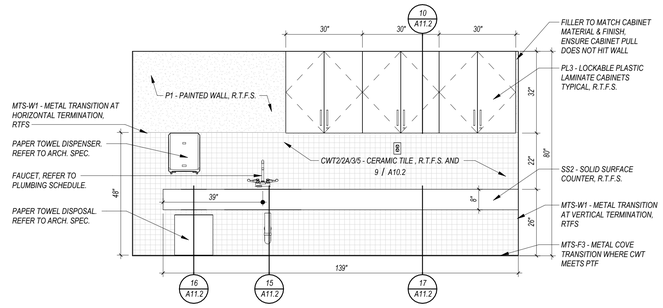
CLASSROOM WING B RMS 148-149 - SINK/MILLWORK

10 A11.1 1/2" = 1'-0"



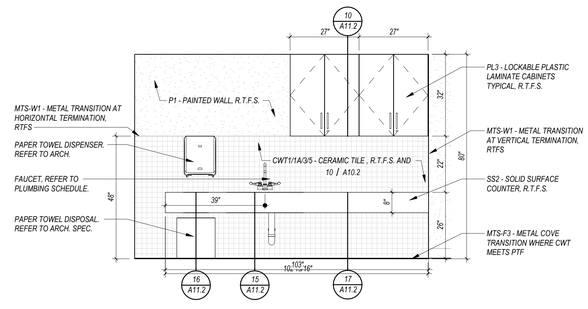
SELF CONTAINED CLASSROOM WING A RM 110 - SINK MILLWORK

6 A11.1 1/2" = 1'-0"



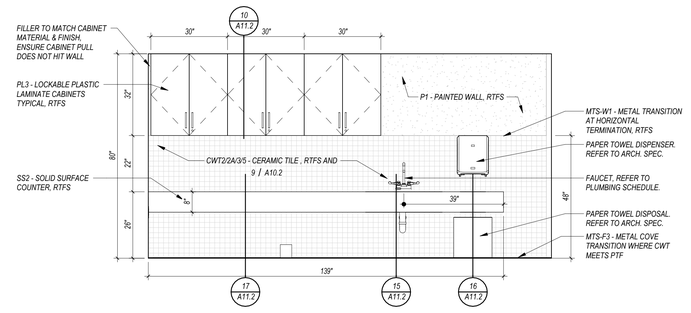
CLASSROOM WING B RMS 146-147 - SINK MILLWORK

9 A11.1 1/2" = 1'-0"



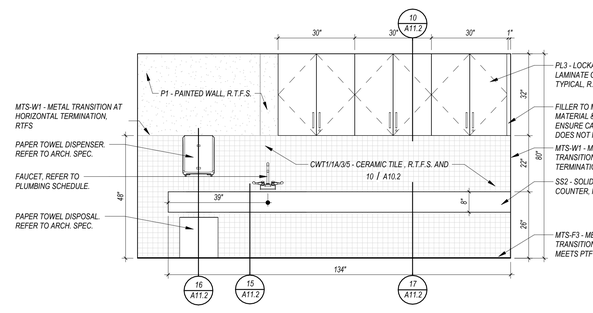
SELF CONTAINED CLASSROOM WING A RM 109 - SINK MILLWORK

5 A11.1 1/2" = 1'-0"



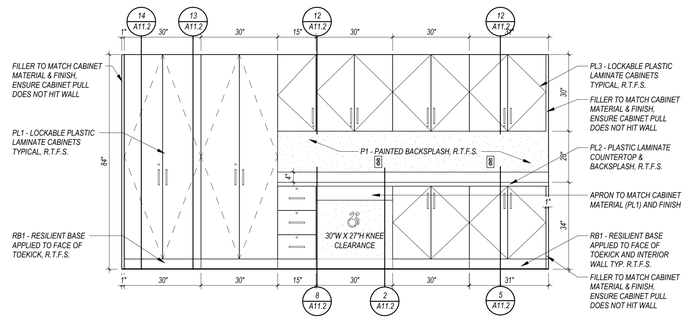
CLASSROOM WING B RMS 137-140 - SINK/MILLWORK

8 A11.1 1/2" = 1'-0"



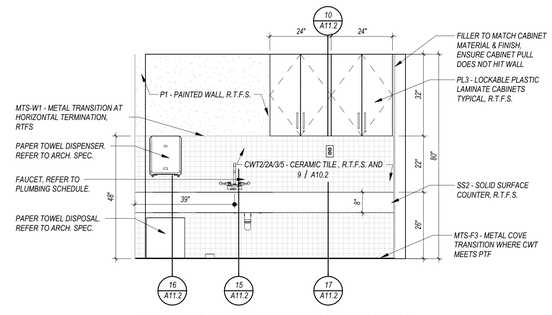
CLASSROOM WING A RMS 101-108 - SINK MILLWORK 2

4 A11.1 1/2" = 1'-0"



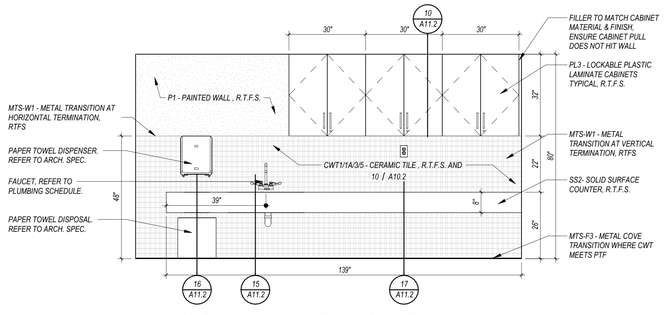
CLASSROOM WING B RMS 124/126 - 1 FILLER MILLWORK

2 A11.1 1/2" = 1'-0"



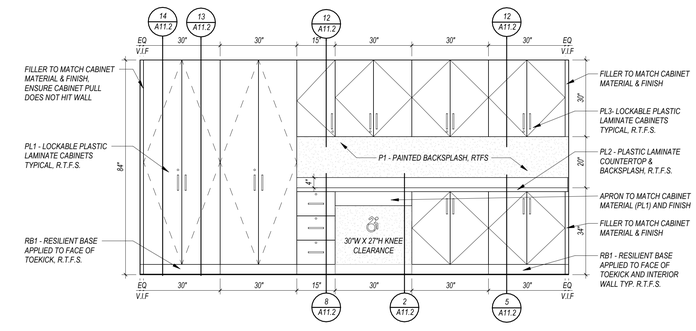
CLASSROOM WING B RMS 124-126 - SINK MILLWORK

7 A11.1 1/2" = 1'-0"



CLASSROOM WING A RMS 101-108 - SINK MILLWORK 1

3 A11.1 1/2" = 1'-0"



CLASSROOM WINGS A/B - 2 FILLER MILLWORK

1 A11.1 1/2" = 1'-0"

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STATE OF CONNECTICUT
DAVID MALIK
REG. 9193
REGISTERED ARCHITECT

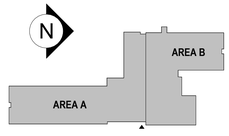
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

CLASSROOM MILLWORK ELEVATIONS

A11.1

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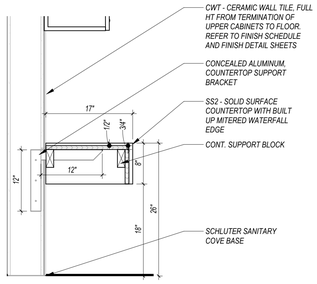
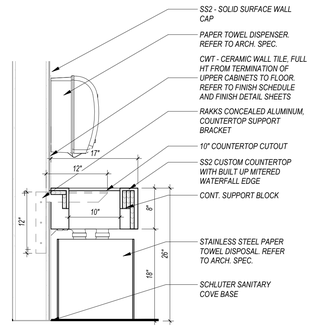


17 A11.2 **TYPICAL CLASSROOM SINK MILLWORK 3**
1" = 1'-0"



16 A11.2 **TYPICAL CLASSROOM SINK MILLWORK 2**
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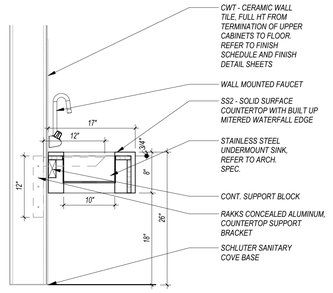
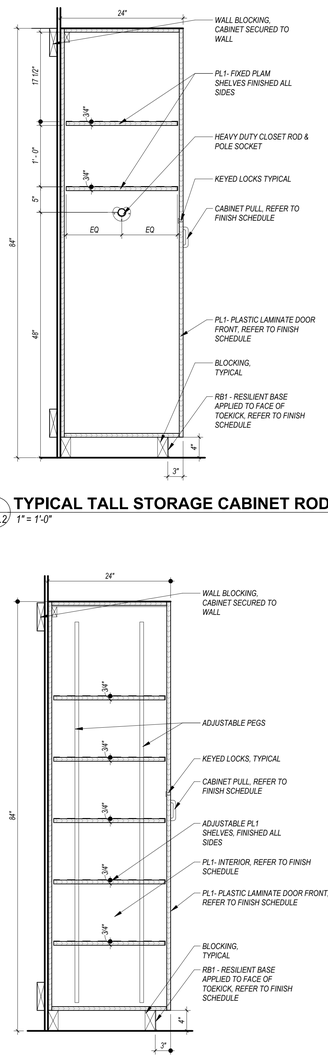
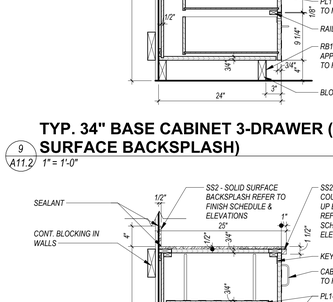


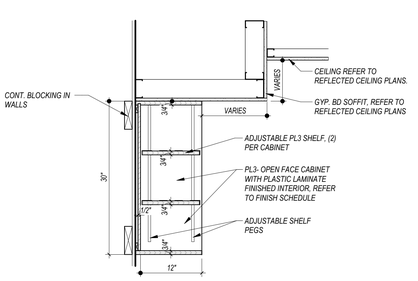
15 A11.2 **TYPICAL CLASSROOM SINK MILLWORK 1**
1" = 1'-0"



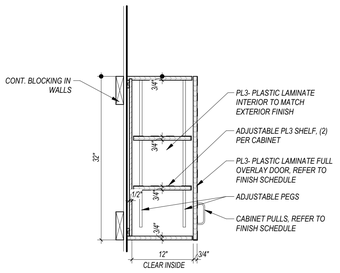
14 A11.2 **TYPICAL TALL STORAGE CABINET ROD SIDE**
1" = 1'-0"



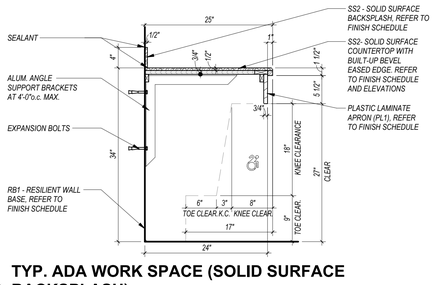
12 A11.2 **TYP. UPPER CABINET W/ DOORS**
1" = 1'-0"



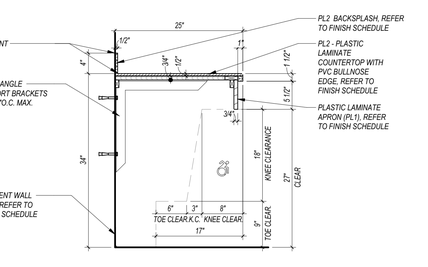
11 A11.2 **TYP. UPPER CABINET W/ OPEN SHELVES**
1" = 1'-0"



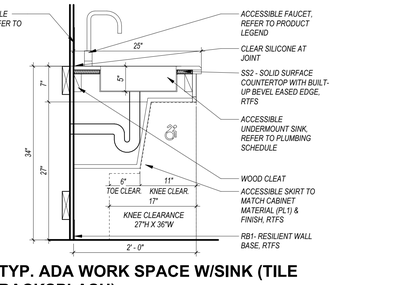
10 A11.2 **TYP. UPPER CABINETS OVER SINK**
1" = 1'-0"



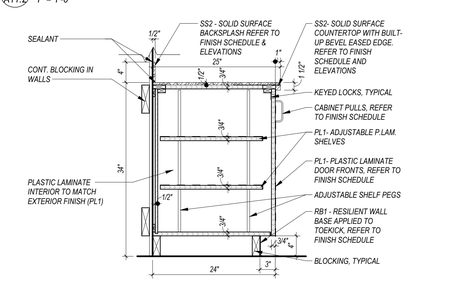
9 A11.2 **TYP. 34" BASE CABINET 3-DRAWER (SOLID SURFACE BACKSPLASH)**
1" = 1'-0"



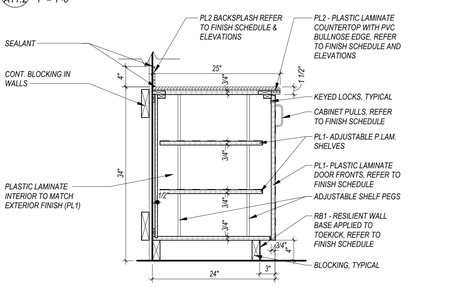
8 A11.2 **TYP. 34" BASE CABINET 3-DRAWER (PLAM BACKSPLASH)**
1" = 1'-0"



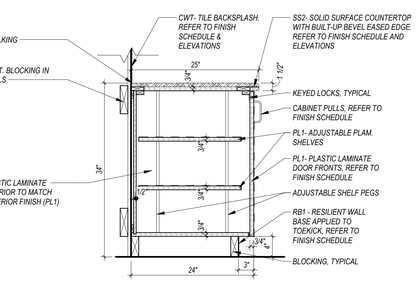
7 A11.2 **TYP. 34" BASE CABINET 3-DRAWER (TILE BACKSPLASH)**
1" = 1'-0"



6 A11.2 **TYP. 34" BASE CABINET W/SHELVES (SOLID SURFACE BACKSPLASH)**
1" = 1'-0"



5 A11.2 **TYP. 34" BASE CABINET W/ SHELVES (PLAM BACKSPLASH)**
1" = 1'-0"



4 A11.2 **TYP. 34" BASE CABINET W/SHELVES (TILE BACKSPLASH)**
1" = 1'-0"

13 A11.2 **TYP. TALL STORAGE CABINET**
1" = 1'-0"

3 A11.2 **TYP. ADA WORK SPACE (SOLID SURFACE BACKSPLASH)**
1" = 1'-0"

2 A11.2 **TYP. ADA WORK SPACE (PLAM BACKSPLASH)**
1" = 1'-0"

1 A11.2 **TYP. ADA WORK SPACE W/SINK (TILE BACKSPLASH)**
1" = 1'-0"

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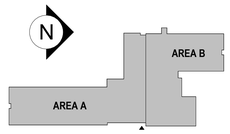
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:250064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MILLWORK DETAILS

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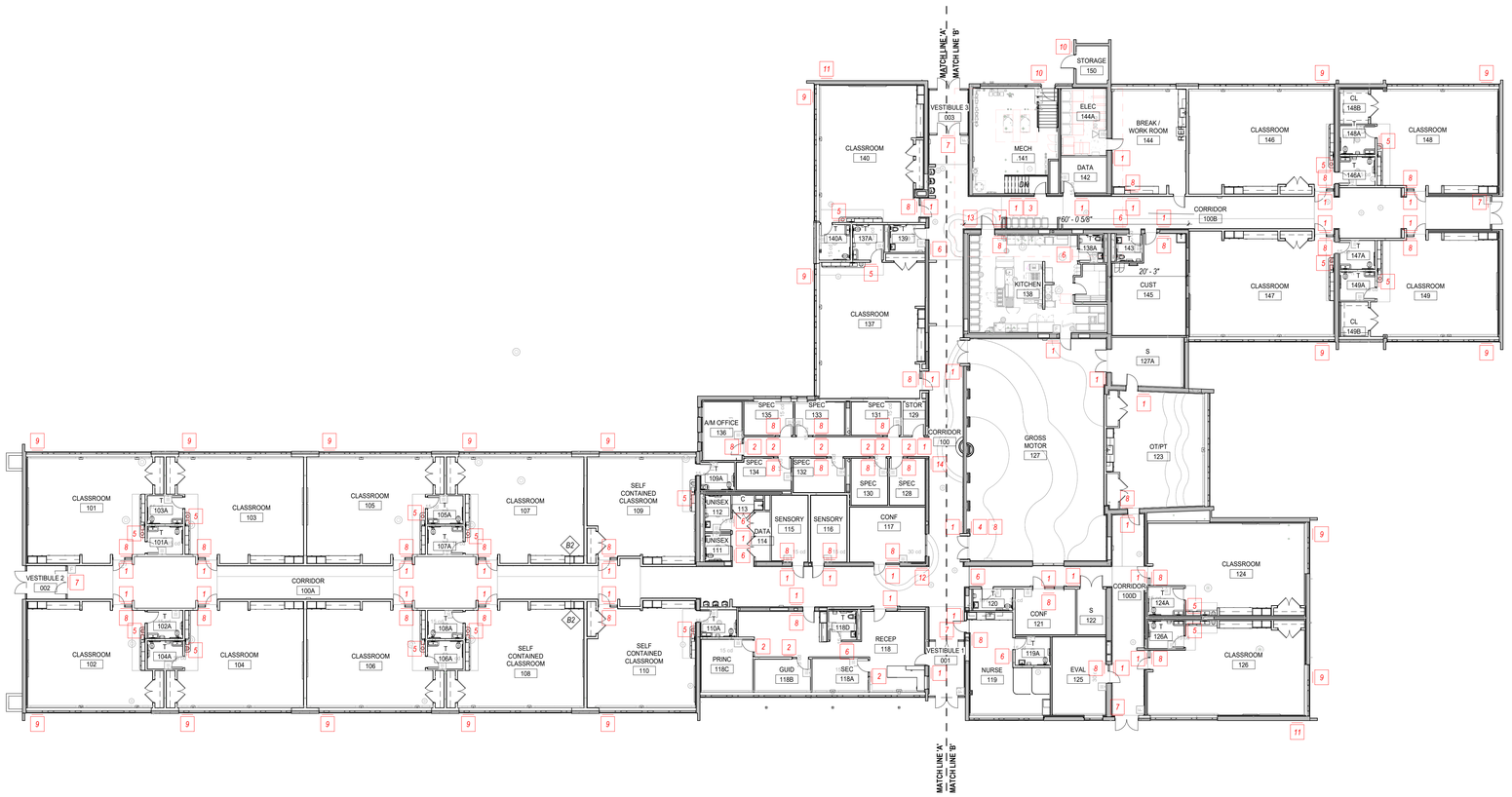

1 A12.0 **OVERALL FIRST FLOOR SIGNAGE PLAN**

1/16" = 1'-0"

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

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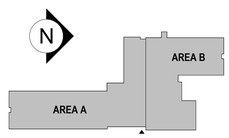
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SIGNAGE PLANS

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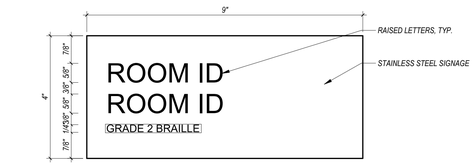
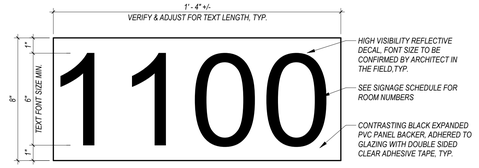
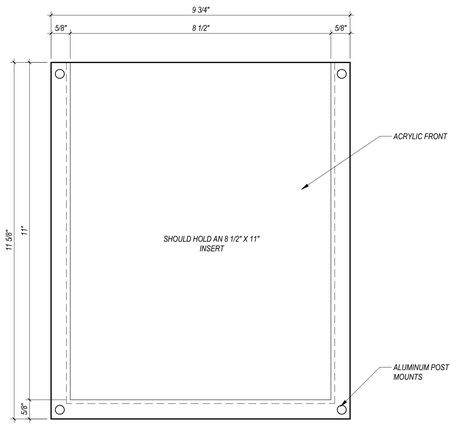
11 A12.1 **SIGN 11 - POST MOUNTED**
3" = 1'-0"



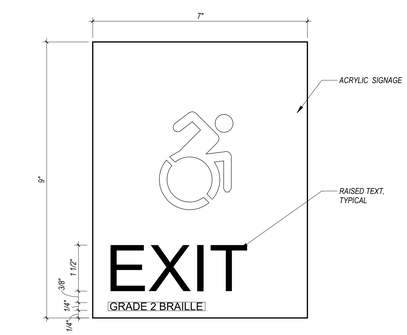
10 A12.1 **SIGN 10 - ROOM ID 2 (MULTI-LINE) EXTERIOR**
6" = 1'-0"



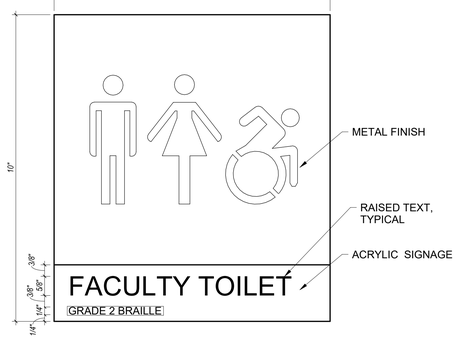
9 A12.1 **SIGN 09 - WINDOW ID - REFLECTIVE VINYL SIGN**
3" = 1'-0"



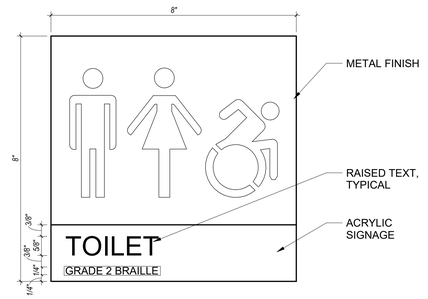
8 A12.1 **SIGN 08 - TYPICAL PAPER INSERT SIGNAGE**
6" = 1'-0"



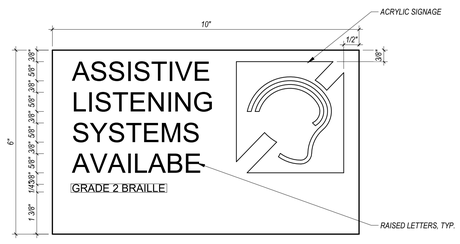
7 A12.1 **SIGN 07 - INTERIOR HA/ EXIT**
6" = 1'-0"



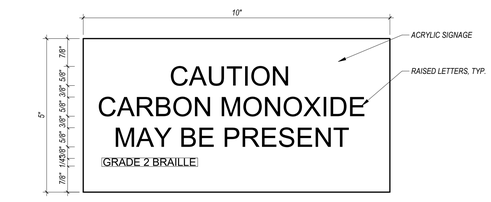
6 A12.1 **SIGN 06 - FACULTY TOILET**
6" = 1'-0"



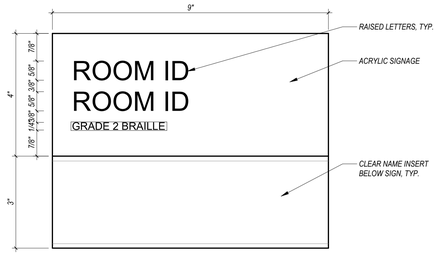
5 A12.1 **SIGN 05- TOILET**
6" = 1'-0"



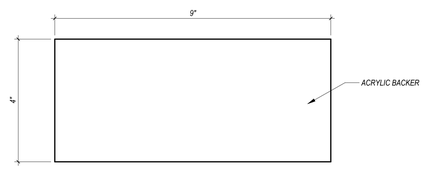
4 A12.1 **SIGN 04 - ASSISTIVE LISTENING SYSTEM**
6" = 1'-0"



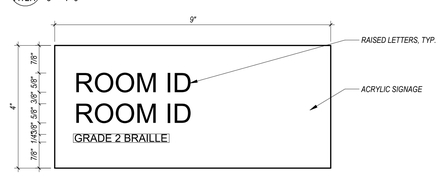
3 A12.1 **SIGN 03 - INTERIOR CARBON MONOXIDE**
6" = 1'-0"



2 A12.1 **SIGN 02 - ROOM ID 2 (MULTI-LINE) WITH INSERT**
6" = 1'-0"



1A A12.1 **SIGN 01 - ROOM ID 2 (MULTI-LINE) BACKER**
6" = 1'-0"



1 A12.1 **SIGN 01 - ROOM ID 2 (MULTI-LINE) FRONT**
6" = 1'-0"

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RENOVATIONS TO:
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State Project #: 017-0090 RNV
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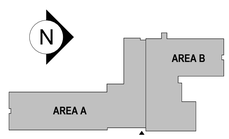
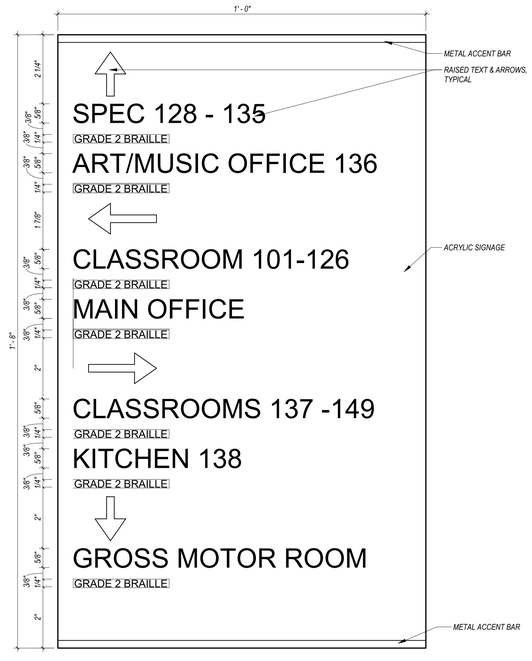
Revisions



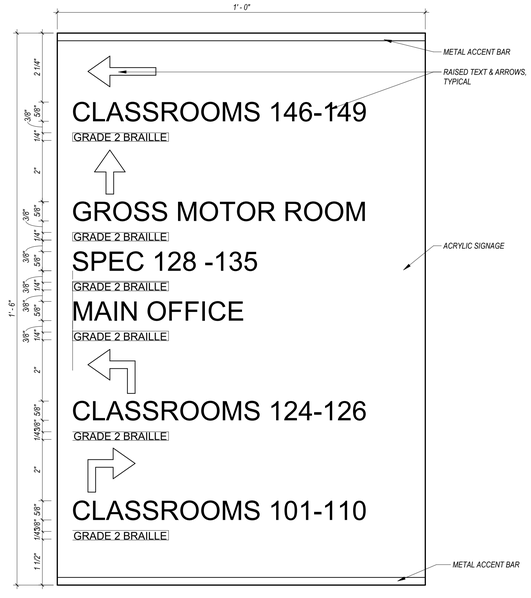
CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SIGNAGE SKETCHES

A12.1



3 A12.2 **SIGN 14 - DIRECTIONAL SIGN**
6" = 1'-0"



2 A12.2 **SIGN 13 - DIRECTIONAL SIGN**
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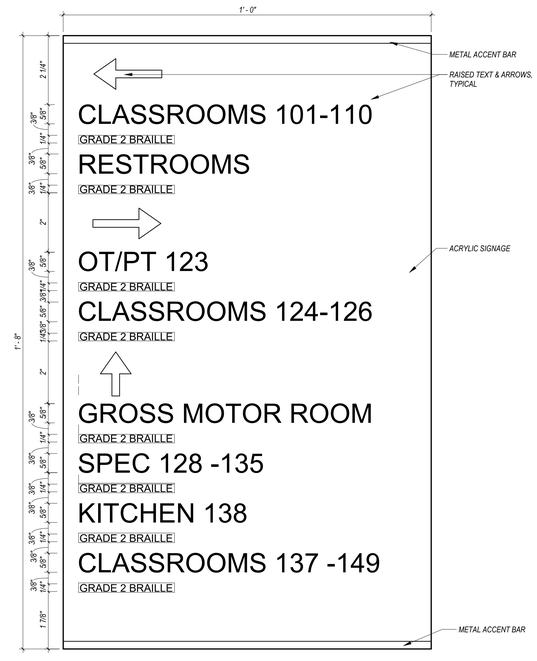

1 A12.2 **SIGN 12 - DIRECTIONAL SIGN**
6" = 1'-0"

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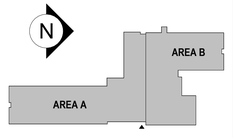

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SIGNAGE SKETCHES

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SIGNAGE SCHEDULE

ROOM # ON PLAN	ARCHITECTURAL PLAN ROOM NAME	ROOM NUMBER/ TEXT DISPLAYED ON SIGN	QTY	SIGN TYPE	MATERIAL	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER, AND SYMBOLS) AND MOUNTING LOCATIONS TO BE CONFIRMED WITH COMMITTEE PRIOR TO FABRICATION						
MAIN LEVEL ROOM SIGNAGE						
	T	TOILET	1	6	ACRYLIC SIGNAGE	
139	T	TOILET	1	6	ACRYLIC SIGNAGE	
140	CLASSROOM	CLASSROOM 140	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	140	1	9	ACRYLIC SIGNAGE	
141	MECH	MECHANICAL	1	1	ACRYLIC SIGNAGE	
	MECH	MECHANICAL	1	3	ACRYLIC SIGNAGE	
	MECH	MECHANICAL	1	10	STAINLESS STEEL SIGNAGE	
142	DATA	DATA	1	1	ACRYLIC SIGNAGE	
143	T	TOILET	1	6	ACRYLIC SIGNAGE	
144	BREAK/ WORK ROOM	BREAK ROOM 144	1	1	ACRYLIC SIGNAGE	
	BREAK/ WORK ROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	
144A	ELEC	ELECTRICAL	1	1	ACRYLIC SIGNAGE	
145	CUST	CUSTODIAN	1	1	ACRYLIC SIGNAGE	
	CUST	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	
146	CLASSROOM	CLASSROOM 146	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	146	1	9	ACRYLIC SIGNAGE	
147	CLASSROOM	CLASSROOM 147	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	147	1	9	ACRYLIC SIGNAGE	
148	CLASSROOM	CLASSROOM 148	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	148	1	9	ACRYLIC SIGNAGE	
149	CLASSROOM	CLASSROOM 149	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	149	1	9	ACRYLIC SIGNAGE	
150	STORAGE	STORAGE	1	10	STAINLESS STEEL SIGNAGE	

SIGNAGE SCHEDULE

ROOM # ON PLAN	ARCHITECTURAL PLAN ROOM NAME	ROOM NUMBER/ TEXT DISPLAYED ON SIGN	QTY	SIGN TYPE	MATERIAL	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER, AND SYMBOLS) AND MOUNTING LOCATIONS TO BE CONFIRMED WITH COMMITTEE PRIOR TO FABRICATION						
MAIN LEVEL CORRIDOR SIGNAGE						
100	CORRIDOR	EXIT	2	7	ACRYLIC SIGNAGE	
	CORRIDOR	DIRECTIONAL	1	12	ACRYLIC SIGNAGE	
	CORRIDOR	DIRECTIONAL	1	13	ACRYLIC SIGNAGE	
	CORRIDOR	DIRECTIONAL	1	14	ACRYLIC SIGNAGE	
100A	CORRIDOR	EXIT	1	7	ACRYLIC SIGNAGE	
100B	CORRIDOR	EXIT	1	7	ACRYLIC SIGNAGE	
100C	CORRIDOR	EXIT	1	7	ACRYLIC SIGNAGE	

SIGNAGE SCHEDULE

ROOM # ON PLAN	ARCHITECTURAL PLAN ROOM NAME	ROOM NUMBER/ TEXT DISPLAYED ON SIGN	QTY	SIGN TYPE	MATERIAL	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER, AND SYMBOLS) AND MOUNTING LOCATIONS TO BE CONFIRMED WITH COMMITTEE PRIOR TO FABRICATION						
EXTERIOR BUILDING SIGNAGE						
EXTERIOR	EAST FACADE	EDGEWOOD	1	11	ALUMINUM DIMENSIONAL SIGNAGE	
	WEST FACADE	EDGEWOOD	1	11	ALUMINUM DIMENSIONAL SIGNAGE	

SIGNAGE SCHEDULE

ROOM # ON PLAN	ARCHITECTURAL PLAN ROOM NAME	ROOM NUMBER/ TEXT DISPLAYED ON SIGN	QTY	SIGN TYPE	MATERIAL	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER, AND SYMBOLS) AND MOUNTING LOCATIONS TO BE CONFIRMED WITH COMMITTEE PRIOR TO FABRICATION						
MAIN LEVEL ROOM SIGNAGE						
	RECEP	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	SEC	SECRETARY 118A	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	GUID	GUIDANCE COUNSELOR 118B	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	PRINC	PRINCIPAL OFFICE 118C	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	T	TOILET	1	6	ACRYLIC SIGNAGE	
119	NURSE	NURSE 119	1	1	ACRYLIC SIGNAGE	
	NURSE	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	6	ACRYLIC SIGNAGE	
120	T	TOILET	1	6	ACRYLIC SIGNAGE	
121	CONF	CONFERENCE ROOM 121	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CONF	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
122	S	STORAGE	1	1	ACRYLIC SIGNAGE	
123	OT/PT	OT/PT 123	1	1	ACRYLIC SIGNAGE	
	OT/PT	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
124	CLASSROOM	CLASSROOM 124	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	124	1	9	ACRYLIC SIGNAGE	
125	EVAL	EVALUATION 125	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	EVAL	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
126	CLASSROOM	CLASSROOM 126	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	126	1	9	ACRYLIC SIGNAGE	
127	GROSS MOTOR	GROSS MOTOR 127	2	1	ACRYLIC SIGNAGE	
	GROSS MOTOR	ASSISTIVE LISTENING SYSTEM	1	4	ACRYLIC SIGNAGE	
	GROSS MOTOR	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	S	STORAGE	2	1	ACRYLIC SIGNAGE	
128	SPEC	SPECIAL EDUCATION 128	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
129	STOR	STORAGE	1	1	ACRYLIC SIGNAGE	
130	SPEC	SPECIAL EDUCATION 130	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
131	SPEC	SPECIAL EDUCATION 131	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
132	SPEC	SPECIAL EDUCATION 132	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
133	SPEC	SPECIAL EDUCATION 133	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
134	SPEC	SPECIAL EDUCATION 134	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
135	SPEC	SPECIAL EDUCATION 135	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	SPEC	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
136	A/M OFFICE	ART/ MUSIC OFFICE 136	1	2	ACRYLIC SIGNAGE	PROVIDE PAPER NAME INSERT
	A/M OFFICE	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
137	CLASSROOM	CLASSROOM 137	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	137	1	9	ACRYLIC SIGNAGE	
138	KITCHEN	KITCHEN 138	2	1	ACRYLIC SIGNAGE	
	KITCHEN	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT

SIGNAGE SCHEDULE

ROOM # ON PLAN	ARCHITECTURAL PLAN ROOM NAME	ROOM NUMBER/ TEXT DISPLAYED ON SIGN	QTY	SIGN TYPE	MATERIAL	REMARKS
NOTE: FINAL ROOM ID (ROOM NAME, NUMBER, AND SYMBOLS) AND MOUNTING LOCATIONS TO BE CONFIRMED WITH COMMITTEE PRIOR TO FABRICATION						
MAIN LEVEL ROOM SIGNAGE						
101	CLASSROOM	CLASSROOM 101	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	101	1	9	ACRYLIC SIGNAGE	
102	CLASSROOM	CLASSROOM 102	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	102	1	9	ACRYLIC SIGNAGE	
103	CLASSROOM	CLASSROOM 103	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	103	1	9	ACRYLIC SIGNAGE	
104	CLASSROOM	CLASSROOM 104	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	104	1	9	ACRYLIC SIGNAGE	
105	CLASSROOM	CLASSROOM 105	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	105	1	9	ACRYLIC SIGNAGE	
106	CLASSROOM	CLASSROOM 106	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	106	1	9	ACRYLIC SIGNAGE	
107	CLASSROOM	CLASSROOM 107	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	107	1	9	ACRYLIC SIGNAGE	
108	SELF CONTAINED CLASSROOM	CLASSROOM 108	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	108	1	9	ACRYLIC SIGNAGE	
109	SELF CONTAINED CLASSROOM	CLASSROOM 109	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	109	1	9	ACRYLIC SIGNAGE	
110	SELF CONTAINED CLASSROOM	CLASSROOM 110	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CLASSROOM	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
	T	TOILET	1	5	ACRYLIC SIGNAGE	
	EXTERIOR	110	1	9	ACRYLIC SIGNAGE	
111	UNISEX	FACULTY TOILET	1	6	ACRYLIC SIGNAGE	
112	UNISEX	FACULTY TOILET	1	6	ACRYLIC SIGNAGE	
113	C	CUSTODIAN	1	1	ACRYLIC SIGNAGE	
114	DATA	DATA	1	1	ACRYLIC SIGNAGE	
115	SENSORY	SENSORY 115	1	1	ACRYLIC SIGNAGE	
	SENSORY	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
116	SENSORY	SENSORY 116	1	1	ACRYLIC SIGNAGE	
	SENSORY	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
117	CONF	CONFERENCE ROOM 117	1	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE
	CONF	EXIT ROUTE	1	8	ACRYLIC SIGNAGE	PROVIDE EXIT ROUTE PAPER INSERT
118	RECEP	MAIN OFFICE 118	3	1	ACRYLIC SIGNAGE	MOUNTED TO SIDELIGHT GLASS, PROVIDE BACK PLATE ON OPPOSITE SIDE

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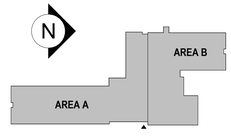
STATE OF CONNECTICUT
DAVID MALIK
REG. 9193
LICENSED ARCHITECT

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SIGNAGE SCHEDULE

A12.3

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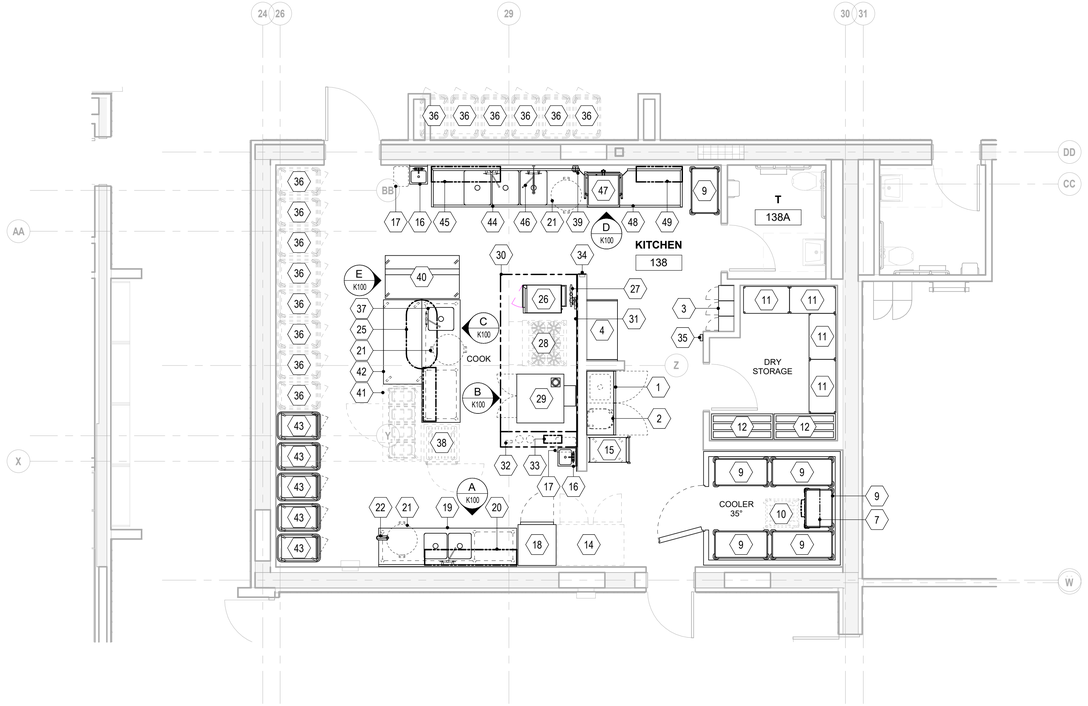
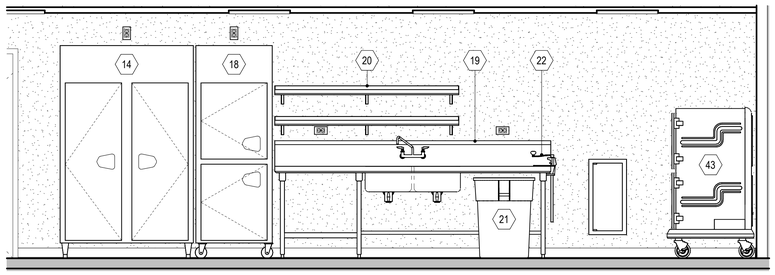


FOODSERVICE EQUIPMENT PLAN

1/4" = 1'-0"

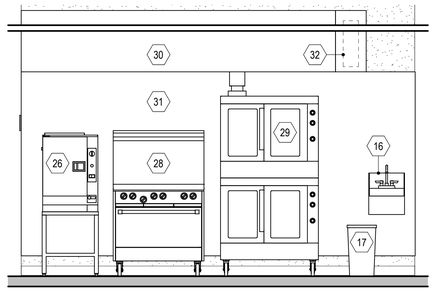
SCHEDULE OF FOODSERVICE EQUIPMENT & CONNECTIONS

Item	Qty	Description	Plumbing	Electrical	Mechanical / Equipment Remarks
1	1	Mop Sink Cabinet	1/2" H&CW; Drain in Floor		Requires wall blocking by GC (See Special Conditions Plans)
2	1	Mop Bucket (by Owner)			
3	3	Staff Locker, Two-Tier (by GC)			Requires wall blocking by GC (See Special Conditions Plans)
4	1	Office Desk (by GC)		20 A circuit - 120/1 wall mounted convenience DR by EC	Provide Data Receptacle
5	1	Walk-In Cooler		1.1 KW - 120/1 (lights, temp. monitoring/alarm, etc); Low voltage wiring from temperature monitor to BMS	Requires floor leveling by GC (See Special Conditions Plan)
6	1	Mechanical Refrigeration System			
7	1	Cooler Evaporator Coil	3/4" IW to FD by KEC	0.85 A - 120/1; Low voltage wiring from evaporator to BMS	Remote refrigeration from Item 8 by KEC
8	1	Cooler Condensing Unit		5.4 A - 0.5 HP - 208/1	Located on Roof per Detail 1/K101
9	6	Mobile Shelving Unit, Four-Tier			
10	1	EXISTING Bun Pan Rack			
11	4	Storage Shelving, Five-Tier			
12	2	Dunnage Rack			
13	1	-Spare Number-			
14	1	EXISTING Reach-In Freezer		11.2 A - 120/1 - C&P	
15	1	Utility Cart			
16	2	Hand Sink	1/2" H&CW; 1-1/2" W		Requires wall blocking by GC (See Special Conditions Plans)
17	2	Waste Bin (by Owner)			
18	1	Reach-in Freezer		9.7 A - 120/1 - C&P	
19	1	Prep Table with Sinks	1/2" H&CW; 2" IW to FS	(2) 20 A circuit - 120/1 wall mounted convenience DR by EC	
20	2	Wall Shelf			Requires wall blocking by GC (See Special Conditions Plan)
21	3	Waste Barrel (by Owner)			
22	1	Can Opener			
23	1	-Spare Number-			
24	1	-Spare Number-			
25	1	Ceiling Mounted Utensil Rack			Requires ceiling support by GC
26	1	Countertop Six Pan Steamer	1/2" G @ 32 MBTU; (2) 3/4" CW; 1-1/2" IW to FS	4 A - 120/1	
27	1	Water Filter Assembly	3/4" CW		Requires wall blocking by GC (See Special Conditions Plan)
28	1	EXISTING Six-Burner Range	3/4" G @ 230 MBTU; QD	2 A - 120/1 - C&P	
29	1	Double Convection Oven	3/4" G @ 100 MBTU; QD	(2) 8 A - 120/1 - C&P	
30	1	Exhaust Hood		Power to lights from Item 33	EXH: 2,200 CFM thru a 14" dia. collar @ -0.969 SP; Coordinate support from structure above for hood hangers by KEC
31	1	Stainless Steel Wall Flashing			
32	1	Fire Suppression System		120/1; J-box for to building alarm system & equipment shutdown	Protection for Item 30; Mounted in hood cabinet
33	1	Hood Auto-Start Control System		15 A circuit - 120/1 (See Note E-33 / K101)	Control for Item 30; Mounted in hood cabinet
34	1	Auto-Start Control Interface		Cable from Item 33	
35	1	Room Temperature Sensor		Wiring from Item 33	
36	14	EXISTING Insulated Food Carrier			
37	1	Cook's Table with Sink	1/2" H&CW; 2" IW to FS	(4) 20 A circuit - 120/1 table mounted convenience DR by KEC	
38	1	EXISTING Hot Holding Cabinet		2 KW - 120/1 - C&P (power from item 37)	
39	1	Water Filter Assembly, Warewasher	3/4" HW		Requires wall blocking by GC (See Special Conditions Plan)
40	1	Milk Cooler		3.3 A - 120/1 - C&P (power from item 37)	
41	1	EXISTING Heated Serving Counter		26 A - 120/208/1 (NEMA 14-50P) (mounted in table #37)	
42	1	Mobile Work Table			
43	5	Insulated Food Carrier			
44	1	Three Compartment Sink	3/4" 120°F H&CW; (3) 2" IW to FS		
45	1	Wall Shelf			Requires wall blocking by GC (See Special Conditions Plan)
46	1	Pre-Rinse Assembly with Add-on Faucet	3/4 H&CW		Requires wall blocking by GC (See Special Conditions Plan)
47	1	Ventless Warewasher	1/2" H&CW; 3/4" IW to FS	53.7 A - 208/3 (single point connection)	6,800 BTU/HR Latent Heat; 5,000 BTU/HR Sensible Heat
48	1	Clean Dishtable			
49	1	Wall Shelf			Requires wall blocking by GC (See Special Conditions Plan)



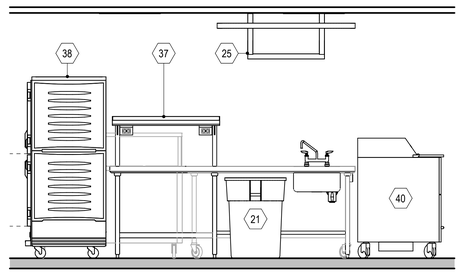
Elevation - Food Prep

1/2" = 1'-0"



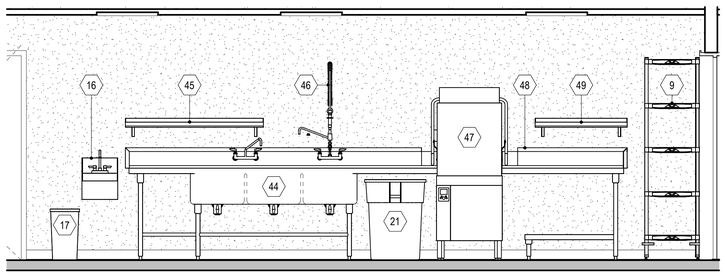
Elevation - Cookline

1/2" = 1'-0"



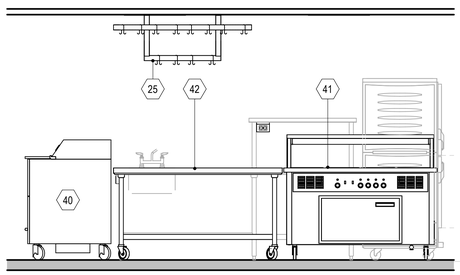
Elevation - Cook's Table

1/2" = 1'-0"



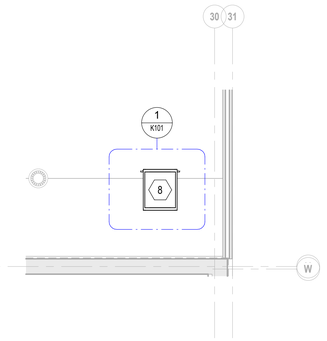
Elevation - Warewashing

1/2" = 1'-0"



Elevation - Tray Make-up

1/2" = 1'-0"



FOODSERVICE ROOF EQUIPMENT PLAN

1/4" = 1'-0"

Abbreviations used:

A	Amperes	EXH	Exhaust	KW	Kilowatt
AFF	Above finished floor	FD	Floor drain	MBTU	BTU per hour/1000
ATC	Automatic Temp. Controls Contractor	FFD	Funnel floor drain	MC	Mechanical Contractor
		FHW	Fahrenheit hot water	MUA	Make-up air
BFF	Below finished floor	FS	Floor sink	PC	Plumbing Contractor
BTC	Branch to connection	G	Gas	QD	Quick disconnect
C&P	Cord & plug provided	GC	General Contractor	SP	Static pressure (WG)
CFM	Cubic feet per minute	GI	Grease interceptor	SR	Single receptacle
CR	Condensate return	HP	Horsepower	SS	Steam supply
CW	Cold water	HW	Hot water	W	Waste (direct conn.)
DFA	Drop from above	H&CW	Hot & cold water		
DR	Duplex receptacle	IW	Indirect Waste		
EC	Electrical contractor	KEC	Kitchen Equip. Contractor		

SCHEDULE NOTES

1) UTILITIES SHOWN IN THESE SCHEDULES ARE SPECIFIC TO THE PRIME MANUFACTURER LISTED IN THE WRITTEN SPECIFICATION SECTION 114000. IF EQUIPMENT FROM AN ALTERNATE MANUFACTURER IS PROVIDED, IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO COORDINATE AND SUBMIT TO THE PROJECT DESIGN TEAM FOR REVIEW.

2) UTILITIES LISTED ON THIS SCHEDULE FOR OWNER FURNISHED OR VENDOR SUPPLIED EQUIPMENT ARE ESTIMATES ASSUMED FOR ENGINEERING PURPOSES ONLY. IT IS THE RESPONSIBILITY OF THE OWNER TO PROVIDE EQUIPMENT CUT SHEETS OF THIS EQUIPMENT TO CRABTREE-MCGRATH ASSOCIATES PRIOR TO CONSTRUCTION.

3) INSTALLING SUB-CONTRACTORS MUST NOTIFY CRABTREE-MCGRATH ASSOCIATES IF A UTILITY REQUIREMENT LISTED ON THIS EQUIPMENT SCHEDULE IS NOT AVAILABLE.

4) REFER TO THE ABBREVIATIONS NOTES PROVIDED ON THIS SHEET FOR CLARIFICATION OF ABBREVIATIONS USED WITHIN THIS EQUIPMENT SCHEDULE.

PLAN NOTES

1) IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO FIELD VERIFY THE DELIVERY PATH OF ALL EQUIPMENT WITHIN THEIR SCOPE WITH BUILDING CONDITIONS PRIOR TO ORDERING TO CONFIRM ALL EQUIPMENT FITS WITHIN THE DESIGNATED SPACE AS LOCATED ON PLANS.

2) KITCHEN EQUIPMENT CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR AS NECESSARY FOR OPENINGS IN BUILDING, WALL LEAVE OUTS, DOOR WIDTHS AND HEADER HEIGHTS REQUIRED FOR DELIVERY AND INSTALLATION MEANS.

3) FINISHES TO ALL WALLS, FLOORS AND CEILINGS ARE TO BE PROVIDED BY THE GENERAL CONTRACTOR AS SPECIFIED BY THE PROJECT ARCHITECT TO MEET THE REQUIREMENTS OF THE LOCAL HEALTH DEPARTMENT.

4) REVISIONS TO THESE PLANS DUE TO FIELD CONDITIONS MUST BE SUBMITTED TO THE PROJECT DESIGN TEAM FOR REVIEW AND APPROVAL PRIOR TO PROCEEDING WITH CONSTRUCTION.

5) FLOORING MATERIAL SPECIFIED BY THE ARCHITECT MUST BE PROVIDED WITH A COVED BASE AT ALL WALLS TO INCLUDE THE INTERIOR AND EXTERIOR OF WALK-IN REFRIGERATED ROOMS.

6) ALL FOODSERVICE EQUIPMENT AND CUSTOM FABRICATED ITEMS MUST MEET THE STANDARDS OF THE NATIONAL SANITATION FOUNDATION AND SHALL BE LABELED ACCORDINGLY.

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STATE OF CONNECTICUT
CHRISTOPHER MALIK
REG. NO. 21917
REGISTERED ARCHITECT

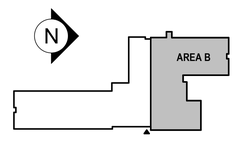
RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FOODSERVICE EQUIPMENT PLAN & SCHEDULE

K100

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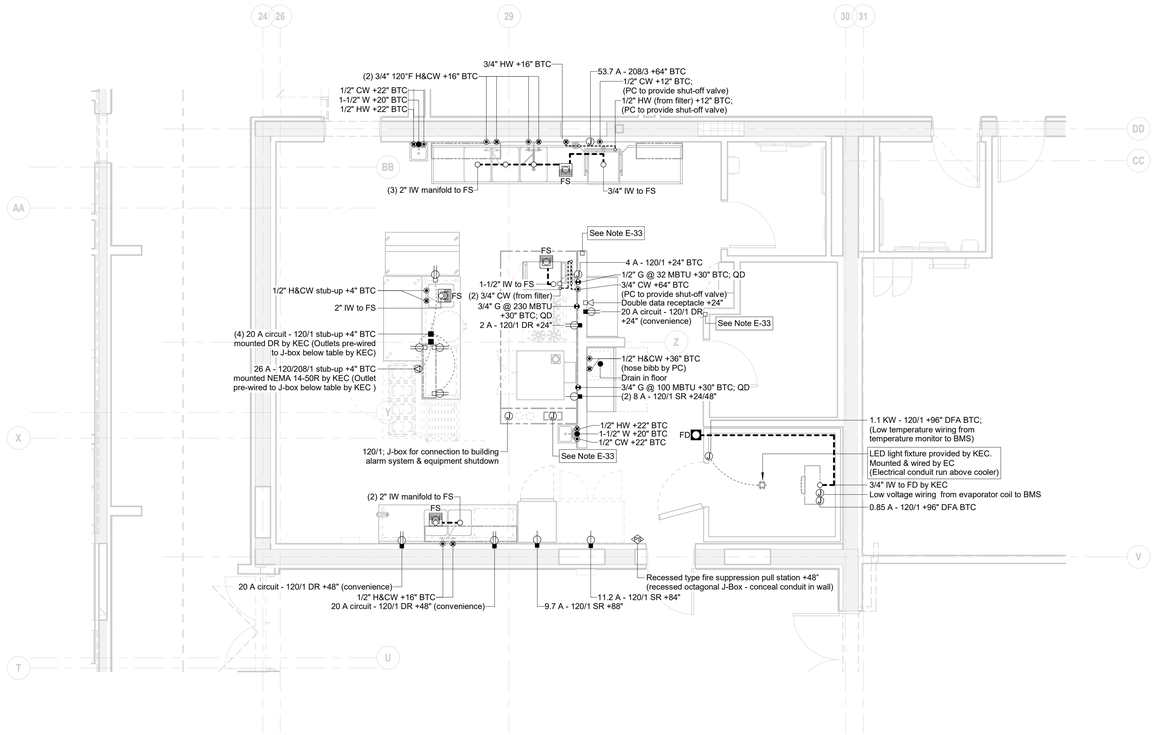
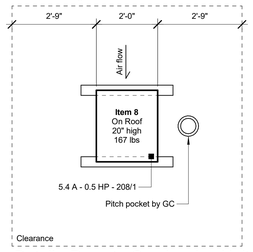


FOODSERVICE EQUIPMENT ROUGH-IN PLAN

1/4" = 1'-0"

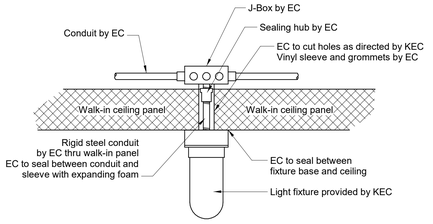
Mount on roof (Location to be coordinated)

Maximum refrigeration line run = 100'
(including a 25' maximum vertical run)



1 K101 Detail - Remote Condensing Units

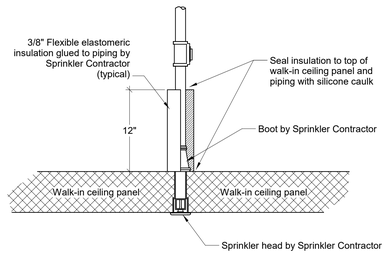
NTS



Notes:
1. All light fixture to be furnished by KEC
2. Mounting light fixtures, all conduit and interwiring by EC
3. All conduit to be on exterior of walk-in by EC
4. All penetrations thru walk-in panels to be thoroughly sealed by EC

Typical Detail - Refrigerated Room Light Fixture

1" = 1'-0"



Typical Detail - Refrigerated Room Fire Sprinkler

1" = 1'-0"

ELECTRICAL ROUGH-IN LEGEND	
	DUPLEX RECEPTACLE
	DUPLEX RECEPTACLE (TABLE MOUNTED)
	SIMPLEX RECEPTACLE
	SIMPLEX RECEPTACLE (TABLE MOUNTED)
	SPECIAL PURPOSE RECEPTACLE
	FLOOR RECEPTACLE
	JUNCTION BOX
	DROP CORD
	ELECTRICAL CONDUIT
	FIELD CONNECTION
	SWITCH
	LIGHT FIXTURE
	FIRE PULL STATION
	FIELD WIRING

PLUMBING ROUGH-IN LEGEND	
	HOT WATER
	COLD WATER
	WASTE - DIRECT CONNECTED
	WASTE - INDIRECT
	GAS
	AREA FD (SUGGESTED LOCATION)
	FLOOR DRAIN
	FUNNEL FLOOR DRAIN
	FLOOR SINK
	FLOOR SINK (3/4 GRATE)
	FLOOR SINK (1/2 GRATE)
	FIELD CONNECTION
	FIELD PIPING (WASTE)
	FIELD PIPING (WATER)

Note E-33

15 A circuit - 120/1 DFA for conn to ventilator control & hood lights at Item 30;
Microswitch wiring from fire suppression systems (Item 32);
EC to provide CAT5 connection to remote touch screen (Item 34 - cable supplied with system);
EC to provide wiring on/off signal wiring to EHX fan;
MC/ATC to provide wiring to temp sensors at hoods;
MC/ATC to provide wiring to room temp sensors (Item 35);
MC/ATC to provide wiring from building management system remote control

Abbreviations used:

A	Amperes	EXH	Exhaust	IW	Indirect waste
AFF	Above finished floor	FD	Floor drain	KEC	Kitchen Equip. Contractor
BFF	Below finished floor	FFD	Funnel floor drain	KW	Kilowatt
BTC	Branch to connection	FHW	Fahrenheit hot water	MBTU	BTU per hour/1000
C&P	Cord & plug provided	FS	Floor sink	MUA	Make-up air
CFM	Cubic feet per minute	G	Gas	PC	Plumbing Contractor
CR	Condensate return	GC	General Contractor	QD	Quick disconnect
CW	Cold water	GI	Grease interceptor	SP	Static pressure (WG)
DFA	Drop from above	HP	Horsepower	SR	Single receptacle
DR	Duplex receptacle	HW	Hot water	SS	Steam supply
EC	Electrical contractor	H&CW	Hot & cold water	W	Waste (direct connection)

PLUMBING NOTES

1) DIMENSIONS ON THIS PLAN ARE PROVIDED FOR DESIGN INTENT. IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND HEIGHTS LISTED IN THE FIELD WITH THE EQUIPMENT BEING PROVIDED.

2) PLUMBING CONTRACTOR IS RESPONSIBLE FOR ALL FINAL CONNECTIONS TO EQUIPMENT THAT REQUIRE A BRANCH TO CONNECTION (BTC), OR WHERE PLUMBING INTERCONNECTION IS INDICATED ON THE PLAN WITH A DASHED LINE.

3) PLUMBING CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL MANUFACTURER'S SHOP DRAWINGS AND EQUIPMENT CUT SHEETS SUBMITTED TO CONFIRM SCOPE REQUIREMENTS AND INSTALLATION EXPECTATIONS.

4) ALL FLOOR SINKS AND DRAINS MUST BE PROVIDED AND INSTALLED BY THE PLUMBING CONTRACTOR. AREA DRAINS, IF LOCATED LOCATED ON THESE PLANS, ARE TO BE CONSIDERED RECOMMENDED AREAS. IT IS THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO CONFIRM QUANTITIES AND LOCATIONS OF AREA DRAINS WITH THE LOCAL AUTHORITY HAVING JURISDICTION.

5) FLOOR SINKS LOCATED UNDER COUNTERS WITH LIMITED ACCESSIBILITY MUST BE INSTALLED 50% EXPOSED AND EASILY ACCESSIBLE FOR CLEANING. IF A FLOOR SINK CAN NOT BE INSTALLED 50% EXPOSED, THE UNDER SHELF OF THE CABINET MUST BE FULLY REMOVABLE OR BE PROVIDED WITH AN ACCESS PANEL LARGE ENOUGH TO REMOVE THE DRAIN GRATE FOR CLEANING.

6) CONDENSATE DRAIN LINES FROM WALK-IN REFRIGERATED ROOM EVAPORATOR COILS SHALL BE INSTALLED BY THE KITCHEN EQUIPMENT CONTRACTOR. DRAIN LINES MUST BE COPPER AND INSTALLED 1" OFF THE WALLS WITH A MINIMUM PITCH OF 1/2" PER FOOT. KITCHEN EQUIPMENT CONTRACTOR TO PROVIDE AND INSTALL A COPPER UNION WITHIN 24" OF THE CONNECTION TO THE EVAPORATOR COIL. FOR INSTALLATION OF DRAIN LINES IN A FREEZER, THE DRAIN SHALL EXIT THE FREEZER AT THE EARLIEST DISTANCE POSSIBLE. DRAIN PENETRATIONS THROUGH THE WALK-IN REFRIGERATED ROOM WALL PANEL MUST BE APPROPRIATELY SEALED TO INCLUDE A VAPOR SEAL AND PROVIDED WITH CHROME ESCUTCHEON PLATES AT ALL EXPOSED POINTS WHERE PIPING PENETRATES THE WALL. DRAINS MUST BE "P" TRAPPED OUTSIDE OF THE REFRIGERATED ROOM WALL TO AVOID ENTRANCE OF WARM AIR AND TERMINATED 1" ABOVE THE FLOOR DRAIN OR AS REQUIRED BY LOCAL CODE.

7) PLUMBING CONTRACTOR TO INSTALL UTILITIES CONCEALED IN WALLS AND STUB-OUT AT TERMINATION POINTS. PLEASE NOTE THAT NOT ALL JURISDICTIONS ALLOW GAS LINES TO BE CONCEALED IN WALL, IT IS THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO VERIFY AND CONFIRM PRIOR TO INSTALLATION.

8) PLUMBING CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ALL DRAINS, FAUCETS, PIPING TRAPS, VALVES, SHUT-OFFS, GAUGES, WATER PRESSURE REDUCERS, REGULATORS AND BACKFLOW PREVENTION, ETC. AS REQUIRED BY LOCAL AUTHORITY HAVING JURISDICTION.

9) IT IS THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO FLUSH ALL WATER LINES PRIOR TO FINAL CONNECTION TO FOODSERVICE EQUIPMENT.

10) A MAIN SHUT-OFF GAS VALVE MUST BE INSTALLED BY THE PLUMBING CONTRACTOR LOCATED TO MEET THE REQUIREMENTS OF THE PLUMBING CODE.

11) GAS SUPPLY TO ALL COOKING EQUIPMENT MUST BE PROVIDED WITH AN ELECTRIC OR MECHANICAL SHUT-OFF VALVE. KITCHEN EQUIPMENT CONTRACTOR SHALL FURNISH THE VALVE AND INSTALLATION PERFORMED BY THE PLUMBING CONTRACTOR. VALVE SHALL BE TIED INTO THE FIRE PROTECTION SYSTEM FOR AUTOMATIC SHUT-OFF.

12) THE PLUMBING CONTRACTOR IS RESPONSIBLE FOR LOCATION OF GREASE TRAPS AS REQUIRED BY LOCAL AUTHORITY HAVING JURISDICTION. GREASE TRAPS MUST BE LOCATED IN A MANNER THAT DOES NOT INTERFERE WITH FOODSERVICE EQUIPMENT LAYOUT.

ELECTRICAL NOTES

1) DIMENSIONS ON THIS PLAN ARE PROVIDED FOR DESIGN INTENT. IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND HEIGHTS LISTED IN THE FIELD WITH THE EQUIPMENT BEING PROVIDED.

2) ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL FINAL CONNECTIONS TO EQUIPMENT THAT REQUIRES A BRANCH TO CONNECTION (BTC), OR WHERE INTER-WIRING IS INDICATED ON THE PLAN IN A DASHED LINE.

3) ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR REVIEWING ALL MANUFACTURER'S SHOP DRAWINGS AND EQUIPMENT CUT SHEETS SUBMITTED TO CONFIRM SCOPE REQUIREMENTS AND EXPECTATIONS.

4) ELECTRICAL PANELS PROVIDED SHALL BE DESIGNED WITH A MINIMUM OF 20% SPARE CAPACITY FOR FUTURE EXPANSION UNLESS OTHERWISE APPROVED BY THE OWNER.

5) ELECTRICAL CONTRACTOR TO INSTALL DROP CORDS AS LOCATED ON PLANS WITH THE CORD ADJUSTED TO HANG 78" ABOVE FINISH FLOOR. PLASTIC WIRE TIES ARE NOT ACCEPTABLE FOR THIS WORK. DROP CORDS MUST BE PROVIDED WITH STRAIN RELIEF.

6) ELECTRICAL CONNECTIONS ON THIS PLAN ARE PROVIDED AS IT RELATES SPECIFICALLY TO FOOD SERVICE EQUIPMENT. CONVENIENCE OUTLETS ARE PROVIDED IN SPECIFIC LOCATIONS AS REQUESTED BY OWNER. IT IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL ANY OTHER ELECTRICAL OUTLETS AS REQUIRED TO MEET CODE REQUIREMENTS BY LOCAL AUTHORITY HAVING JURISDICTION.

7) WALK-IN REFRIGERATED ROOM LIGHT FIXTURES ARE TO BE PROVIDED BY THE KITCHEN EQUIPMENT CONTRACTOR. LIGHTS ARE TO BE MOUNTED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.

8) IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO CONFIRM WITH THE WALK-IN REFRIGERATED ROOM MANUFACTURER THAT THE QUANTITY AND LOCATIONS OF THE LIGHTING LAYOUT WILL MEET 20 FOOT CANDLES OF LIGHT AT A DISTANCE OF 30" ABOVE FINISH FLOOR AS REQUIRED IN WALK-IN REFRIGERATED ROOMS BY THE NATIONAL FOOD CODE.

9) DRAIN PIPING WITHIN A WALK-IN FREEZER SHALL BE PROVIDED WITH A DRAIN LINE HEATER AND INSULATION. FINAL CONNECTION OF THE DRAIN LINE HEATER MUST BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

10) ELECTRICAL CONTRACTOR TO INSTALL UTILITIES CONCEALED IN WALLS AND STUB-OUT AT TERMINATION POINTS.

11) ELECTRICAL CONTRACTOR TO PROVIDE AND INSTALL WIRING BETWEEN EXHAUST VENTILATORS, AND ASSOCIATED FAN SYSTEMS, CONTROL PANELS, MAGNETIC STARTERS, FIRE SUPPRESSION SYSTEMS, PULL STATIONS AND SWITCHES AS REQUIRED.

12) CONTROL AND POWER WIRING BETWEEN CONTROL PANELS AND GARBAGE DISPOSALS, WASTE PULPERS, TROUGH COLLECTORS ETC. ARE TO BE PROVIDED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.

13) ELECTRICAL CONTRACTOR MUST PROVIDE ELECTRICAL POWER TO ANY COOKING EQUIPMENT THROUGH A SHUNT TRIP SYSTEM.

14) FOOD PREPARATION AREAS MUST BE PROVIDED WITH 50 FOOT CANDLES OF LIGHTING AS REQUIRED BY THE NATIONAL FOOD CODE.

15) ELECTRICAL CONTRACTOR MUST VERIFY REMOTE FIRE SUPPRESSION PULL STATION LOCATIONS WITH THE LOCAL FIRE INSPECTOR PRIOR TO INSTALLATION.

16) FOODSERVICE EQUIPMENT CAN NOT BLOCK ACCESS TO GFI RECEPTACLES. CRABTREE-MCGRATH ASSOCIATES STRONGLY RECOMMENDS THAT THE ELECTRICAL CONTRACTOR PROVIDE GFI PROTECTION AT THE CIRCUIT BREAKER PANEL. THIS WILL ALSO LIMIT NUISANCE TRIPPING THAT IS COMMON WITH COMMERCIAL FOODSERVICE EQUIPMENT.

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STATE OF CONNECTICUT
KENNETH R. MALIK
REG. NO. 8199
LICENSED ARCHITECT

RENOVATIONS TO:
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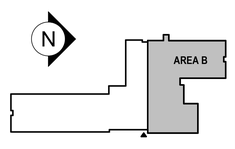

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FOODSERVICE EQUIPMENT ROUGH-IN PLAN

K101

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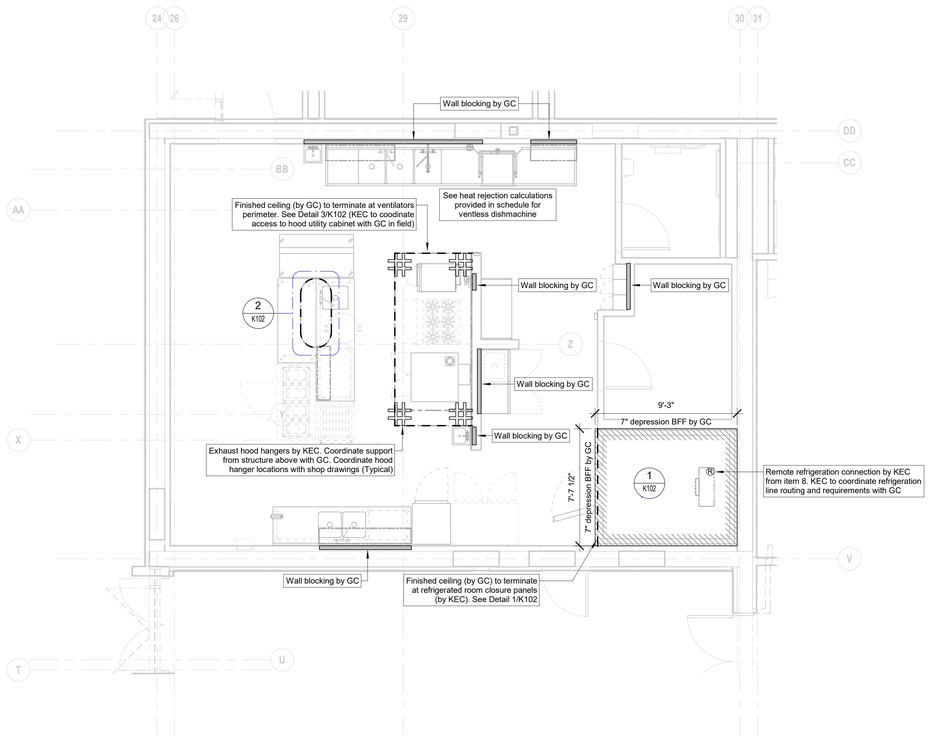
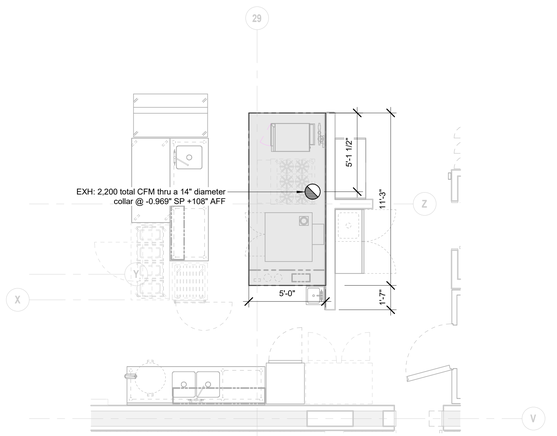


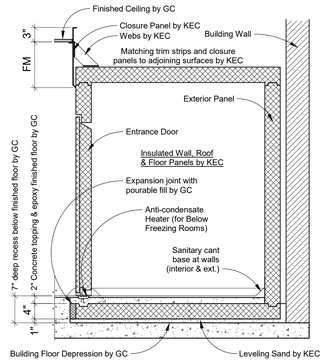
FOODSERVICE EQUIPMENT SPECIAL CONDITIONS PLAN

1/4" = 1'-0"



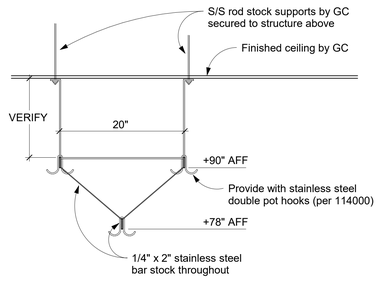
FOODSERVICE EQUIPMENT VENTILATION ROUGH-IN PLAN

1/4" = 1'-0"



1 K102 Detail - Refrigerated Room

1" = 1'-0"



2 K102 Section - Ceiling Mounted Utensil Rack

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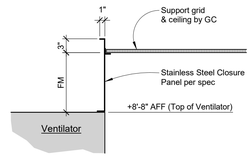

3 K102 Detail - Closure Panel

NTS

Abbreviations used:

A	Amperes	EXH	Exhaust	IW	Indirect waste
AFF	Above finished floor	FD	Floor drain	KEC	Kitchen Equip. Contractor
BFF	Below finished floor	FFD	Funnel floor drain	KW	Kilowatt
BTC	Branch to connection	FHW	Fahrenheit hot water	MBTU	BTU per hour/1000
C&P	Cord & plug provided	FS	Floor sink	MUA	Make-up air
CFM	Cubic feet per minute	G	Gas	PC	Plumbing Contractor
CR	Condensate return	GC	General Contractor	QD	Quick disconnect
CW	Cold water	GI	Grease interceptor	SP	Static pressure (WG)
DFA	Drop from above	HP	Horsepower	SR	Single receptacle
DR	Duplex receptacle	HW	Hot water	SS	Steam supply
EC	Electrical contractor	H&CW	Hot & cold water	W	Waste (direct connection)

SPECIAL CONDITIONS NOTES

1) DIMENSIONS ON THIS PLAN ARE PROVIDED FOR DESIGN INTENT. IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO VERIFY AND COORDINATE ALL DIMENSIONS AND HEIGHTS LISTED IN THE FIELD WITH THE EQUIPMENT BEING PROVIDED.

2) WALK-IN REFRIGERATED ROOM SLAB DEPRESSIONS MUST BE SMOOTH AND LEVEL, SIZED AS SHOWN ON PLAN.

3) THE GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING WALL BLOCKING AS INDICATED FOR SUPPORTING WALL MOUNTED EQUIPMENT. KITCHEN EQUIPMENT CONTRACTOR SHALL VERIFY AND COORDINATE ALL LOCATIONS AND HEIGHTS PROVIDED IN THE FIELD.

4) WALL FLASHING, WHERE SPECIFIED, MUST BE A MINIMUM OF 20 GAUGE STAINLESS STEEL, PROVIDED AND INSTALLED BY THE KITCHEN EQUIPMENT CONTRACTOR. STAINLESS STEEL TO BE CUT IN THE LARGEST SHEETS POSSIBLE TO MINIMIZE JOINTS. ALL SEAMS TO BE COVERED WITH BATTEN STRIPS AND CAP STRIPS PROVIDED AT FLASHING ENDS. PROVIDE CAREFULLY PUNCHED HOLES AT SERVICE LOCATIONS. ALL WALL FLASHING DIMENSIONS MUST BE FIELD VERIFIED BY THE KITCHEN EQUIPMENT CONTRACTOR PRIOR TO FABRICATION.

5) CORNER GUARDS, WHERE SPECIFIED, MUST BE A MINIMUM OF 14 GAUGE STAINLESS STEEL PROVIDED AND INSTALLED BY THE KITCHEN EQUIPMENT CONTRACTOR. BREAK LONG EDGES SO THAT THE GUARDS "HUG" THE WALL AND SECURE TO THE WALL WITH A SUITABLE ADHESIVE. ALL CORNER GUARD DIMENSIONS AND ANGLES MUST BE FIELD VERIFIED BY THE KITCHEN EQUIPMENT CONTRACTOR PRIOR TO FABRICATION.

6) KITCHEN EQUIPMENT CONTRACTOR IS RESPONSIBILE FOR THE INSTALLATION OF THE REMOTE REFRIGERATION LINE RUNS AND COORDINATION OF THE COMPLETE REMOTE REFRIGERATION SYSTEM WITH THE GENERAL CONTRACTOR.

7) EXHAUST HOODS MUST BE HUNG AND MOUNTED WITH THE BOTTOM OF THE HOOD AT 6'-8" ABOVE FINISH FLOOR. HVAC CONTRACTOR IS RESPONSIBLE FOR FINAL CONNECTIONS FROM THE EXHAUST HOOD COLLAR TO THE DUCTWORK. FINAL CONNECTIONS SHALL BE FULLY WELDED AND LIQUID TIGHT.

8) HVAC CONTRACTOR TO PROVIDE AND INSTALL ALL FANS, DUCTWORK AND CURBS AS REQUIRED FOR A COMPLETE AND FUNCTIONING VENTILATIO SYSTEM. START-UP AND AIR BALANCING OF THESE SYSTEMS MUST BE COMPLETED BY THE HVAC CONTRACTOR.

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STATE OF CONNECTICUT
MATTHEW R. MALIK
NO. 21917
LICENSED ARCHITECT

RENOVATIONS TO:
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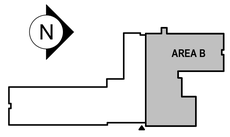

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JUNE 5, 2026

FOODSERVICE EQUIPMENT SPECIAL CONDITIONS PLAN

K102

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CODES AND STANDARDS:

1. THE FOLLOWING CODES AND STANDARDS, INCLUDING ALL SPECIFICATIONS WITHIN, SHALL APPLY TO THE DESIGN, CONSTRUCTION, QUALITY CONTROL AND SAFETY OF ALL WORK PERFORMED ON THE PROJECT. USE THE LATEST EDITIONS UNLESS NOTED OTHERWISE.
   a. ALL WORK SHALL COMPLY WITH THE 2022 CONNECTICUT STATE BUILDING CODE WHICH ADOPTS THE 2021 INTERNATIONAL BUILDING CODE (IBC) WITH AMENDMENTS
   b. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318", (LATEST EDITION) AMERICAN CONCRETE INSTITUTE.
   c. "AISC "SPECIFICATION FOR THE DESIGN FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS" AND "STEEL CONSTRUCTION MANUAL" LATEST EDITION, AMERICAN INSTITUTE OF STEEL CONSTRUCTION.
   d. BUILDING CODE REQUIREMENTS FOR COLD-FORMED STEEL FRAMING, AISI S100/S200/S211/S214 (LATEST EDITION).
   e. BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES, ACI 530/ASCE 5/TMS 402 (LATEST EDITION).
   f. SPECIFICATIONS FOR MASONRY STRUCTURES, ACI 530.1/ASCE 6/TMS 602 (LATEST EDITION).
   g. HOT WEATHER CONCRETING, ACI 305R AND COLD WEATHER CONCRETING ACI 306R (LATEST EDITION).

DIMENSIONS:

1. THE CONTRACTOR SHALL COORDINATE THE DIMENSIONS AND LOCATIONS OF THE ROOF, FLOOR & WALL OPENINGS SO THE FRAMING PROPERLY FITS THE REQUIREMENTS OF ALL TRADES.
2. THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS, ELEVATIONS AND CONDITIONS SHOWN ON THE DRAWINGS PRIOR TO ANY FABRICATION AND INSTALLATION OF ANY NEW MATERIALS. IF ANY DISCREPANCIES ARE FOUND BETWEEN ACTUAL CONDITIONS AND THESE DRAWINGS NOTIFY ARCHITECT AND/OR ENGINEER FOR FURTHER INSTRUCTIONS.

CONSTRUCTION:

1. GENERAL:
   a. SUBMIT SHOP DRAWINGS AT LEAST 15 DAYS BEFORE DATE REVIEWED SUBMITTALS WILL BE NEEDED. SHOP DRAWINGS SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL WHICH SHALL CONSTITUTE CERTIFICATION THAT THE CONTRACTOR HAS VERIFIED ALL FIELD MEASUREMENTS, CONSTRUCTION CRITERIA, MATERIALS AND SIMILAR DATA AND HAS CHECKED EACH DRAWING FOR COMPLETENESS, COORDINATION AND COMPLIANCE WITH THE CONTRACT.
   b. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ALLOWABLE CONSTRUCTION LOADS AND TO PROVIDE PROPERLY DESIGNED FORMWORK, STAGINGS, BRACING, SHEETING, SHORING, ETC.
   c. IMPLEMENTING JOB SAFETY, CONSTRUCTION PROCEDURES AND TEMPORARY SHORING ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
   d. CONTRACTOR SHALL REFER TO ARCHITECTURAL, MECHANICAL, PLUMBING AND ELECTRICAL DRAWINGS FOR SIZE AND LOCATIONS OF OPENINGS, SLEEVES, CONCRETE HOUSEKEEPING PADS, INSERTS, AND DEPRESSIONS.
   e. SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR DETAILED INFORMATION REGARDING FINISHES, FIREPROOFING, ETC.
   f. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF MASONRY AND DRYWALL NON-LOAD BEARING PARTITIONS. PROVIDE SLIP CONNECTIONS THAT ALLOW VERTICAL MOVEMENT AT THE HEADS OF ALL SUCH PARTITIONS. CONNECTIONS ARE DESIGNED TO SUPPORT THE TOP OF THE WALLS LATERALLY FOR THE CODE-REQUIRED LATERAL LOAD. PROVIDE COMPRESSIBLE FIRESAFING AT TOP OF WALL AS REQUIRED BY ARCHITECTURAL DRAWINGS.
   g. IN CASE OF CONFLICT BETWEEN THE GENERAL NOTES, DETAILS AND SPECIFICATIONS, THE MOST RIGID REQUIREMENTS SHALL GOVERN.
   h. CONTRACTOR SHALL FURNISH DIMENSIONED SHOP DRAWINGS AT ALL LEVELS LOCATING FLOOR AND ROOF EDGES FOR REVIEW BY THE ARCHITECT AND STRUCTURAL ENGINEER.
   i. CONTRACTOR SHALL FURNISH DIMENSIONED COORDINATED SHOP DRAWINGS AT ALL LEVELS SHOWING THE LOCATIONS OF ALL SLEEVES AND OPENINGS REQUIRED BY ALL TRADES.

TESTING AND SPECIAL INSPECTION NOTES:

1. A SPECIAL INSPECTIONS PROGRAM SHALL BE ESTABLISHED BY THE OWNER AS REQUIRED BY CHAPTER 17 OF THE STATE BUILDING CODE. THE PROGRAM SHALL BE MANAGED BY A SPECIAL INSPECTIONS COORDINATOR TO BE HIRED BY THE OWNER OR AUTHORIZED AGENT.
2. TESTING AND INSPECTIONS SHALL BE PERFORMED FOR ALL STRUCTURAL SYSTEMS INDICATED IN THE "STATEMENT OF SPECIAL INSPECTIONS" FORM ISSUED BY STRUCTURAL ENGINEER OF RECORD. TESTING AGENCIES AND SPECIAL INSPECTOR SHALL BE APPROVED BY THE BUILDING OFFICIAL.
3. THE INSPECTIONS AND TESTING PROGRAM SHALL NOT RELIEVE THE CONTRACTOR OF THE QUALITY ASSURANCE PROVISIONS OF THE BUILDING CODE AND CONTRACT DOCUMENTS..
4. THE CONTRACTOR SHALL ARRANGE FOR THE REQUIRED INSPECTIONS WHEN WORK IS COMPLETE AND READY FOR REVIEW. WORK SHALL REMAIN ACCESSIBLE AND EXPOSED. ALLOW FOR SUFFICIENT TIME FOR THE INSPECTION AGENCY TO SCHEDULE A VISIT PRIOR TO CONCEALMENT.
5. THE SPECIAL INSPECTOR SHALL KEEP RECORDS OF INSPECTIONS. THE SPECIAL INSPECTOR SHALL FURNISH INSPECTIONS REPORTS TO THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS OR WAS NOT COMPLETED IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION. IF THEY ARE NOT CORRECTED, THE DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK. A FINAL REPORT OF INSPECTIONS DOCUMENTING COMPLETION OF ALL REQUIRED SPECIAL INSPECTIONS AND CORRECTION OF ANY DISCREPANCIES NOTED IN THE INSPECTIONS SHALL BE SUBMITTED PRIOR TO THE ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.
6. PRIOR TO COMMENCEMENT WORK, A PRE-CONSTRUCTION MEETING WITH THE SPECIAL INSPECTIONS COORDINATOR, TESTING AGENCIES, DESIGN TEAM, AND SUBCONTRACTORS TO REVIEW THE SPECIAL INSPECTIONS PROGRAM AND IDENTIFY ALL PARTICIPANTS' ROLES AND RESPONSIBILITIES.

TEMPORARY SHORING :

1. THE CONTRACTOR SHALL ENGAGE THE SERVICES OF A SHORING ENGINEER REGISTERED IN THE STATE WHERE PROJECT IS CONSTRUCTED TO PREPARE ALL SUBMITTALS REQUIRED AND TO BE FULLY RESPONSIBLE FOR DETAILED DESIGN AND CONSTRUCTION SPECIFICATIONS AND PROVIDE SUPERVISION DURING CONSTRUCTION OF THE TEMPORARY SHORING WORK REQUIRED.
2. THE CONTRACTOR AND CONTRACTOR'S SHORING ENGINEER SHALL DESIGN, FURNISH, INSTALL AND PERFORM THE NECESSARY WORK REQUIRED TO SAFELY SUPPORT, PROTECT AND MAINTAIN EXISTING STRUCTURE. ANY MOVEMENT OR DAMAGE OF EXISTING BUILDING OR STRUCTURE SHALL BE CORRECTED TO THE SATISFACTION OF THE OWNER AND ENGINEER AT THE SOLE EXPENSE OF THE CONTRACTOR.
3. THE CONTRACTOR'S SHORING ENGINEER SHALL PREPARE A REPORT OF THE STRUCTURAL PRECONDITION SURVEY OF THE EXISTING BUILDING. THIS ON-SITE SURVEY SHALL BE DONE IN THE PRESENCE OF A REPRESENTATIVE FOR THE OWNER OF THE EXISTING BUILDING. THIS PRECONDITION SURVEY REPORT SHALL INCLUDE A DETAILED ON-SITE INSPECTION OF THE INTERIOR AND THE EXTERIOR OF THE BUILDING WITH PHOTOGRAPHS DOCUMENTING THE EXISTING CONDITIONS OF THE BUILDING.
4. THE CONTRACTOR'S ENGINEER SHALL SUBMIT A COMPLETE SET OF SEALED, DETAILED, DESIGN SHOP DRAWINGS FOR REVIEW AND COMMENTS BY STRUCTURAL ENGINEER. THE SUBMITTAL SHALL INCLUDE ALL CONSTRUCTION SEQUENCES, METHODS, DETAILS, SPECIFICATIONS AND DESIGN LOADS AND OPERATIONS NECESSARY FOR PROPER EXECUTION OF THE TEMPORARY SHORING WORK

FOUNDATIONS & STRUCTURAL EARTHWORK:

1. GENERAL:
   a. FOUNDATIONS HAVE BEEN DESIGNED UNDER ASSUMPTION THAT BUILDING PAD AREA IS COMPACTED STRUCTURAL FILL OR UNDISTURBED VIRGIN INORGANIC SOIL CAPABLE OF PROVIDING BEARING CAPACITY INDICATED. OWNER TO HIRE A GEOTECHNICAL ENGINEER, LICENSED IN THE STATE OF CONNECTICUT, TO VERIFY SOIL CONDITIONS DURING EXCAVATION PRIOR TO CONSTRUCTION OF THE FOUNDATION. ANY DISCREPANCIES WITH NOTED FOUNDATION DESIGN ASSUMPTIONS ARE TO BE FORWARDED TO THE ARCHITECT AND ENGINEER FOR POSSIBLE FURTHER INSTRUCTIONS.
   b. CONTRACTOR SHALL VERIFY ALL EXISTING FIELD CONDITIONS THAT MAY AFFECT THE INSTALLATION OF THE FOUNDATION SYSTEM AS SHOWN PRIOR TO STARTING WORK.
   c. EXISTING UTILITIES KNOWN TO BE IN THE CONSTRUCTION AREA HAVE BEEN INDICATED. THE SIZE, LOCATION AND DEPTH OF THE UTILITIES ARE NOT KNOWN EXACTLY AND MAY VARY SIGNIFICANTLY FROM THAT INDICATED. OTHER UNKNOWN UTILITIES NOT INDICATED MAY ALSO BE PRESENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING UTILITIES, WHETHER INDICATED OR NOT, WHICH MAY BE AFFECTED BY THE CONSTRUCTION PROCESS.
   d. ALL FOUNDATIONS SHALL BE PLACED ON UNDISTURBED FIRM, INORGANIC, VIRGIN SOIL OR COMPACTED STRUCTURAL FILL. DETERMINATION OF FINAL BEARING ELEVATIONS AND FIELD VERIFICATION OF ALLOWABLE BEARING PRESSURE SHALL BE MADE BY AN EXPERIENCED QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO PLACING FOUNDATIONS.
   e. CONCRETE FOR FOUNDATIONS SHALL BE PLACED ON THE SAME DAY SUBGRADE APPROVAL IS GIVEN BY THE GEOTECHNICAL ENGINEER.
   f. ALL SHORING, SHEETING, AND DEWATERING SHALL BE THE TOTAL RESPOSIBILITY OF THE CONTRACTOR. SHEETING AND SHORING SHALL BE DESIGNED BY THE CONTRACTOR'S ENGINEER REGISTERED IN THE PROJECT'S JURISDICTION. ALL SUBMITTALS SHALL BEAR CONTRACTOR'S /ENGINEERING SEAL AND SIGNATURE.

2. BACKFILL:
   a. ALL BACKFILL SHALL BE APPROVED GRAVEL COMPACTED TO 95% OPTIMUM DENSITY IN ACCORDANCE WITH ASTM D-1557, OR AS RECOMMENDED BY EXPERIENCED, QUALIFIED, LICENSED STATE OF CONNECTICUT GEOTECHNICAL ENGINEER. DO NOT USE ON SITE MATERIAL, UNLESS TESTED AND ACCEPTED BY THE GEOTECHNICAL ENGINEER.
   b. NO BACKFILL MATERIAL SHALL BE PLACED AGAINST FOUNDATION WALLS UNTIL THE CONCRETE HAS REACHED DESIGN STRENGTH OR ADEQUATE BRACING HAS BEEN INSTALLED.
   c. WHERE THE FINAL GRADE ELEVATIONS ARE APPROXIMATELY EQUAL ON BOTH SIDES OF A WALL, BACKFILL IN LIFTS TO MAINTAIN LEVEL ELEVATIONS WITHIN 12" ON BOTH SIDES AT ANY TIME.

3. STRUCTURAL FILL:
   a. CONTROL FILL SHALL BE PROCESSED AGGREGATE BASE CONFORMING TO CONNDOT M.05.01 INSPECTION OF PLACEMENT OF COMPACTED GRAVEL FILL SHALL BE BY AN EXPERIENCED QUALIFIED GEOTECHNICAL ENGINEER.

GENERAL NOTES:

1. THE CONTRACTOR SHALL VERIFY ALL DRAWINGS FOR COORDINATION BETWEEN TRADES, AND LOCATE SLOTS, SLEEVES AND TRENCHES AS REQUIRED FOR MECHANICAL TRADES. PROVIDE AND OR INSTALL ANCHORS, INSERTS, HANGERS, ETC. AS REQUIRED FOR VARIOUS TRADES.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF CONCRETE REINFORCING STEEL, STRUCTURAL STEEL, AND METAL DECK FOR REVIEW, BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL CHECK ALL DIMENSIONS AND ACCEPT FULL RESPONSIBILITY FOR DIMENSIONAL CORRECTNESS. SHOP DRAWINGS SHALL BEAR THE REVIEW AND APPROVAL STAMP OF THE CONTRACTOR, IN ACCORDANCE WITH THE GENERAL CONDITIONS.
3. THE CONTRACTOR SHALL PROMPTLY NOTIFY THE ARCHITECT IN WRITING OF ANY DISCREPANCIES BETWEEN ASSUMED CONDITIONS, ELEVATIONS, ETC. AND THOSE ACTUALLY ENCOUNTERED IN THE FIELD, OR OTHER REASONS THAT MIGHT ADVERSELY AFFECT THE INTENDED FUNCTION OF THE DESIGN, AND SHALL WAIT FOR INSTRUCTIONS BEFORE PROCEEDING WITH THE WORK.
4. STRUCTURAL PLANS SHALL NOT BE REPRODUCED IN WHOLE OR IN PART FOR USE AS SHOP DRAWINGS OR ERECTION PLANS. (THERE WILL BE NO RELAXATION OF THIS RESTRICTION FOR ANY TRADE.) REBAR DETAILER SHALL DRAW ELEVATIONS OF ALL CONCRETE WALLS WHICH SHALL INDICATE ALL POCKETS, OPENINGS, CHASES, ETC. ELEVATIONS SHALL BE DRAWN TO A MINIMUM SCALE OF 1/4"=1'-0".
5. FOR TYPES OF FINISHES ON FLOORS, WALLS, AND ROOFS, SEE ARCHITECTURAL DRAWINGS. DEPRESS OR SLOPE SLABS ON GRADE AS REQUIRED BY ARCHITECTURAL DRAWINGS.
6. REFERENCES MADE ON THESE DRAWINGS TO EXISTING CONDITIONS AND DEMOLITION MUST BE COORDINATED WITH ACTUAL CONDITIONS IN THE FIELD. SUCH REFERENCES ARE NOT INTENDED TO BE ALL INCLUSIVE OF THE WORK REQUIRED TO CONSTRUCT THE PROJECT.
7. THE TEMPORARY SUPPORT OF CONSTRUCTION MATERIALS IS RESTRICTED TO THE DESIGN CAPACITY OF THE NEW OR EXISTING CONSTRUCTION, AND SHALL BE PLACED SO AS NOT TO EXCEED THE CAPACITY OF INDIVIDUAL ELEMENTS. PROVIDE ADEQUATE, ENGINEERED SHORING/BRACING WHERE DESIGN CAPACITY IS NOT SUFFICIENT.
8. PROVIDE AND MAINTAIN TEMPORARY SHORING, BRACING, AND OTHER STRUCTURAL SUPPORTS AS NECESSARY TO PROTECT THE STRUCTURE FROM MOVEMENT, SETTLEMENT, OR COLLAPSE.
9. MEANS, METHODS, TECHNIQUES AND SEQUENCES OF CONSTRUCTION, INCLUDING JOBSITE SAFETY, SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
10. WALLS SHALL BE ADEQUATELY BRACED DURING CONSTRUCTION UNTIL WALL DESIGN STRENGTH HAS BEEN ATTAINED AND ALL PERMANENT SUPPORTS ARE IN PLACE.
11. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF MASONRY AND DRYWALL NON-LOAD BEARING PARTITIONS. PROVIDE SLIP CONNECTIONS THAT ALLOW VERTICAL MOVEMENT AT THE HEADS OF ALL SUCH PARTITIONS. CONNECTIONS ARE DESIGNED TO SUPPORT THE TOP OF THE WALLS LATERALLY FOR THE CODE-REQUIRED LATERAL LOAD. PROVIDE COMPRESSIBLE FIRE-SAFING, IF ANY, AT TOP OF WALL AS REQUIRED BY ARCHITECTURAL DRAWINGS.
12. THESE GENERAL NOTES SUPPLEMENT THE PROJECT SPECIFICATIONS. WHERE A DISCREPANCY OCCURS BETWEEN THESE DRAWINGS AND THE SPECIFICATIONS, THE MORE RESTRICTIVE SHALL APPLY.

CONCRETE:

1. CAST-IN-PLACE
   a. RENFORCING STEEL CLEAR COVER SHALL BE AS FOLLOWS UNLESS NOTED OTHERWISE:
      NON-POST-TENSIONED CONCRETE:

      CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 3"

      CONCRETE EXPOSED TO EARTH OR WEATHER
      #6 BARS AND LARGER 2"
      #5 AND SMALLER 1-1/2"
      CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND
      SLABS, WALL, JOISTS:
      #11 BARS OR SMALLER 3/4"

   b. CONSTRUCTION JOINTS AND CONTROL JOINTS IN SLABS ON GRADE SHALL BE ARRANGED TO LIMIT MAXIMUM AREA BETWEEN JOINTS TO 900 S.F. APPROXIMATELY SQUARE ALLOW A MINIMUM OF 48 HOURS TIME BETWEEN PLACEMENT OF ADJACENT SECTIONS.
   c. ALL FORMWORK, SHORING AND RESHORING SHALL BE DESIGNED BY THE CONTRACTOR'S ENGINEER REGISTERED IN THE PROJECT'S JURISDICTION. ALL SUBMISSIONS SHALL BEAR THE ENGINEER'S SEAL AND SIGNATURE.
   d. NO SLEEVE SHALL BE PLACED THROUGH ANY CONCRETE ELEMENT UNLESS SHOWN ON THE STRUCTURAL DRAWINGS, APPROVED SLEEVING SHOP DRAWINGS OR SPECIFICALLY AUTHORIZED IN WRITING BY THE STRUCTURAL ENGINEER.
   e. CORE DRILLING OF FOUNDATIONS, SLABS, SHALL NOT BE PERMITTED, UNLESS AUTHORIZED IN WRITING BY THE STRUCTURAL ENGINEER.
   f. NO SPLICES OF REINFORCEMENT SHALL BE PERMITTED EXCEPT AS DETAILED OR AUTHORIZED BY THE STRUCTURAL ENGINEER. MAKE BARS CONTINUOUS AROUND CORNERS.
   g. WHEN INSTALLING EXPANSION BOLTS OR ADHESIVE ANCHORS, THE CONTRACTOR SHALL TAKE MEASURES TO AVOID DRILLING OR CUTTING OF ANY EXISTING REINFORCING AND DESTRUCTION OF CONCRETE. HOLES SHALL BE BLOWN CLEAN PRIOR TO PLACING BOLTS OR ADHESIVE ANCHORS.
   h. CHAMFER ALL EXPOSED CONCRETE CORNERS, 3/4" x 3/4" MINIMUM, UNLESS NOTED OTHERWISE ON ARCHITECTURAL DRAWINGS.
   i. THE CONCRETE SLABS SHALL BE FINISHED FLAT AND LEVEL WITHIN TOLERANCE, TO THE ELEVATIONS SHOWN ON THE DRAWINGS.
   j. PROPOSED CONSTRUCTION JOINT LOCATIONS SHALL BE SHOWN ON REINFORCING STEEL SHOP DRAWINGS. ANY STOP IN CONCRETE MUST BE MADE WITH VERTICAL BULKHEADS AND HORIZONTAL KEYS, UNLESS OTHERWISE SHOWN. ALL REINFORCING IS TO BE CONTINUOUS THROUGH JOINTS.
   k. PREMOLDED EXPANSION JOINT FILLER SHALL BE PLACED ALONG EDGES OF SLAB ON GRADE WHERE ABUTTING FOUNDATION WALLS, AND AT ALL OTHER LOCATIONS AS DETAILED.
   l. SLAB SHALL NOT HAVE JOINTS IN A HORIZONTAL PLANE UNLESS SHOWN OTHERWISE. DO NOT PLACE ELECTRICAL CONDUITS IN ANY SLAB.
   m. CONTRACTOR SHALL PREPARE DETAILED DRAWINGS SHOWING DIMENSIONS, BAR SCHEDULES, BENDING DETAILS AND PLACING DIAGRAMS AND DETAILS, FOR ALL REINFORCEMENT. DRAWINGS SHALL BE SUBMITTED FOR APPROVAL AND NO REINFORCEMENT SHALL BE PLACED BEFORE DRAWINGS ARE APPROVED.
   n. METAL REINFORCEMENT SHALL BE SECURED AGAINST DISPLACEMENT WITH SUITABLE TIES.
   o. WELDED WIRE FABRIC REINFORCEMENT SHALL BE SUPPLIED IN SHEETS. LAP TWO FULL MESH LENGTHS AT SPLICES AND WIRE TOGETHER.
   p. ALL CONTINUOUS REINFORCING BARS SHALL BE LAPPED 48 BAR DIAMETERS, UNLESS NOTED OTHERWISE.
   q. WELDED WIRE FABRIC SHALL BE PLACED IN THE UPPER 1/3 OF THE SLAB ON GRADE AND SHALL CONFORM TO SECTION "MATERIALS" ITEM #5 ON THIS DRAWING.
   r. THIS CONTRACT INCLUDES ALL LABOR, MATERIALS, EQUIPMENT AND APPLIANCES NECESSARY TO COMPLETE ALL CAST-IN-PLACE CONCRETE AS INDICATED ON THE DRAWINGS OR HEREINAFTER SPECIFIED.
   s. ANCHOR BOLTS, LEVELING PLATES, SLEEVES, INSERTS, HANGERS, ETC. FURNISHED UNDER OTHER DIVISIONS AND REQUIRED TO BE CAST INTO THE CONCRETE SHALL BE SET BY THIS CONTRACTOR WHERE REQUIRED.
   t. PROVIDE ALL CONCRETE BASES, CURBS, MATS, PADS, TRENCHES, SLOTS, OPENINGS, ETC., AS REQUIRED BY ANY OR ALL OF TRADES TO ACCOMMODATE EQUIPMENT OR WORK OF ALL THE DIVISIONS.
   u. MATERIALS AND OPERATIONS SHALL BE TESTED AND INSPECTED AS WORK PROGRESSES. FAILURE TO DETECT DEFECTIVE WORK SHALL NOT PREVENT REJECTION WHEN DEFECT IS DISCOVERED.
   v. PROVIDE 1.) WATER SHALL BE FRESH, DRINKABLE 2.) AIR-ENTRAINING AGENT: CONFORMING TO ASTM C260 3.) WATER-REDUCING, SET-CONTROLLING ADMIXTURE CONFORMING TO ASTM C494 MANUFACTURED BY MASTER BUILDERS, SONNEBORN, EUCLID, OR W.R. GRACE COMPANIES.
   w. GROUT: NON-SHRINK "SETGROUT" AS MANUFACTURED BY MASTER BUILDERS.
   x. VAPOR RETARDER: SHALL BE INSTALLED UNDER CONCRETE SLABS ON GRADE WHERE INDICATED AND SHALL BE 15 MIL POLYETHYLENE. IT SHALL BE INSTALLED IN WIDEST PRACTICAL WIDTH. ALL JOINTS SHALL BE LAPPED A MINIMUM OF SIX (6) INCHES, AND ALL BREAKS OR HOLES SHALL BE PATCHED PRIOR TO POURING THE CONCRETE. WATER VAPOR RETARDER: ASTM E-1745 THAT MEETS OR EXCEEDS CLASS C.
   y. EXPANSION JOINT: CONFORMING TO ASTEM D 1751 OR ASTM D 1752.
   z. CONCRETE SHALL BE PROPORTIONED AND PRODUCED TO HAVE A SLUMP NOT TO EXCEED 4 IN. IF CONSOLIDATION IS BY VIBRATION OR 5 IN. IF CONSOLIDATION BY OTHER MEANS.
   z1. MAXIMUM SIZE OF COARSE AGGREGATE SHALL NOT EXCEED ONE-THIRD THE THICKNESS OF SLABS, AND ONE-FIFTH THE NARROWER DIMENSION BETWEEN FORMS.
   z2. CONCRETE SHALL BE ADJUSTED TO PRODUCE THE REQUIRED RATE OF HARDENING FOR VARIED CLIMATIC AND JOB-SITE CONDITIONS.
   z3. CONCRETE SHALL BE HANDLED FROM MIXER TO FINAL PLACEMENT RAPIDLY BY METHODS WHICH WILL PREVENT SEGREGATION OT LOSS OF INGREDIENTS TO MAINTAIN REQUIRED QUALITY OF CONCRETE.
   z4. USE OF VIBRATORS TO TRANSPORT CONCRETE SHALL NOT BE ALLOWED.
   z5. IMMEDIATELY FOLLOWING PLACEMENT, CONCRETE SHALL BE PROTECTED FROM PREMATURE DRYING, HOT AND COLD TEMPERATURES, RAIN, FLOWING WATER AND MECHANICAL INJURY.
   z6. FORMS FOR WALLS SHALL BE LEFT IN PLACE FOR A MINIMUM OF 3 DAYS. FINAL CURING SHALL CONTINUE FOR NOT LESS THAN 7 DAYS.
   z7. ALL INTERIOR CONCRETE FLOOR SLABS SHALL BE STEEL TROWELED TO A SMOOTH UNIFORM FINISH, FREE FROM DEFECTS AND BLEMISHES, NOTHING TO BE ADDED TO EITHER WET OR DRY FINISH. STEEL TROWELING SHALL NOT BE DONE UNTIL CONCRETE HAS HARDENED SUFFICIENTLY TO PREVENT FINE MATERIAL FROM WORKING TO THE SURFACE. ALL EXTERIOR CONCRETE FLOOR SLABS SHALL HAVE A BROOM FINISH.
   z8. WHERE DRAINS ARE INDICATED, ALL FLOOR SLABS SHALL SLOPE MINIMUM 1/8-INCH PER FOOT DOWN TO FLOOR DRAINS, AND THE FLOOR SLABS ON THE EQUIPMENT STORAGE ROOMS SHALL SLOPE DOWN TO DOORS A MINIMUM 1/8-INCH PER FOOT.
   z9. CONCRETE SHALL BE PROTECTED FROM DAMAGE. DAMAGED CONCRETE SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF CONCRETE SLABS ON GRADE THROUGH WINTER WEATHER. IF THEY SHOULD HEAVE DUE TO COLD WEATHER, THEY SHALL BE REMOVED AND REPLACED. ALL FILL BELOW THE SLABS SHALL BE REMOVED AND REPLACED.
   z10. COORDINATE WITH DRAWINGS, SECTIONS AND SPECIFICATIONS FOR ALL UNDERSLAB AND EXTERIOR FOUNDATION WALL WATERPROOFING REQUIREMENTS.
   z11. PATCH ALL VOIDS IN EXISTING CONCRETE, INCLUDING INFILL OF CONDUIT PENETRATIONS LESS THAN 12 INCHES WIDE, WITH SIKADUR 32, HI-MOD EPOXY BONDING/GROUTING ADHESIVE AND SIKAGRETE 211 POURABLE CONCRETE MIX. FOLLOW ALL MANUFACTURER GUIDELINES FOR PROPER INSTALLATION. PROVIDE PROPER FORMWORK BELOW RAISED HOLES TO BE PATCHED CAPABLE OF SUPPORTING THE WET CONCRETE MIX TIMES A SAFETY FACTOR OF 1.5.

STRUCTURAL STEEL:

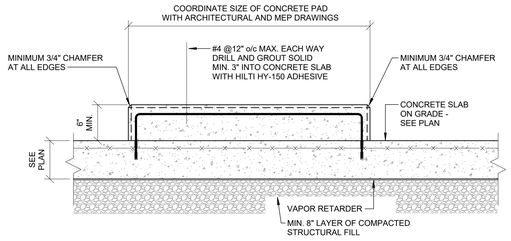
1. GENERAL:
   a. ALL SHOP AND FIELD CONNECTIONS SHALL BE MADE WITH HIGH STRENGTH BOLTS OR WELDS. ALL HIGH STRENGTH BOLTS AND NUTS SHALL BE CLEARLY MARKED AS REQUIRED BY AISC SPECIFICATIONS. CONNECTIONS MADE WITH UNMARKED BOLTS AND NUTS WILL BE REJECTED.
   b. PROVIDE ACCESS FOR INSPECTIONS OF ALL SHOP AND FIELD CONNECTIONS FOR PROPER MATERIALS AND WORKMANSHIP.
   c. ALL CONNECTIONS, SPLICES AND ERECTION PIECES SHALL BE DESIGNED BY THE FABRICATOR'S ENGINEER REGISTERED IN THE PROJECT'S JURISDICTION. STRUCTURAL STEEL FABRICATOR SHALL BE RESPONSIBLE FOR DESIGNING ALL BEAM SHEAR CONNECTIONS AND ALL NEW BEAM TO COLUMN MOMENT CONNECTIONS, INCLUDING STIFFENERS, HORIZONTAL TUBE COLUMN THROUGH-PLATES, AND WEB DOUBLER PLATES, IF REQUIRED (SHEAR AND MOMENT VALUES ARE INDICATED ON THE FRAMING PLANS- VALUES ARE IN ASD). WHEN PROVIDING CONNECTIONS, ALL AISC CODE REQUIREMENTS SHALL BE MET, AS APPLICABLE (I.E., NET SECTION, BLOCK SHEAR, ETC.,) FOR THE MEMBERS AND GUSSET PLATES. CALCULATIONS AND SHOP DRAWINGS FOR ALL CONNECTIONS SHALL BE SUBMITTED BEARING THE ENGINEER'S SEAL AND SIGNATURE.
   d. ALL STRUCTURAL STEEL THAT IS LOCATED IN EXTERIOR UNHEATED SPACES, INCLUDING STEEL DIRECTLY EXPOSED TO WEATHER, SHALL BE HOT DIPPED GALVANIZED. ALL OTHER STEEL TO HAVE ONE COAT OF SHOP PRIMER (2 COATS FOR STEEL SUPPORTING GLASS FLOORS.) FOR EXPOSED STRUCTURAL STEEL, COLOR TO BE APPROVED BY ARCHITECT (COORDINATE WITH SPECIFICATIONS AND ARCHITECTURAL DRAWINGS FOR EXACT LOCATION AND COLOR).
   e. CERTIFIED COPIES OF MILL TEST REPORTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER.
   f. THE CONTRACTOR SHALL NOTIFY THE STRUCTURAL ENGINEER OF ANY FABRICATION OR ERECTION ERRORS OR DEVIATIONS AND RECEIVE WRITTEN APPROVAL BEFORE ANY FIELD CORRECTIONS ARE MADE.
   g. SIMPLE SHEAR CONNECTIONS SHALL BE SELECTED AND DETAILED BY THE FABRICATOR IN ACCORDANCE WITH AISC. IF NO REACTION IS INDICATED, THEN CONNECTION IS TO BE DESIGNED USING A REACTION OF 10 KIPS. MINIMUM WELD 3/16" FILLET. MINIMUM NUMBER OF BOLTS PER CLIP ANGLE OR SINGLE PLATE CONNECTION:

BEAM SIZE	MIN. NO. OF BOLTS
W 8, W10	2
W12, W14	3
W16, W18	4
W21, W24	5

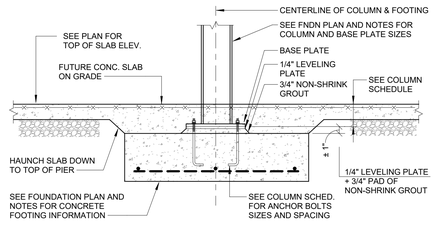
   h. UNLESS OTHERWISE NOTED, ALL A325 BOLTS SHALL BE TIGHTENED TO THE "SNUG TIGHT" CONDITION DEFINED AS THE TIGHTNESS ATTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A PERSON USING AN ORDINARY SPUD WRENCH. THE SNUG TIGHT CONDITION MUST ENSURE THAT THE PLIES OF THE CONNECTED MATERIAL HAVE BEEN BROUGHT INTO SNUG CONTACT.
   i. THE FABRICATOR AND ERECTOR ARE RESPONSIBLE FOR THE DESIGN OF TEMPORARY BRACING AND RECOMMENDED ERECTION PROCEDURES.
   j. WHEN INSTALLING EXPANSION BOLTS OR ADHESIVE ANCHORS, THE CONTRACTOR SHALL TAKE MEASURES TO AVOID DRILLING OR CUTTING OF ANY EXISTING REINFORCING AND DESTRUCTION OF CONCRETE. HOLES SHALL BE BLOWN CLEAN PRIOR TO PLACING BOLTS OR ADHESIVE ANCHORS.
   k. WELDING ELECTRODES, WELDING PROCESS, MINIMUM PREHEAT AND INTERPASS TEMPERATURES SHALL BE IN ACCORDANCE WITH THE AISC AND AWS SPECIFICATIONS. ANY STRUCTURAL STEEL DAMAGED IN WELDING IS TO BE REPLACED OR REINFORCED AS ACCEPTABLE TO THE STRUCTURAL ENGINEER.
   l. WELDERS SHALL HAVE CURRENT EVIDENCE OF PASSING THE APPROPRIATE AWS QUALIFICATION TESTS.
   m. GAS CUTTING TORCHES SHALL NOT BE USED TO CORRECT FABRICATION ERRORS WITHOUT THE APPROVAL OF THE STRUCTURAL ENGINEER.
   n. STEEL FABRICATOR SHALL BE QUALIFIED FABRICATOR CERTIFIED IN THE AISC QUALITY CERTIFICATION PROGRAM AND IS A DESIGNATED AISC-CERTIFIED PLANT.
   o. **MATERIAL SPECIFICATIONS AS FOLLOWS:**

WIDE FLANGE SHAPES AND TEES:	ASTM A992, Fy = 50 ksi.
ANGLES, CHANNELS, AND PLATES:	ASTM A36, Fy = 36 ksi, UNLESS NOTED OTHERWISE.
SQUARE AND RECTANGULAR HOLLOW STRUCTURAL SECTIONS:	ASTM A1085 (50 ksi.) OR ASTM A500 GRADE C
BOLTS:	MIN. 3/4" DIAMETER ASTM A325 WITH BUILT-IN TENSION CONTROLLED SPLINE.
WELDING:	E-70XX ELECTRODES PERFORMED BY CERTIFIED WELDERS IN ACCORDANCE WITH AWS D1.1
ANCHOR BOLTS:	ASTM F1554, GRADE 36, WITH HEAVY PLATE WASHERS.

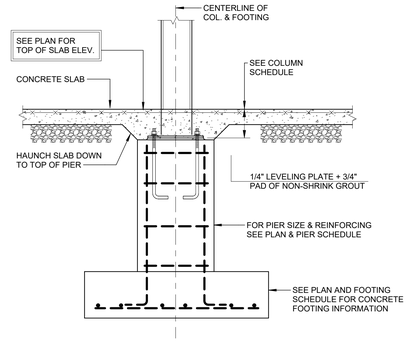
   p. ALL STRUCTURAL STEEL SH



1 TYPICAL HOUSEKEEPING PAD DETAIL
N.T.S.



2 TYPICAL INTERIOR FOOTING DETAIL
N.T.S.



3 TYPICAL INTERIOR PIER AND FOOTING DETAIL
N.T.S.

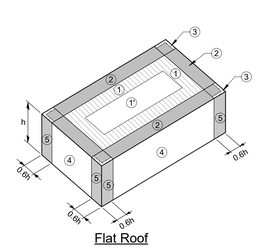
Component and Cladding Design Wind Pressures taken from ASCE 7-16, Figure 30.4-1, h < 60 ft

Effective wind area (sf)	Ultimate Net Design Wind Pressure , $p_{net(30)}$ (psf) V_{ult} =130 mph, Exposure B at h = 30 ft									
	Zone 1		Zone 1'		Zone 2		Zone 3		Zone 4	Zone 5
10	+12.4	-48.2	+12.4	-27.8	+12.4	-63.9	+12.4	-87.1	+30.4	-33.0	+30.4	-40.7
20	+11.6	-45.2	+11.6	-27.8	+11.6	-59.8	+11.6	-78.9	+29.0	-31.6	+29.0	-38.0
50	+10.6	-41.0	+10.6	-27.8	+10.6	-54.4	+10.6	-68.0	+27.2	-29.8	+27.2	-34.3
100	+9.8	-37.8	+9.8	-27.8	+9.8	-50.2	+9.8	-59.8	+25.9	-28.4	+25.9	-31.6

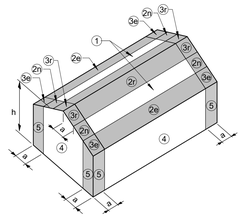
1. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
2. Multiply values by Adjustment Factor for Building Height and Exposure, λ (lambda) $p_{net} = \lambda K_{zt} p_{net30}$
3. For any discrepancies between these values and those published in the Code, the Code values shall apply.
4. The full load is applied laterally to the wall members for strength design and 42% of the ultimate load is used for stiffness design (2021 IBC Table 1604.3, footnote f)
5. a = 10 percent of least horizontal dimension, but not less than 3 ft

Adjustment Factor, λ (K_{zt}=1.0)

Mean Roof Height	Exposure	
	B	C
15	1.00	1.21
20	1.00	1.29
25	1.00	1.35
30	1.00	1.40
35	1.05	1.45
40	1.09	1.49
45	1.12	1.53
50	1.16	1.56
55	1.19	1.59
60	1.22	1.62

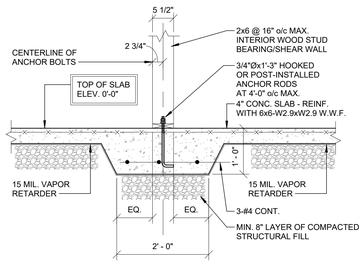


Flat Roof

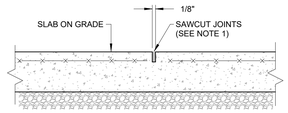


Gable Roof (27° < Θ < 45°)

ASCE 7-16 - COMPONENTS AND CLADDING PRESSURES



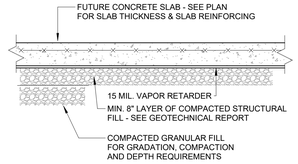
4 TYPICAL SLAB HAUNCH DETAIL AT INTERIOR BEARING/SHEAR WALLS
N.T.S.



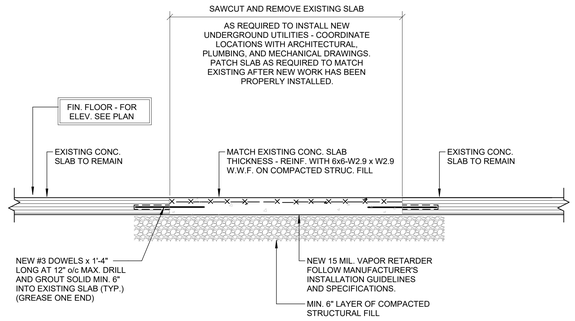
NOTES:

1. SAWCUT JOINTS USING A "SOFT-CUT" MACHINE OR EQUAL IMMEDIATELY AFTER FINISHING SLAB.
2. FILL JOINT WITH EPOXY SEALANT AFTER SLAB HAS BEEN CUT.
3. CONSTRUCTION JOINT MAY REPLACE CONTRACTION JOINT.

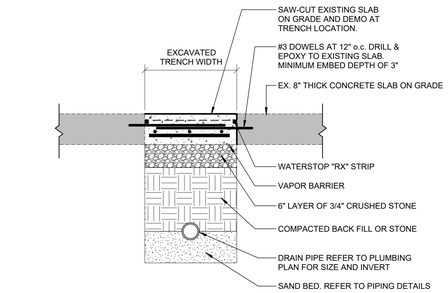
5 TYPICAL SLAB ON GRADE CONTROL JOINT DETAIL
N.T.S.



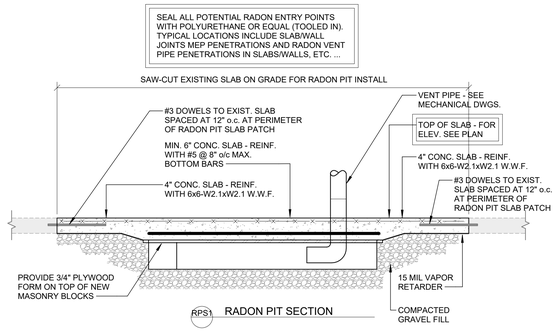
6 TYPICAL INTERIOR SLAB ON GRADE
N.T.S.

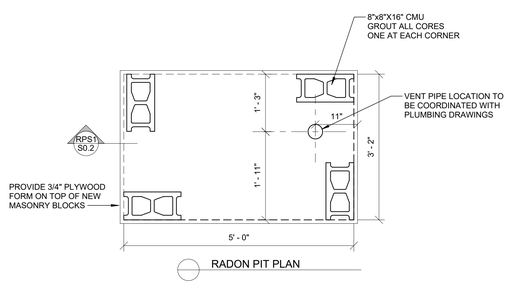


7 TYPICAL SLAB ON GRADE INFILL DETAIL AT NEW UNDERGROUND UTILITIES AND EXISTING FLOOR INFIILLS
N.T.S.

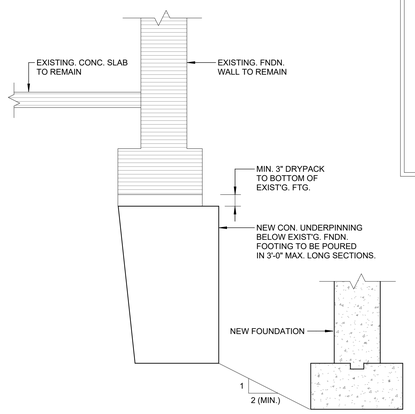


8 EX. MECHANICAL ROOM SLAB TRENCHING DETAIL
3/4" = 1'-0"





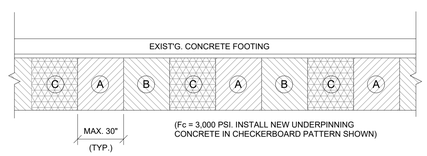
9 RADON PIT - 5'-0 x 3'-2" RECTANGLE
NTS



UNDERPINNING NOTES:

1. THE UNDERPINNING DETAIL IS INTENDED TO BE USED WHEN SOIL CONDITIONS ARE CONDUCIVE TO UNDERPINNING, i.e. DENSE GRANULAR OR GRAVELLY SOILS OR STIFF COHESIVE SOILS. IF SOILS OTHER THAN THESE, SUCH AS LOOSE SANDS, SOFT CLAYS, OR FILL ARE ENCOUNTERED, CONTACT THE OWNER'S AND CONTRACTOR'S ENGINEERS FOR ALTERNATE INSTRUCTIONS TO BE TAILORED TO THE SPECIFIC CONDITIONS ENCOUNTERED.
2. THE TECHNIQUE CONSISTS OF DIGGING SOIL FROM BENEATH THE EXISTING WALL/FOOTING AND REPLACING IT WITH CONCRETE IN SECTIONS OR COLUMNS, ONE AT A TIME, IN SEQUENCE "A", THEN "B" AND THEN "C" DOWN TO THE PROPOSED BOTTOM OF FOOTING ELEVATION.
3. INITIAL EXCAVATION IS DOWN TO BOTTOM OF EXISTING FOUNDATION. EXCAVATION FOR UNDERPINNING COLUMN "A" MAY THEN BEGIN. ONCE THE UNDERPINNING CONCRETE IS CAST, GROUT SOLID TO BOTTOM OF EXIST. FOOTING, AND CURED 48 HOURS, THEN EXCAVATION FOR COLUMN "B" MAY COMMENCE. ETC.
4. GROUT FOR SPACE BETWEEN EXISTING FOUNDATIONS AND NEW CONCRETE: APPLY SIKA "SIKADUR 32 HI-MOD LPL" EPOXY BONDING AGENT TO BOTH THE BOTTOM OF THE EXISTING FOUNDATION AND THE TOP OF THE NEW UNDERPINNING CONCRETE. PACK SIKA "SIKAGROUT 212" OR APPROVED EQUIVALENT WHILE BONDING AGENT IS STILL TACKY.

TYPICAL UNDERPINNING SECTION



TYPICAL UNDERPINNING ELEVATION

10 TYPICAL UNDERPINNING SECTION/ELEVATION DETAIL
N.T.S.

QA+M architecture
QuinebaugArcamMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:250064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

TYPICAL DETAILS - STRUCTURAL

S0.2

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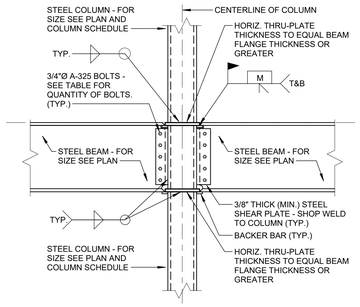
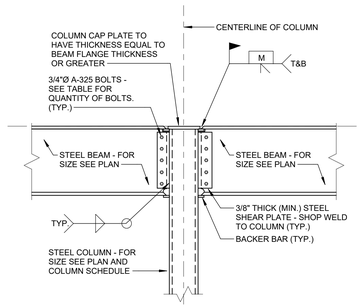


1 TYPICAL BEAM TO TUBE COLUMN MOMENT CONNECTION DETAIL - THRU-PLATE OPTION AT FLOOR LEVEL
NTS



2 TYPICAL BEAM TO TUBE COLUMN MOMENT CONNECTION DETAIL AT ROOF LEVEL
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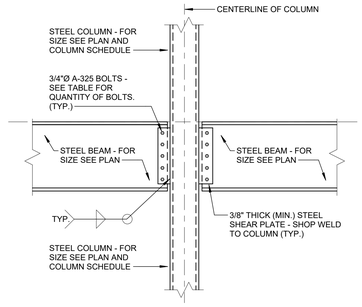

3 TYPICAL BEAM TO TUBE COLUMN NON- MOMENT CONNECTION DETAIL AT FLOOR LEVEL
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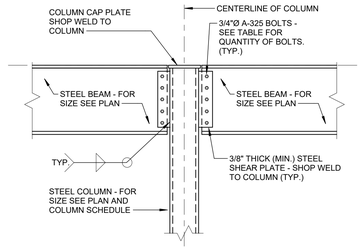
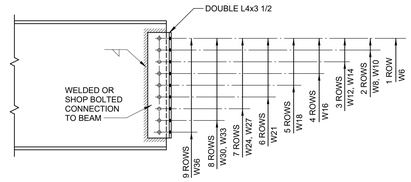
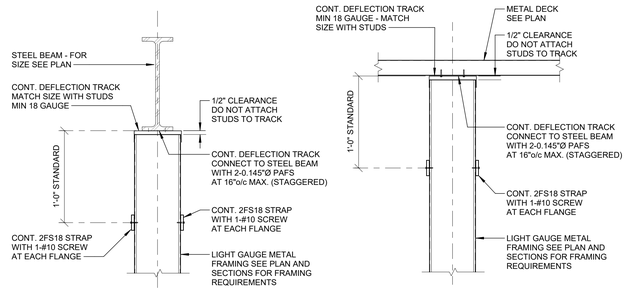


4 TYPICAL BEAM TO TUBE COLUMN NON-MOMENT CONNECTION DETAIL AT ROOF LEVEL
NTS



MINIMUM STEEL BEAM CONNECTION DETAIL

5 TYPICAL MINIMUM BEAM CONNECTION DETAIL
1/2" = 1'-0"



6 TYPICAL METAL STUDS CONNECTION DETAILS
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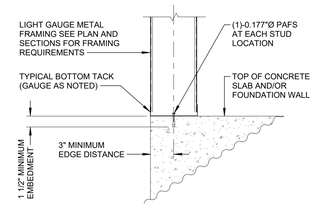
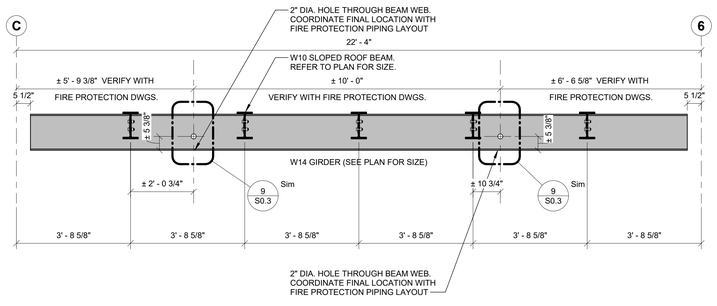
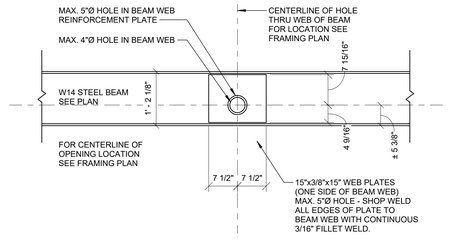


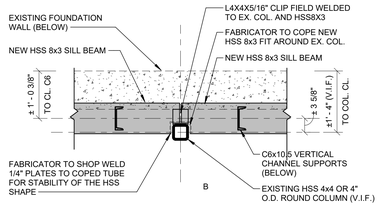
7 TYPICAL METAL STUD WALL CONNECTION TO CONCRETE
NTS



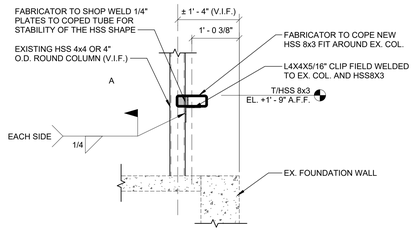
8 W18 GIRDER WITH PIPE PENETRATIONS THROUGH WEB
1/2" = 1'-0"



9 TYPICAL REINFORCEMENT DETAIL AT OPENING THRU STEEL BEAM WEB
NTS

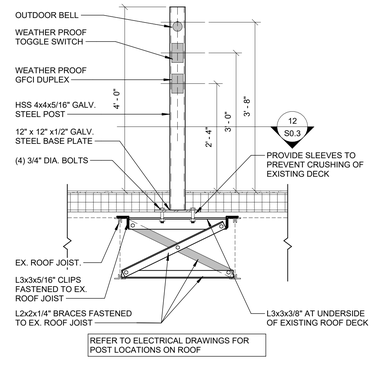


VIEW A - PLAN VIEW AT CONNECTION
3/4" = 1'-0"

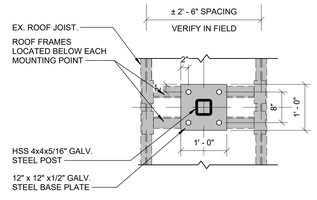


VIEW B - SECTION VIEW AT CONNECTION
3/4" = 1'-0"

10 TYPICAL HSS SILL CONNECTION AT EX. COLUMN
3/4" = 1'-0"



11 ROOF TOP RECEPTACLE PEDESTAL
3/4" = 1'-0"



12 ROOF TOP PEDESTAL PLAN VIEW
3/4" = 1'-0"

QA+M architecture
QuinebaugArcamMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

TYPICAL DETAILS - STRUCTURAL STEEL

S0.3

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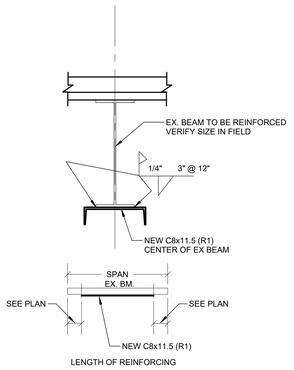
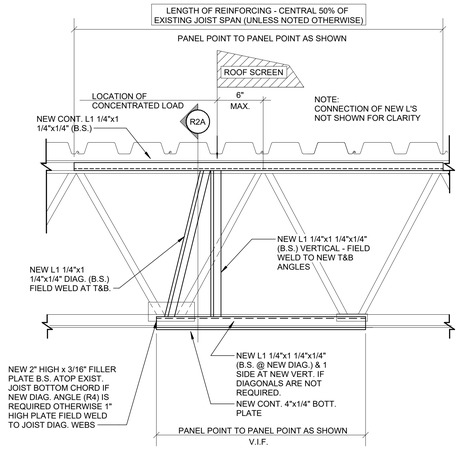
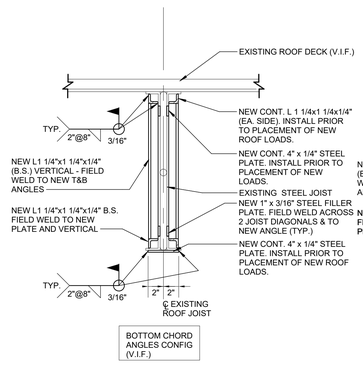


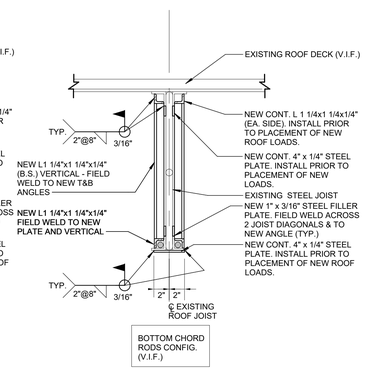
R1 REINFORCING



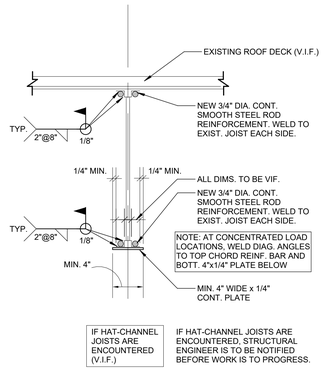
R2 REINFORCING



R2A (OPTION 1)



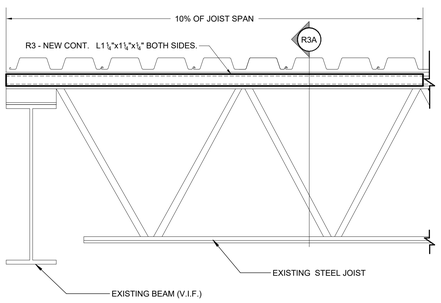
R2A (OPTION 2)



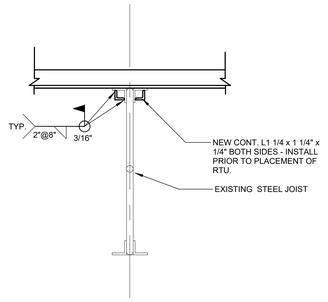
R2A (OPTION 3)

R1 BEAM REINFORCING - R1
1 1/2" = 1'-0"

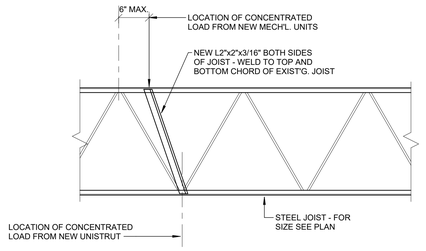
R2 REINFORCE FOR BENDING & DEFLECTION - R2
1 1/2" = 1'-0"



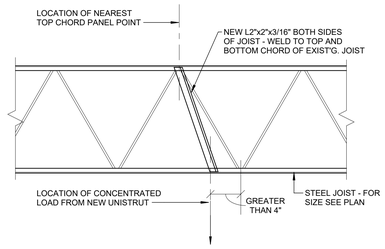
R3 REINFORCING



R3A

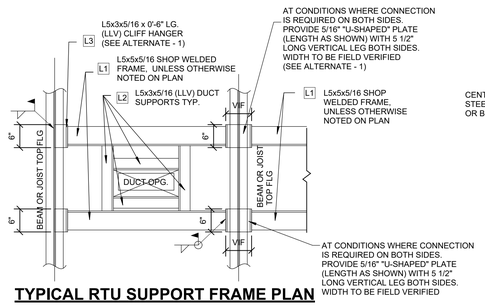


CONCENTRATED LOAD AT TOP

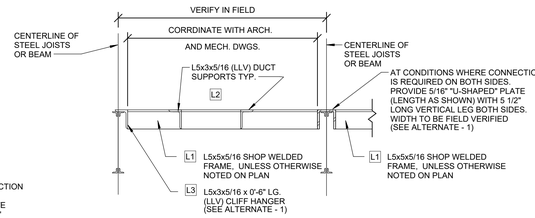


CONCENTRATED LOAD AT BOTTOM

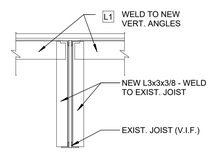
R3 SHEAR REINFORCING - R3
1 1/2" = 1'-0"



TYPICAL RTU SUPPORT FRAME PLAN

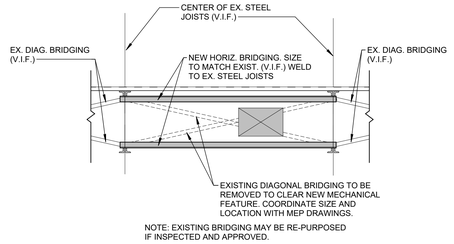


TYPICAL RTU SUPPORT FRAME DETAIL



ALTERNATE - 1 TO L3 AND U-SHAPED PLATE CONNECTION

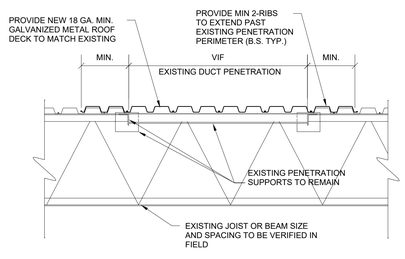
R4 TYPICAL REINFORCING DETAIL OF EXISTING JOIST @ CONCENTRATED LOAD LOCATIONS
NTS



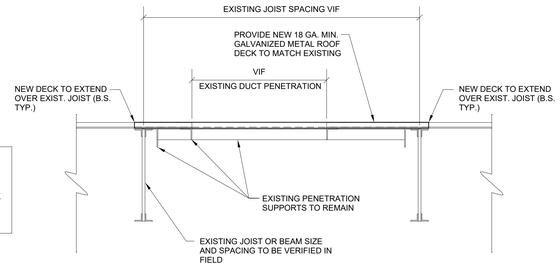
NOTE: EXISTING BRIDGING MAY BE RE-PURPOSED IF INSPECTED AND APPROVED.

1 TYPICAL RTU SUPPORT DETAILS
3/4" = 1'-0"

2 TYPICAL BRIDGING MODIFICATION DETAIL
3/4" = 1'-0"



EXISTING ROOF DECK TYPE TO BE VERIFIED IN FIELD. EXISTING DECK IS TO BE INSPECTED FOR SIGNS OF CORROSION. DETERIORATED DECK TO BE REMOVED PRIOR TO NEW DECK INSTALLATION. NEW DECK TO MATCH EXISTING STYLE. NEW DECK TO BE 18 GA. GALVANIZED



3 TYPICAL DECK INFILL
NTS

QA+M architecture
QuennerberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

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JUNE 5, 2026

TYPICAL DETAILS - JOIST REINFORCING

S0.4

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NEW CONSTRUCTION PIER SCHEDULE			
MARK	SIZE	VERTICAL REINFORCING	TIE BAR SIZE
P2.0	2'-0" x 2'-0"	(8) #6 VERTICAL BARS	#3 TIES @ 10"
P2.2	2'-2" x 1'-10"	(8) #6 VERTICAL BARS	#3 TIES @ 10"

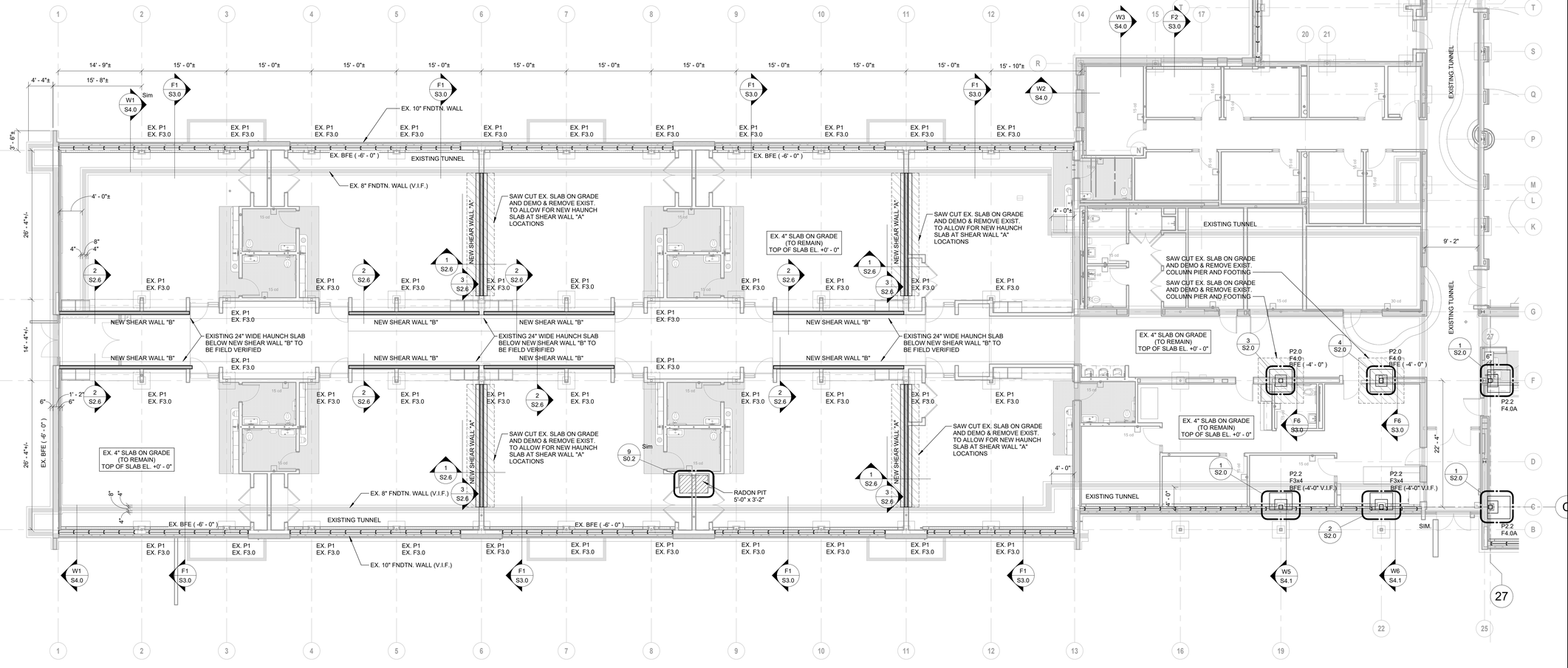
PIER SCHEDULE NOTE:

1. FOR ALL PIERS REDUCE SPACING OF TIES AT TOP OF PIER AROUND ANCHOR BOLTS TO 3" o.c. FOR A MINIMUM OF 3 TIES.

FOOTING SCHEDULE			
MARK	SIZE	DEPTH	REINFORCING
F3.0	3'-0" x 3'-0"	1'-0"	(4) #5 BARS EACH WAY BOTTOM
F3x4	3'-0" x 4'-0"	1'-0"	(3) #6 LONG BARS TOP & BOTTOM (4) #6 SHORT BARS TOP & BOTTOM
F4.0	4'-0" x 4'-0"	1'-0"	(5) #6 BARS EACH WAY BOTTOM
F4.0A	4'-0" x 4'-0"	2'-0"	(4) #6 BARS EACH WAY BOTTOM (4) #6 BARS EACH WAY TOP

FOUNDATION PLAN NOTES:

1. PATCHED AREAS OF EXISTING CONCRETE SLAB ON GRADE (INCLUDING TRENCHES COORDINATED W/ NEW UNDERGROUND PLUMBING) ARE TO BE A MINIMUM OF 4" THICK (MATCH EXISTING) REINFORCED WITH 6x6 - W2.9xW2.9 WELDED WIRE MESH CAST ON A 15 MIL VAPOR PATCHED INTO EXISTING VAPOR RETARDER (IF PRESENT). VAPOR RETARDER TO BE PLACED OVER A MINIMUM 8" LAYER OF COMPACTED STRUCTURAL FILL OR COMPACTED CRUSHED STONE. TRENCHES OR EXCAVATED AREAS ARE TO BE BACKFILLED WITH COMPACTED STRUCTURAL FILL OVER NATURAL SOILS. SEE DETAIL 7/S0.2.
2. THE PROJECT DOES NOT HAVE A GEOTECHNICAL INVESTIGATION FOR THIS PROJECT SITE. EXISTING SOILS ARE ASSUMED TO BE SITE CLASS "D" ACCORDING TO ASCE 7-16 SECTION 11.4.3 "SITE CLASS". THE ASSUMED ALLOWABLE SOIL BEARING PRESSURE WITHIN THE BUILDING FOOTPRINT IS 3000 POUNDS PER SQUARE FOOT (PSF).
3. ZERO DATUM FOR ALL ELEVATIONS GIVEN ON THIS PLAN IS FINISHED FLOOR ELEVATION = 0' - 0" (SITE EL. 262.96')
4. T.W.E. (. . . .) INDICATES TOP OF WALL ELEVATION REFERENCING DISTANCE ABOVE OR BELOW ELEVATION 0' - 0".
5. B.F.E. (. . . .) INDICATES BOTTOM OF FOOTING ELEVATION REFERENCING DISTANCE ABOVE OR BELOW ELEVATION 0' - 0".
6. COORDINATE THE BOTTOM OF FOOTING ELEVATIONS WITH UTILITIES. NOTIFY ARCHITECT AND / OR ENGINEER OF CONFLICTS FOR FURTHER INSTRUCTIONS. ALL PLUMBING INVERTS SHOWN ON STRUCTURAL PLANS ARE FOR GENERAL REFERENCE ONLY. FINAL INVERT ELEVATIONS ARE TO BE COORDINATED WITH PLUMBING DRAWINGS & SITE UTILITIES & DRAINAGE PLANS.
7. COLUMN PIERS ARE INDICATED ON THE DRAWINGS. FOR REINFORCING INFORMATION INCLUDING BAR SIZE, QUANTITY, TIE SIZE AND TIE SPACING INSTRUCTIONS REFER TO THE PIER SCHEDULE.
8. ELEVATION OF THE TOP OF CONCRETE COLUMN PIERS AND BUTTRESSES SUPPORTING NEW STEEL COLUMNS ARE AT THE ELEVATIONS LISTED ON THE COLUMN SCHEDULE NOTES AND PIER DETAILS.
9. THE STRUCTURAL CONDITIONS WHERE SECTIONS AND DETAILS ARE CUT AT PARTICULAR LOCATIONS, SHALL APPLY TO COMPARABLE SIMILAR CONDITIONS ELSEWHERE ON PLAN.
10. SEE DWG. S2.6 FOR SHEAR WALL INFORMATION.



1 FOUNDATION PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
QuennerberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FOUNDATION PLAN - AREA A

S1.1A

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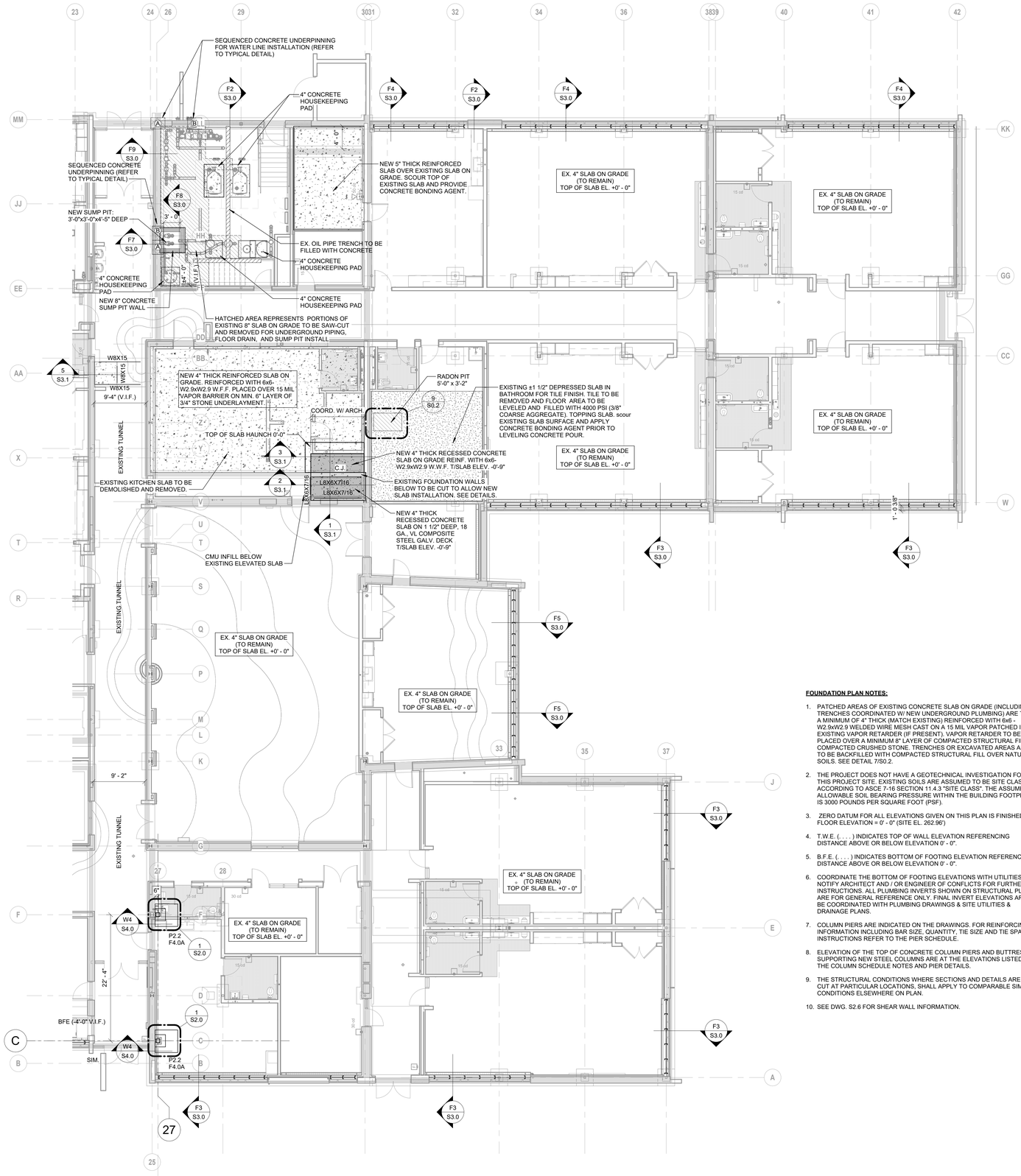

1 FOUNDATION PLAN - AREA B
1/8" = 1'-0"

FOUNDATION PLAN NOTES:

1. PATCHED AREAS OF EXISTING CONCRETE SLAB ON GRADE (INCLUDING TRENCHES COORDINATED W/ NEW UNDERGROUND PLUMBING) ARE TO BE A MINIMUM OF 4" THICK (MATCH EXISTING) REINFORCED WITH 6x6 - W2.9xW2.9 WELDED WIRE MESH CAST ON A 15 MIL VAPOR PATCHED INTO EXISTING VAPOR RETARDER (IF PRESENT). VAPOR RETARDER TO BE PLACED OVER A MINIMUM 8" LAYER OF COMPACTED STRUCTURAL FILL OR COMPACTED CRUSHED STONE. TRENCHES OR EXCAVATED AREAS ARE TO BE BACKFILLED WITH COMPACTED STRUCTURAL FILL OVER NATURAL SOILS. SEE DETAIL 7/S0.2.
2. THE PROJECT DOES NOT HAVE A GEOTECHNICAL INVESTIGATION FOR THIS PROJECT SITE. EXISTING SOILS ARE ASSUMED TO BE SITE CLASS "D" ACCORDING TO ASCE 7-16 SECTION 11.4.3 "SITE CLASS". THE ASSUMED ALLOWABLE SOIL BEARING PRESSURE WITHIN THE BUILDING FOOTPRINT IS 3000 POUNDS PER SQUARE FOOT (PSF).
3. ZERO DATUM FOR ALL ELEVATIONS GIVEN ON THIS PLAN IS FINISHED FLOOR ELEVATION = 0' - 0" (SITE EL. 262.96')
4. T.W.E. (. . .) INDICATES TOP OF WALL ELEVATION REFERENCING DISTANCE ABOVE OR BELOW ELEVATION 0' - 0".
5. B.F.E. (. . .) INDICATES BOTTOM OF FOOTING ELEVATION REFERENCING DISTANCE ABOVE OR BELOW ELEVATION 0' - 0".
6. COORDINATE THE BOTTOM OF FOOTING ELEVATIONS WITH UTILITIES. NOTIFY ARCHITECT AND / OR ENGINEER OF CONFLICTS FOR FURTHER INSTRUCTIONS. ALL PLUMBING INVERTS SHOWN ON STRUCTURAL PLANS ARE FOR GENERAL REFERENCE ONLY. FINAL INVERT ELEVATIONS ARE TO BE COORDINATED WITH PLUMBING DRAWINGS & SITE UTILITIES & DRAINAGE PLANS.
7. COLUMN PIERS ARE INDICATED ON THE DRAWINGS. FOR REINFORCING INFORMATION INCLUDING BAR SIZE, QUANTITY, TIE SIZE AND TIE SPACING INSTRUCTIONS REFER TO THE PIER SCHEDULE.
8. ELEVATION OF THE TOP OF CONCRETE COLUMN PIERS AND BUTTRESSES SUPPORTING NEW STEEL COLUMNS ARE AT THE ELEVATIONS LISTED ON THE COLUMN SCHEDULE NOTES AND PIER DETAILS.
9. THE STRUCTURAL CONDITIONS WHERE SECTIONS AND DETAILS ARE CUT AT PARTICULAR LOCATIONS, SHALL APPLY TO COMPARABLE SIMILAR CONDITIONS ELSEWHERE ON PLAN.
10. SEE DWG. S2.6 FOR SHEAR WALL INFORMATION.

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RENOVATE AS NEW:
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BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FOUNDATION PLAN - AREA B

S1.1B

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UNIT SUPPORT NOTES:

1.(E) ROOF DECK PROFILE IS STANDARD METAL ROOF DECK COMPOSITION - V.I.F.
2.CUT EXISTING ROOFING, MINIMALLY, AS REQUIRED TO INSTALL STRUCTURAL ELEMENTS I.E. ANGLES/CHANNELS/BEAMS. COORDINATE EXACT LOCATIONS WITH MECH. CONTRACTOR. PROVIDE PROPER FLASHING AND WATERPROOFING AFTER NEW ELEMENTS ARE INSTALLED TO PROVIDE A WATERTIGHT ENCLOSURE (COORDINATE WITH ARCHITECT).
3.ALL STEEL AND CONNECTIONS EXPOSED TO THE ELEMENTS ARE TO BE HOT-DIPPED GALVANIZED.
4.CONTRACTOR TO VERIFY EXISTING STRUCTURAL ELEMENTS IN FIELD AND COORDINATE WITH MECH. DWGS. TO LOCATE THE UNIT CORRECTLY.
5.IF AT EXISTING UNIT SUPPORTS - CONTRACTOR TO VERIFY IN FIELD THE RTU FRAMING IS SUPPORTED BY MIN. „5"X3-1/2"X5/16" LLV OR BETTER . IF NOT, PLEASE UPDATE EXISTING ANGLE ON EACH SIDE OF OPENING.
6.CONTRACTOR TO NOTIFY IF THERE IS ANY DISCREPANCY FOUND TO THE STRUCTURAL ENGINEER OF RECORD.
7.IF NEW DECK INFILL IS REQUIRED: NEW INFILL ROOF DECK PROFILE TO MATCH EXIST. DECK TO SPAN BETWEEN EXISTING OR NEW SUPPORT ANGLE FRAMES. REFER TO ROOF IN-FILL DETAIL FOR MORE INFORMATION.
8.EXISTING JOIST "X" BRIDGING THAT CONFLICTS WITH NEW MECHANICAL DUCT RUNS IS TO BE CONVERTED TO PARALLEL BRIDGING AT TOP AND BOTTOM CHORD. BRIDGING REMOVAL IS NOT PERMITTED WITHOUT CONSENT OF THE ENGINEER OF RECORD.
9.ALL DETAILS ARE CONSIDERED TYPICAL AND APPLY AT SAME AND SIMILAR CONDITIONS WITHIN THE PROJECT SCOPE.
10. SUPPORT FRAMES ARE REQUIRED BENEATH ALL ROOF TOP UNIT (RTU) CURBS AND ROOF PENETRATIONS FOR DUCT AND OTHER MECHANICAL EQUIPMENT. ALL SUPPORT LOCATIONS TO BE COORDINATED WITH NEW RTU LOCATIONS. SEE MECH. AND ARCH. DWGS. FOR LOCATIONS. EXISTING UNDERSIZED OR CONFLICTING ANGLES ARE TO BE REMOVED AND REPLACED SIZED AS SHOWN IN DETAILS.
11. ALL NEW SUPPORT FRAMING IS TO BE INSTALLED TIGHT TO UNDERSIDE OF EXIST. ROOF DECK U.N.O.
12. ALL EXISTING STEEL IS TO BE VERIFIED IN FIELD PRIOR TO FABRICATION / INSTALLATION.
13. **UNLESS NOTED OTHERWISE, REINFORCING REQUIRED AT ALL CONCENTRATED LOADS WHERE NEW FRAMES DO NOT FALL ON PANEL POINTS - SEE TYPICAL DETAILS R4A AND R4B / S0.4**

RTU SUPPORT SCHEDULE:

L1 - INDICATES L5x5x5/16 DECK SUPPORT. DECK SUPPORT ANGLES PERPENDICULAR TO EXISTING FRAMING TO BE SEGMENTED BETWEEN MEMBERS AS NECESSARY (FIELD VERIFY).
L2 - INDICATES L5x3x5/16 (LLV) DUCT SUPPORTS WELDED TO BOTTOM OF HSS 6x3x1/4 AND L5x5 DECK SUPPORTS (V.I.F.)
L3 - L5x3x5/16 x 0'-6" LG. (LLV) CLIFF HANGER

EX. WIDE FLANGE BEAM AND OPEN WEB STEEL JOIST REINFORCING SCHEDULE:

R1 - REFERS TO STEEL BEAM REINFORCING WITH STEEL CHANNEL.
R2 - REFERS TO TOP CHORD AND WEB REINFORCING WITH ANGLES, AND BOTTOM CHORD REINFORCING WITH PLATE AND 3/4" DIA. ROUND STEEL BARS OR ANGLES.
R3 - REFERS TO SHEAR REINFORCING DETAIL FOR OPEN WEB STEEL JOISTS

REFER TO TYPICAL DETAIL SHEET S0.4, "JOIST REINFORCING" FOR TYPICAL OPEN WEB STEEL JOIST REINFORCING DETAILS

UNIT WEIGHTS:

UNIT	DESIGN WEIGHT
DOAS-1	2370#
DOAS-2	2704#
DOAS-3	1592#
DOAS-4	1246#
DOAS-5	1246#
DOAS-6	2372#
RTU-1	1347#
RTU-2	950#
RTU-3	1341#

NOTE: ALL UNIT DESIGN WEIGHTS SHOWN TO BE COORDINATED WITH MEP AND ANY DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE STRUCTURAL ENGINEER

ROOF FRAMING PLAN NOTES:

1. ZERO DATUM FOR ALL ELEVATIONS GIVEN ON THIS PLAN IS FINISHED FLOOR ELEVATION = 0' - 0" (SITE EL. 262.96')
2. ELEVATION OF TOP OF STRUCTURAL STEEL ELEMENTS:

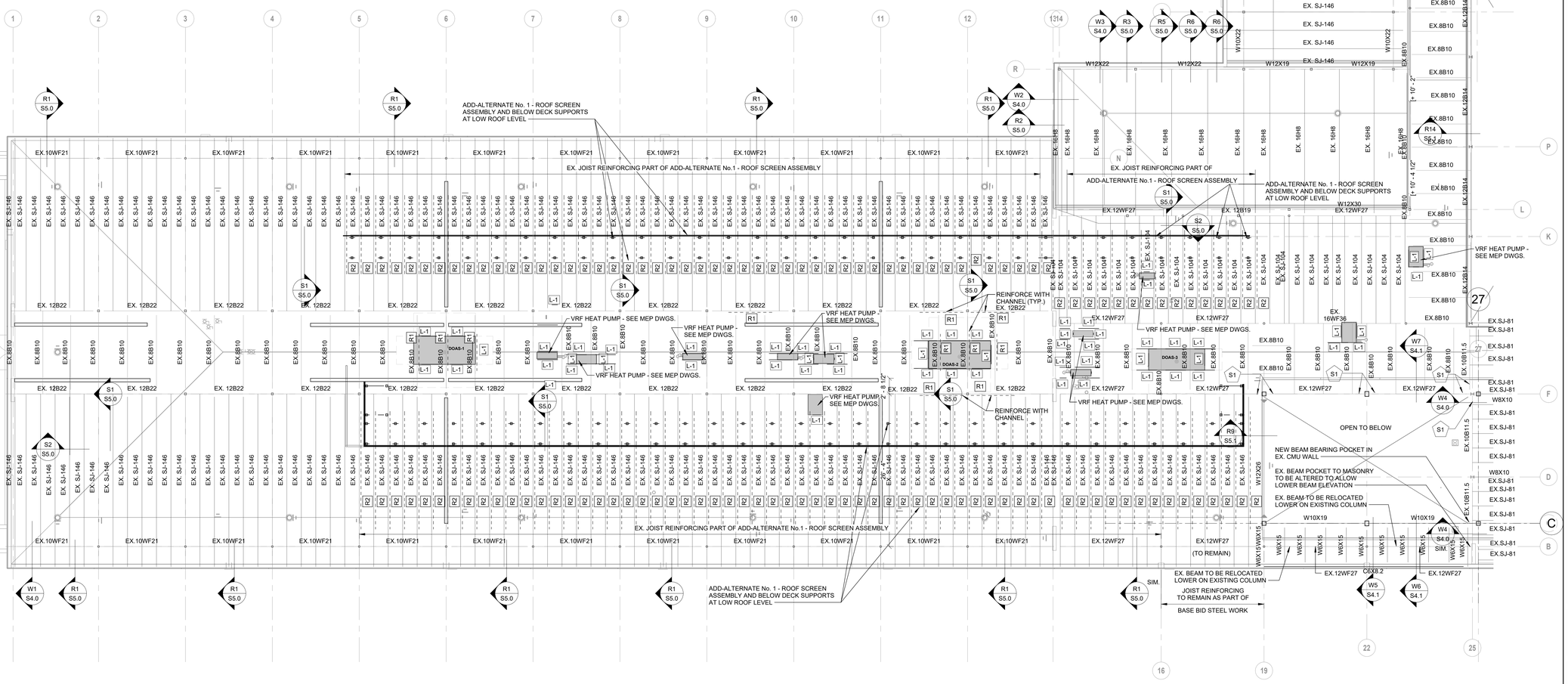
   1956 & 1963 EXISTING BUILDING: TOP OF STEEL = +10' - 4 1/2" AFF (V.I.F.)
   1985 EXISTING BUILDING: TOP OF STEEL = +10' - 4 1/2" AFF (V.I.F.)
3. ELEVATION OF TOP OF STRUCTURAL STEEL BEAMS IS SHOWN [+. . . .] ON PLAN INDICATING DISTANCE ABOVE DATUM. SLOPE (IF ANY) IS INDICATED BY "SLOPED" OR "SL" ON PLAN. SLOPE STEEL PARALLEL TO WORKING POINT ELEVATIONS GIVEN ON PLAN, OR AS DETERMINED FROM DETAILS. ALL EXISTING BUILDING T.O.S. ELEVATIONS AND DIMENSIONS TO BE FIELD VERIFIED.
4. NEW ROOF CONSTRUCTION IS 1 1/2" DEEP, 20 GAUGE, TYPE "B", GALVANIZED METAL ROOF DECK UNLESS OTHERWISE NOTED.
5. LARGE PORTIONS OF THE EXISTING BUILDING HAVE ROOF LEAKS THAT HAVE BEEN ACTIVE FOR SOME TIME. ONCE THE EXISTING FINISHED ROOF MATERIAL AND ROOF INSULATION HAS BEEN STRIPPED AND REMOVED, THE EXISTING ROOF DECK IS REQUIRED TO BE INSPECTED FOR DAMAGE, RUST, OR DETERIORATION.

   SECTIONS OF DETERIORATED DECK WILL REQUIRE REPLACEMENT, RE-FASTENING AND/OR REPAIR DEPENDING ON THE SEVERITY OF THE EXISTING DAMAGE.

   1954 BUILDING ROOF DECK IS 1 1/2" DEEP, 20 GA. ROOF DECK
   1963 BLDG. ADDITIONS ARE 1 1/2" DEEP, UNKNOWN THICKNESS ROOF DECK
   1985 BDLG. ADDITIONS ARE 1 1/2" DEEP, 20 GA. WIDE RIB ROOF DECK
6. LOCATIONS WHERE EXISTING ROOF OPENINGS ARE TO BE ABANDONED AND COVERED OVER, ARE REQUIRED TO BE FILLED IN WITH 1 1/2" DEEP, 20 GA. TYPE "B" GALVANIZED METAL ROOF DECK.
7. ATTACH ROOF DECK WITH MECHANICAL FASTENERS.
8. PROVIDE STEEL ANGLE FRAMES AROUND ALL ROOF OPENINGS FOR ROOF DRAINS, MECHANICAL VENTILATION, AND HATCHES. FOR OPENINGS SMALLER THAN 12", SEE METAL ROOF DECKING SPECIFICATION FOR DECK REINFORCING. FRAMES SHOWN, HAVE NOT BEEN SIZED NOR LOCATED EXACTLY. CONTRACTOR SHALL ESTABLISH SIZE AND LOCATION WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
9. THE STRUCTURAL CONDITIONS WHERE SECTIONS AND DETAILS ARE CUT AT PARTICULAR LOCATIONS, SHALL APPLY TO COMPARABLE SIMILAR CONDITIONS ELSEWHERE ON PLAN.
10. ADD-ALTERNATE No.1 - ROOF SCREENS

    ADD-ALTERNATE INCLUDES COMPONENTS OF ROOF SCREEN FRAME AND BELOW ROOF SUPPORTS, INCLUDING EXISTING STEEL JOIST REINFORCING, UNLESS OTHERWISE NOTED ON PLANS.

S1 CONTRACTOR TO PROVIDE SHORING FOR EXISTING W12 GIRDERS WHERE INDICATED. SHORING IS REQUIRED TO PROVIDE WORKING ACCESS TO REMOVE THE EXISTING COLUMN AND EXISTING FOUNDATION BELOW.



1 ROOF FRAMING PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
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195 Scott Swamp Road
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STATE OF CONNECTICUT
CHRISTOPHER J. MARTIN
REGISTERED PROFESSIONAL ENGINEER

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

LOW ROOF FRAMING PLAN - AREA A

S1.2A

UNIT SUPPORT NOTES:

1. (E) ROOF DECK PROFILE IS STANDARD METAL ROOF DECK COMPOSITION - V.I.F.
2. CUT EXISTING ROOFING, MINIMALLY, AS REQUIRED TO INSTALL STRUCTURAL ELEMENTS I.E. ANGLES/CHANNELS/BEAMS. COORDINATE EXACT LOCATIONS WITH MECH. CONTRACTOR. PROVIDE PROPER FLASHING AND WATERPROOFING AFTER NEW ELEMENTS ARE INSTALLED TO PROVIDE A WATERTIGHT ENCLOSURE (COORDINATE WITH ARCHITECT).
3. ALL STEEL AND CONNECTIONS EXPOSED TO THE ELEMENTS ARE TO BE HOT-DIPPED GALVANIZED.
4. CONTRACTOR TO VERIFY EXISTING STRUCTURAL ELEMENTS IN FIELD AND COORDINATE WITH MECH. DWGS. TO LOCATE THE UNIT CORRECTLY.
5. IF AT EXISTING UNIT SUPPORTS - CONTRACTOR TO VERIFY IN FIELD THE RTU FRAMING IS SUPPORTED BY MIN. „5"X3-1/2"X5/16" LLV OR BETTER . IF NOT, PLEASE UPDATE EXISTING ANGLE ON EACH SIDE OF OPENING.
6. CONTRACTOR TO NOTIFY IF THERE IS ANY DISCREPANCY FOUND TO THE STRUCTURAL ENGINEER OF RECORD.
7. IF NEW DECK INFILL IS REQUIRED: NEW INFILL ROOF DECK PROFILE TO MATCH EXIST. DECK TO SPAN BETWEEN EXISTING OR NEW SUPPORT ANGLE FRAMES. REFER TO ROOF IN-FILL DETAIL FOR MORE INFORMATION.
8. EXISTING JOIST "X" BRIDGING THAT CONFLICTS WITH NEW MECHANICAL DUCT RUNS IS TO BE CONVERTED TO PARALLEL BRIDGING AT TOP AND BOTTOM CHORD. BRIDGING REMOVAL IS NOT PERMITTED WITHOUT CONSENT OF THE ENGINEER OF RECORD.
9. ALL DETAILS ARE CONSIDERED TYPICAL AND APPLY AT SAME AND SIMILAR CONDITIONS WITHIN THE PROJECT SCOPE.
10. SUPPORT FRAMES ARE REQUIRED BENEATH ALL ROOF TOP UNIT (RTU) CURBS AND ROOF PENETRATIONS FOR DUCT AND OTHER MECHANICAL EQUIPMENT. ALL SUPPORT LOCATIONS TO BE COORDINATED WITH NEW RTU LOCATIONS. SEE MECH. AND ARCH. DWGS. FOR LOCATIONS. EXISTING UNDERSIZED OR CONFLICTING ANGLES ARE TO BE REMOVED AND REPLACED SIZED AS SHOWN IN DETAILS.
11. ALL EXISTING STEEL IS TO BE VERIFIED IN FIELD PRIOR TO FABRICATION / INSTALLATION.
12. **UNLESS NOTED OTHERWISE, REINFORCING REQUIRED AT ALL CONCENTRATED LOADS WHERE NEW FRAMES DO NOT FALL ON PANEL POINTS - SEE TYPICAL DETAILS R4A AND R4B / S0.4**

RTU SUPPORT SCHEDULE:

L1 - INDICATES L5x5x5/16 DECK SUPPORT. DECK SUPPORT ANGLES PERPENDICULAR TO EXISTING FRAMING TO BE SEGMENTED BETWEEN MEMBERS AS NECESSARY (FIELD VERIFY).
L2 - INDICATES L5x3x5/16 (LLV) DUCT SUPPORTS WELDED TO BOTTOM OF HSS 6x3x1/4 AND L5x5 DECK SUPPORTS (V.I.F.)
L3 - L5x3x5/16 x 0'-6" LG. (LLV) CLIFF HANGER

OPEN WEB STEEL JOIST REINFORCING SCHEDULE:

R1 - REFERS TO STEEL BEAM REINFORCING WITH STEEL CHANNEL.
R2 - REFERS TO BOTTOM CHORD REINFORCING WITH 3/4" DIA. ROUND STEEL BARS OR ANGLES.
R3 - REFERS TO SHEAR REINFORCING DETAIL FOR OPEN WEB STEEL JOISTS

REFER TO TYPICAL DETAIL SHEET "JOIST REINFORCING" FOR TYPICAL OPEN WEB STEEL JOIST REINFORCING DETAILS

UNIT WEIGHTS:

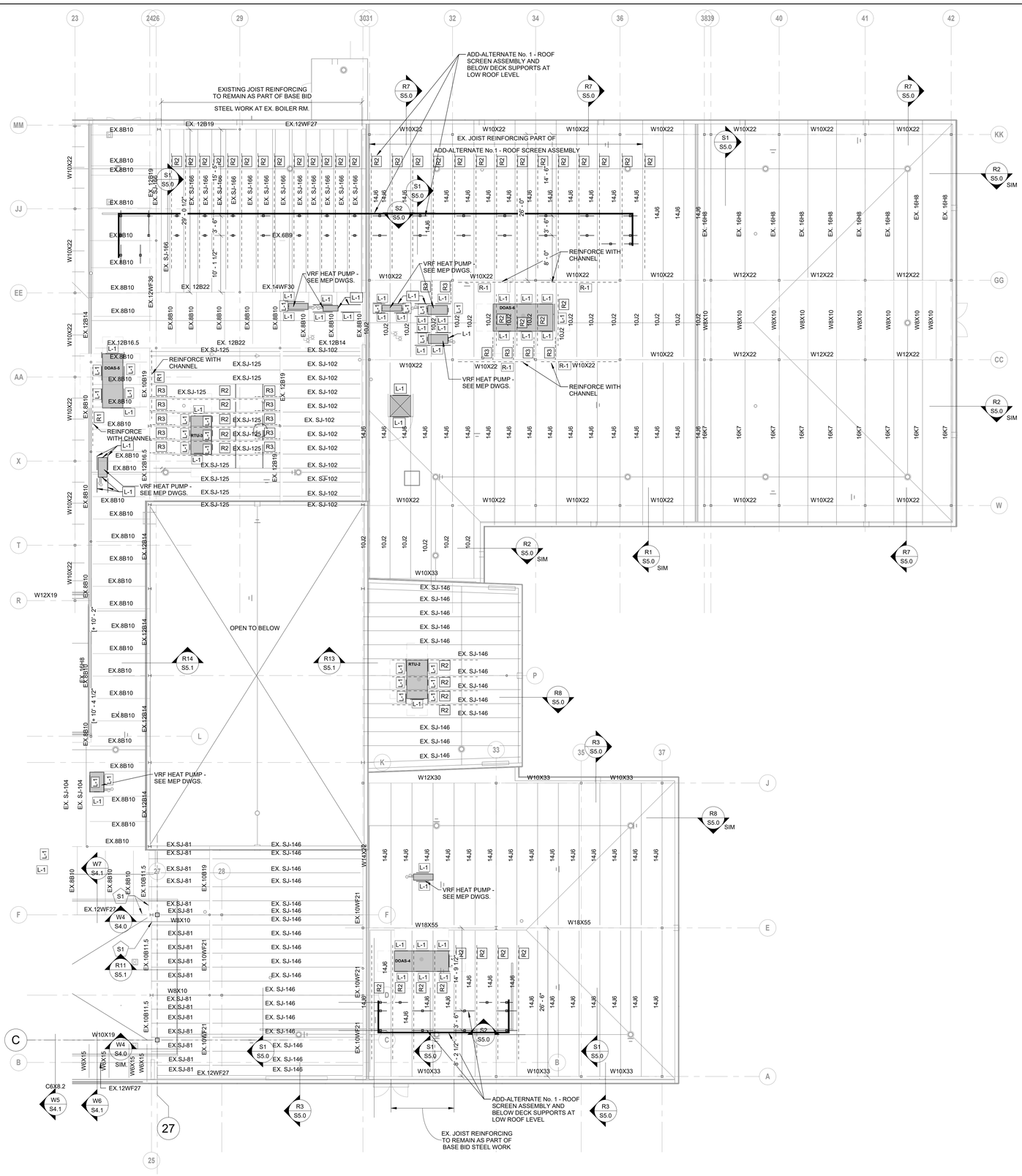
UNIT	DESIGN WEIGHT
DOAS-1	2370#
DOAS-2	2704#
DOAS-3	1592#
DOAS-4	1246#
DOAS-5	1246#
DOAS-6	2372#
RTU-1	1347#
RTU-2	950#
RTU-3	1341#

NOTE: ALL UNIT DESIGN WEIGHTS SHOWN TO BE COORDINATED WITH MEP AND ANY DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE STRUCTURAL ENGINEER

ROOF FRAMING PLAN NOTES:

1. ZERO DATUM FOR ALL ELEVATIONS GIVEN ON THIS PLAN IS FINISHED FLOOR ELEVATION = 0' - 0" (SITE EL. 262.96')
2. ELEVATION OF TOP OF STRUCTURAL STEEL ELEMENTS:

   1956 & 1963 EXISTING BUILDING: TOP OF STEEL = +10' - 4 1/2" AFF (V.I.F.)
   1985 EXISTING BUILDING: TOP OF STEEL = +10' - 4 1/2" AFF (V.I.F.)
3. ELEVATION OF TOP OF STRUCTURAL STEEL BEAMS IS SHOWN [+ . . .] ON PLAN INDICATING DISTANCE ABOVE DATUM. SLOPE (IF ANY) IS INDICATED BY "SLOPED" OR "SL" ON PLAN. SLOPE STEEL PARALLEL TO WORKING POINT ELEVATIONS GIVEN ON PLAN, OR AS DETERMINED FROM DETAILS. ALL EXISTING BUILDING T.O.S. ELEVATIONS AND DIMENSIONS TO BE FIELD VERIFIED.
4. NEW ROOF CONSTRUCTION IS 1 1/2" DEEP, 20 GAUGE, TYPE "B", GALVANIZED METAL ROOF DECK UNLESS OTHERWISE NOTED.
5. LOCATIONS WHERE EXISTING ROOF OPENINGS ARE TO BE ABANDONED AND COVERED OVER, ARE REQUIRED TO BE FILLED IN WITH 1 1/2" DEEP, 20 GA. TYPE "B" GALVANIZED METAL ROOF DECK.
6. ATTACH ROOF DECK WITH MECHANICAL FASTENERS. WELDING OF ROOF DECK SUPPORTS IS NOT PERMITTED.
7. PROVIDE STEEL ANGLE FRAMES AROUND ALL ROOF OPENINGS FOR ROOF DRAINS, MECHANICAL VENTILATION, AND HATCHES. FOR OPENINGS SMALLER THAN 12", SEE METAL ROOF DECKING SPECIFICATION FOR DECK REINFORCING. FRAMES SHOWN, HAVE NOT BEEN SIZED NOR LOCATED EXACTLY. CONTRACTOR SHALL ESTABLISH SIZE AND LOCATION WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
8. THE STRUCTURAL CONDITIONS WHERE SECTIONS AND DETAILS ARE CUT AT PARTICULAR LOCATIONS, SHALL APPLY TO COMPARABLE SIMILAR CONDITIONS ELSEWHERE ON PLAN.



1 ROOF FRAMING PLAN - AREA B
1/8" = 1'-0"

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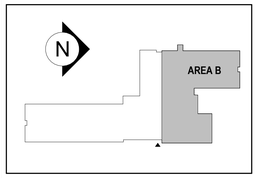
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

LOW ROOF FRAMING PLAN - AREA B

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UNIT SUPPORT NOTES:

1.(E) ROOF DECK PROFILE IS STANDARD METAL ROOF DECK COMPOSITION - V.I.F.
2.CUT EXISTING ROOFING, MINIMALLY, AS REQUIRED TO INSTALL STRUCTURAL ELEMENTS I.E. ANGLES/CHANNELS/BEAMS. COORDINATE EXACT LOCATIONS WITH MECH. CONTRACTOR. PROVIDE PROPER FLASHING AND WATERPROOFING AFTER NEW ELEMENTS ARE INSTALLED TO PROVIDE A WATERTIGHT ENCLOSURE (COORDINATE WITH ARCHITECT).
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5.IF AT EXISTING UNIT SUPPORTS - CONTRACTOR TO VERIFY IN FIELD THE RTU FRAMING IS SUPPORTED BY MIN. „5"X3-1/2"X5/16" LLV OR BETTER . IF NOT, PLEASE UPDATE EXISTING ANGLE ON EACH SIDE OF OPENING.
6.CONTRACTOR TO NOTIFY IF THERE IS ANY DISCREPANCY FOUND TO THE STRUCTURAL ENGINEER OF RECORD.
7.IF NEW DECK INFILL IS REQUIRED; NEW INFILL ROOF DECK PROFILE TO MATCH EXIST. DECK TO SPAN BETWEEN EXISTING OR NEW SUPPORT ANGLE FRAMES. REFER TO ROOF IN-FILL DETAIL FOR MORE INFORMATION.
8.EXISTING JOIST "X" BRIDGING THAT CONFLICTS WITH NEW MECHANICAL DUCT RUNS IS TO BE CONVERTED TO PARALLEL BRIDGING AT TOP AND BOTTOM CHORD. BRIDGING REMOVAL IS NOT PERMITTED WITHOUT CONSENT OF THE ENGINEER OF RECORD.
9.ALL DETAILS ARE CONSIDERED TYPICAL AND APPLY AT SAME AND SIMILAR CONDITIONS WITHIN THE PROJECT SCOPE.
10. SUPPORT FRAMES ARE REQUIRED BENEATH ALL ROOF TOP UNIT (RTU) CURBS AND ROOF PENETRATIONS FOR DUCT AND OTHER MECHANICAL EQUIPMENT. ALL SUPPORT LOCATIONS TO BE COORDINATED WITH NEW RTU LOCATIONS. SEE MECH. AND ARCH. DWGS. FOR LOCATIONS. EXISTING UNDERSIZED OR CONFLICTING ANGLES ARE TO BE REMOVED AND REPLACED SIZED AS SHOWN IN DETAILS.
11. ALL EXISTING STEEL IS TO BE VERIFIED IN FIELD PRIOR TO FABRICATION / INSTALLATION.
12. **UNLESS NOTED OTHERWISE, REINFORCING REQUIRED AT ALL CONCENTRATED LOADS WHERE NEW FRAMES DO NOT FALL ON PANEL POINTS - SEE TYPICAL DETAILS R4A AND R4B / S0.4**

RTU SUPPORT SCHEDULE:

L1 - INDICATES L5x5x5/16 DECK SUPPORT. DECK SUPPORT ANGLES PERPENDICULAR TO EXISTING FRAMING TO BE SEGMENTED BETWEEN MEMBERS AS NECESSARY (FIELD VERIFY).
L2 - INDICATES L5x3x5/16 (LLV) DUCT SUPPORTS WELDED TO BOTTOM OF HSS 6x3x1/4 AND L5x5 DECK SUPPORTS (V.I.F.)
L3 - L5x3x5/16 x 0'-6" LG. (LLV) CLIFF HANGER

OPEN WEB STEEL JOIST REINFORCING SCHEDULE:

R1 - REFERS TO STEEL BEAM REINFORCING WITH STEEL CHANNEL.
R2 - REFERS TO BOTTOM CHORD REINFORCING WITH 3/4" DIA. ROUND STEEL BARS OR ANGLES.
R3 - REFERS TO SHEAR REINFORCING DETAIL FOR OPEN WEB STEEL JOISTS

REFER TO TYPICAL DETAIL SHEET "JOIST REINFORCING" FOR TYPICAL OPEN WEB STEEL JOIST REINFORCING DETAILS

UNIT WEIGHTS:

UNIT	DESIGN WEIGHT
DOAS-1	2370#
DOAS-2	2704#
DOAS-3	1592#
DOAS-4	1246#
DOAS-5	1246#
DOAS-6	2372#
RTU-1	1347#
RTU-2	950#
RTU-3	1341#

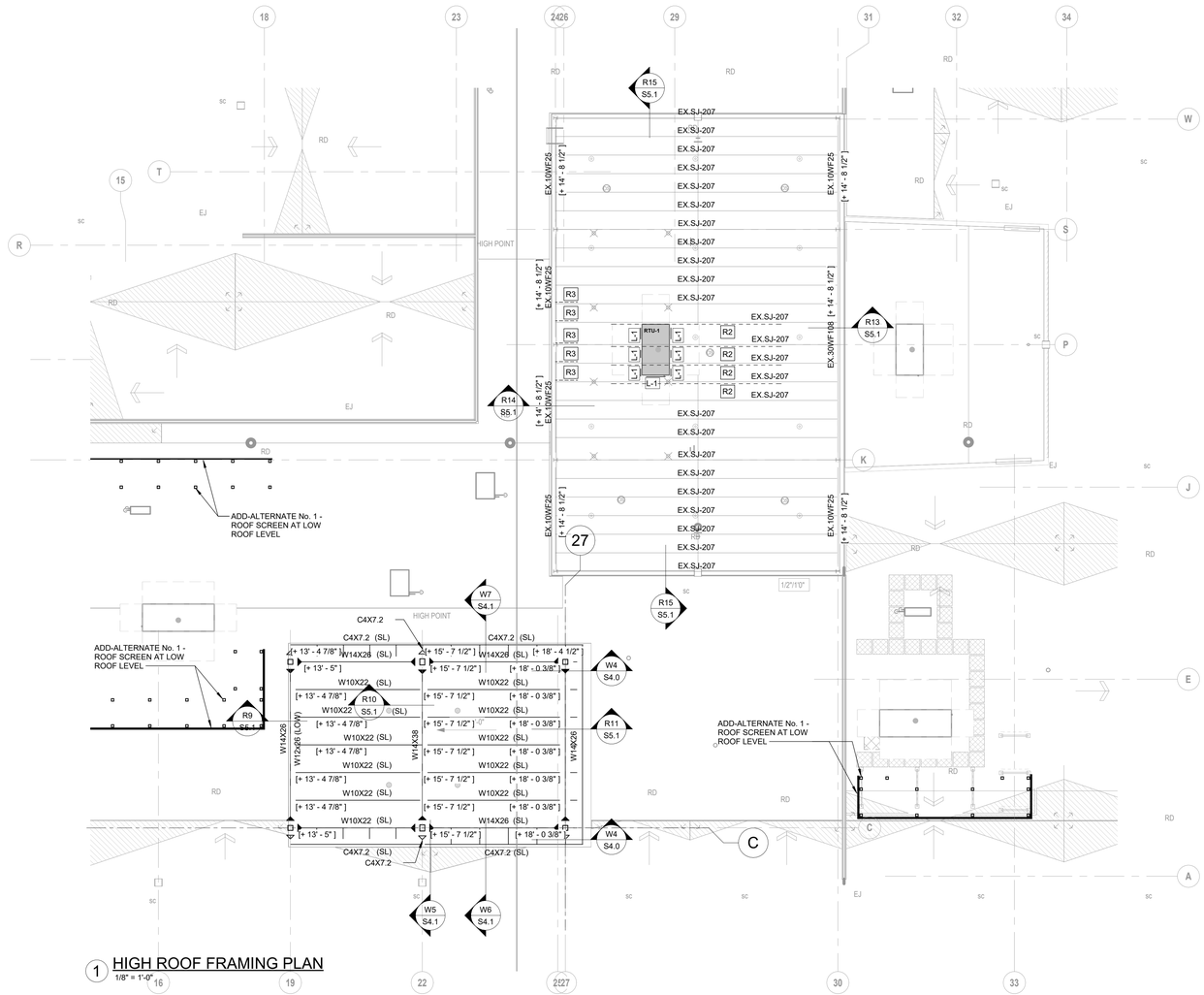
NOTE: ALL UNIT DESIGN WEIGHTS SHOWN TO BE COORDINATED WITH MEP AND ANY DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE STRUCTURAL ENGINEER

HIGH ROOF FRAMING PLAN NOTES:

1. ZERO DATUM FOR ALL ELEVATIONS GIVEN ON THIS PLAN IS FINISHED FLOOR ELEVATION = 0' - 0" (SITE EL. 262.96')
2. ELEVATION OF TOP OF STRUCTURAL STEEL ELEMENTS:

   1956 EXISTING BUILDING (GYM): TOP OF STEEL = +14' - 11" AFF (V.I.F.)
   (OT/PT): TOP OF STEEL = +12' - 5 7/8" AFF (V.I.F.)

3. ELEVATION OF TOP OF STRUCTURAL STEEL BEAMS IS SHOWN [+ . . .] ON PLAN INDICATING DISTANCE ABOVE DATUM. SLOPE (IF ANY) IS INDICATED BY "SLOPED" OR "SL" ON PLAN. SLOPE STEEL PARALLEL TO WORKING POINT ELEVATIONS GIVEN ON PLAN, OR AS DETERMINED FROM DETAILS. ALL EXISTING BUILDING T.O.S. ELEVATIONS AND DIMENSIONS TO BE FIELD VERIFIED.
4. NEW ROOF CONSTRUCTION IS 1 1/2" DEEP, 20 GAUGE, TYPE "B", GALVANIZED METAL ROOF DECK UNLESS OTHERWISE NOTED.
5. LOCATIONS WHERE EXISTING ROOF OPENINGS ARE TO BE ABANDONED AND COVERED OVER, ARE REQUIRED TO BE FILLED IN WITH 1 1/2" DEEP, 20 GA. TYPE "B" GALVANIZED METAL ROOF DECK.
6. ATTACH ROOF DECK WITH MECHANICAL FASTENERS. WELDING OF ROOF DECK SUPPORTS IS NOT PERMITTED.
7. PROVIDE STEEL ANGLE FRAMES AROUND ALL ROOF OPENINGS FOR ROOF DRAINS, MECHANICAL VENTILATION, AND HATCHES. FOR OPENINGS SMALLER THAN 12", SEE METAL ROOF DECKING SPECIFICATION FOR DECK REINFORCING. FRAMES SHOWN, HAVE NOT BEEN SIZED NOR LOCATED EXACTLY. CONTRACTOR SHALL ESTABLISH SIZE AND LOCATION WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.
8. THE STRUCTURAL CONDITIONS WHERE SECTIONS AND DETAILS ARE CUT AT PARTICULAR LOCATIONS, SHALL APPLY TO COMPARABLE SIMILAR CONDITIONS ELSEWHERE ON PLAN.



1 HIGH ROOF FRAMING PLAN
1/8" = 1'-0"

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BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

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AREA A
AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

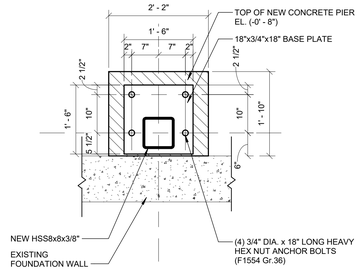
HIGH ROOF FRAMING PLAN

S1.3

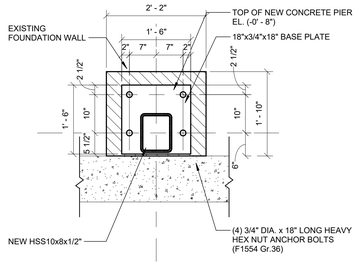
LEVEL 2							*LEVEL 2*
10' - 4 1/2"	HSS8X8X3/8	HSS10X8X1/2	HSS8X0X3/8	HSS8X8X3/8	HSS10X8X1/2	HSS8X0X3/8	*10' - 4 1/2"*
LEVEL 1							*LEVEL 1*
0' - 0"	EX. BFE (-0' - 8"	EX. BFE (-0' - 8"	T/PIER = -0' - 8"	EX. BFE (-0' - 8"	EX. BFE (-0' - 8"	EX. BFE (-0' - 8"	*0' - 0"*
Column Locations	**C-19**	**C-22**	**C-27**	**F-19**	**F-22**	**F-27**	

COLUMN SCHEDULE NOTES

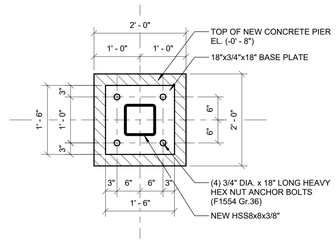
1. EXACT TOP OF COLUMN ELEVATIONS SHALL BE DETERMINED FROM SECTIONS, PLANS AND DETAILS.
2. THE DIMENSION GIVEN IN THE SCHEDULE AT THE BOTTOM OF COLUMNS INDICATES THE TOP OF CONCRETE FOOTING, PIER, OR BUTRESS SUPPORTING COLUMN. ALLOW 1" (3/4" GROUT PLUS 1/4" LEVELING PLATE) TO DETERMINE ELEVATION OF BOTTOM OF BASE PLATE.
3. ALL TUBULAR COLUMNS ARE HOLLOW, UNLESS OTHERWISE SHOWN IN DETAILS. PROVIDE 1/4" WELDED CAP PLATE TO PREVENT INTRUSION OF WATER.
4. REFER TO THE 'TYPICAL BASE PLATE DETAILS' FOR ADDITIONAL INFORMATION ON BASE PLATE GEOMETRY, ANCHOR LAYOUT, AND ANCHORAGE REQUIREMENTS.



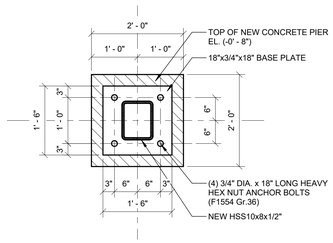
1 PLAN DETAIL AT NEW PIER
3/4" = 1'-0"



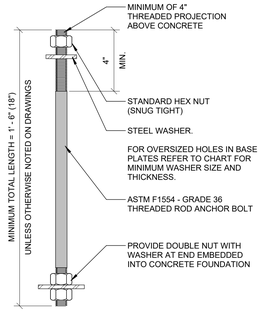
2 PLAN DETAIL AT NEW PIER - LINE 22
3/4" = 1'-0"



3 PLAN DETAIL AT NEW INTERIOR PIER
3/4" = 1'-0"



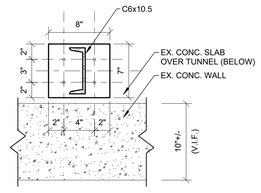
4 PLAN DETAIL AT NEW INTERIOR PIER - LINE 22
3/4" = 1'-0"



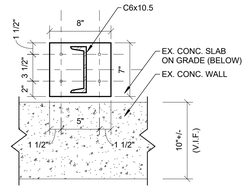
MAXIMUM SIZES FOR ANCHOR - ROD HOLES IN BASE PLATES:			
ANCHOR ROD DIA. (in.)	MAX. HOLE DIA. (in.)	MIN. WASHER SIZE (in.)	MIN. WASHER THICKNESS (in.)
3/4	1 5/16	2	1/4

NOTES: 1. REFERENCE AISC 360 TABLE 14-2
2. CIRCULAR OR SQUARE WASHERS MEETING THE WASHER SIZE ARE ACCEPTABLE.

5 TYPICAL ANCHOR BOLT DETAIL
3" = 1'-0"



6 PLAN DETAIL AT KNEE WALL SUPPORT BASE PLATE
1 1/2" = 1'-0"



7 PLAN DETAIL AT KNEE WALL SUPPORT AT SLAB ON GRADE
1 1/2" = 1'-0"

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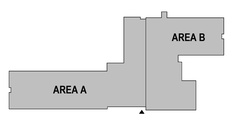
Project #:25064

Revisions



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COLUMN SCHEDULE & PLAN DETAILS

S2.0

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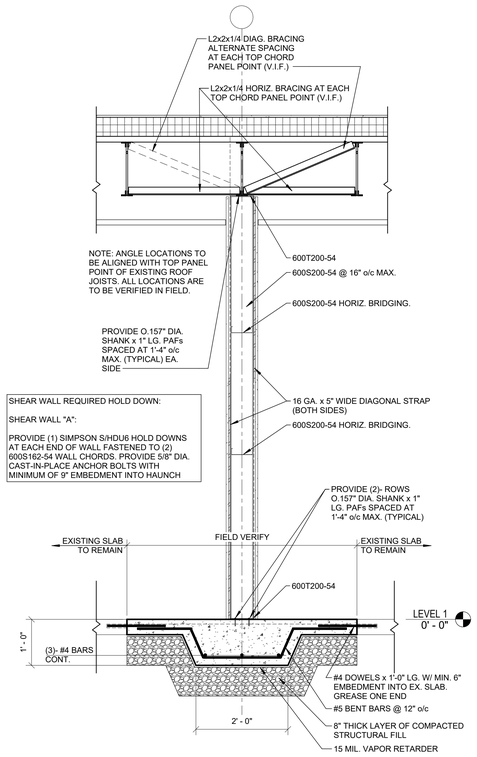
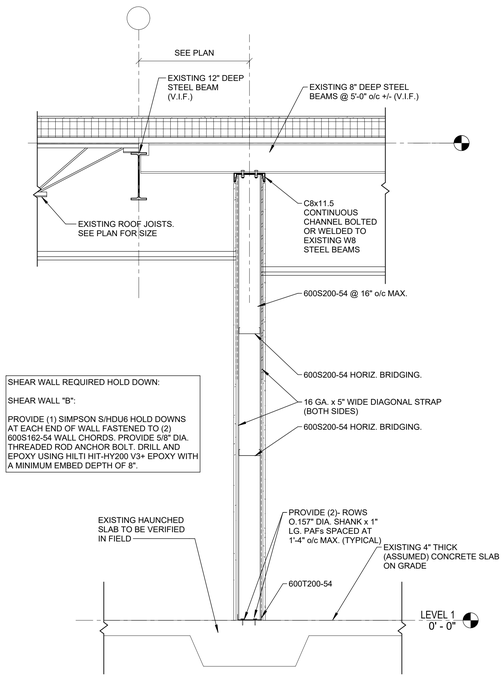
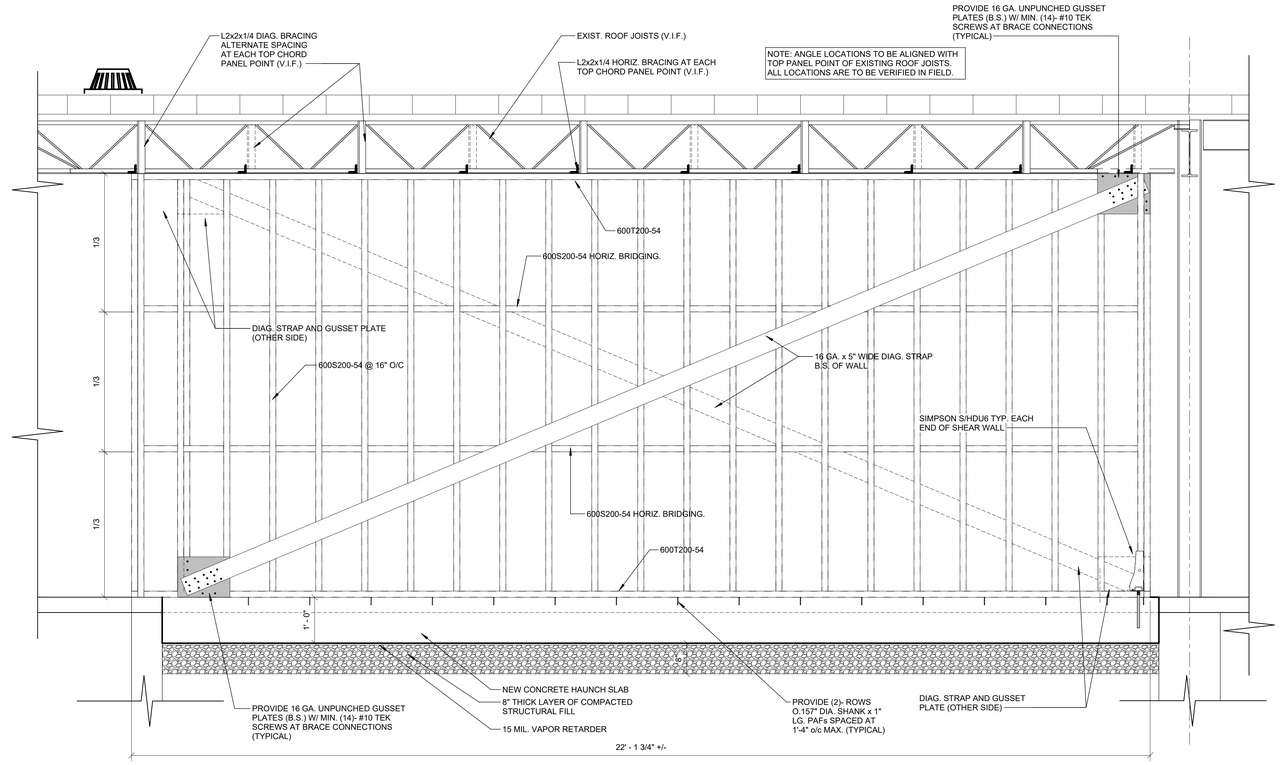


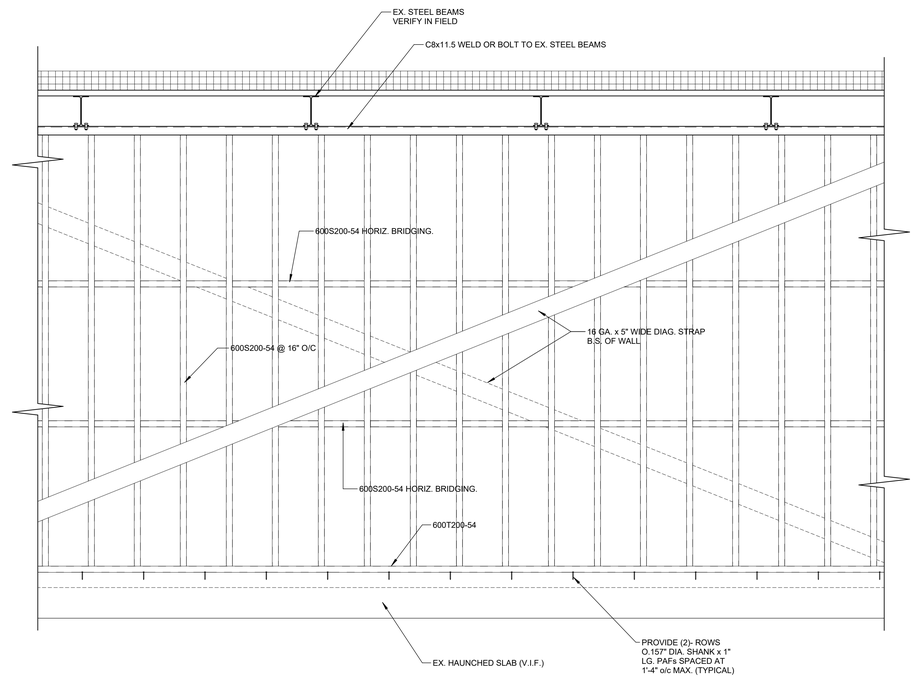
1 SECTION AT SHEAR WALL A
3/4" = 1'-0"



2 SECTION AT SHEAR WALL B
3/4" = 1'-0"



3 SHEAR WALL "A" ELEVATION
3/4" = 1'-0"



4 SHEAR WALL "B" ELEVATION
3/4" = 1'-0"

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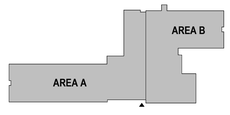

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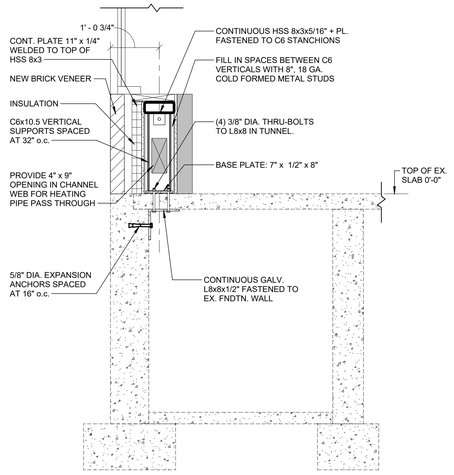
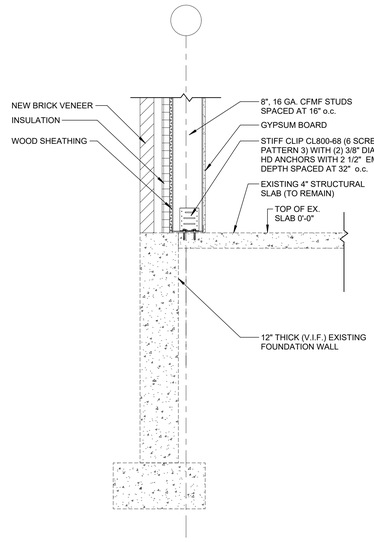
SHEAR WALL DETAILS

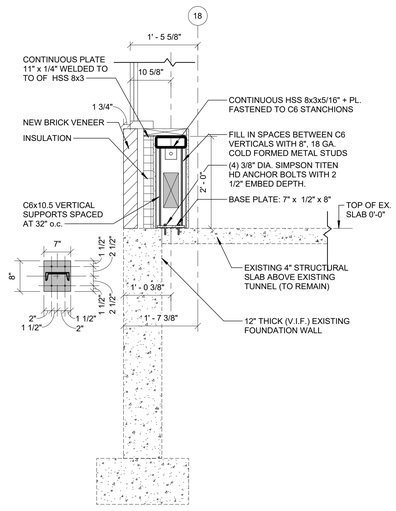
S2.6



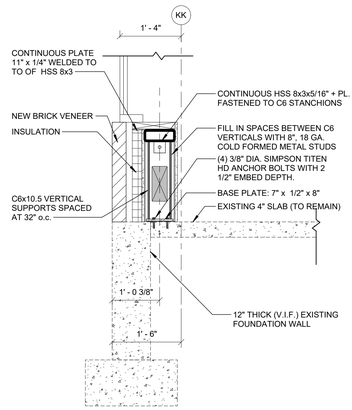
F1 SILL SUPPORT DETAIL F1
3/4" = 1'-0"



F2 SILL SUPPORT DETAIL F2
3/4" = 1'-0"



F3 SILL SUPPORT DETAIL F3
3/4" = 1'-0"



F4 SILL SUPPORT DETAIL F4
3/4" = 1'-0"

F5 SILL SUPPORT DETAIL F5
3/4" = 1'-0"

F6 FOUNDATION SECTION AT COL. LINE 6
3/4" = 1'-0"

F7 SECTION AT SUMP PIT & UNDERPINNING
3/4" = 1'-0"

F8 SECTION AT SUMP PIT
3/4" = 1'-0"

F9 SECTION AT NEW BASEMENT SLAB
3/4" = 1'-0"

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FOUNDATION SECTIONS

S3.0

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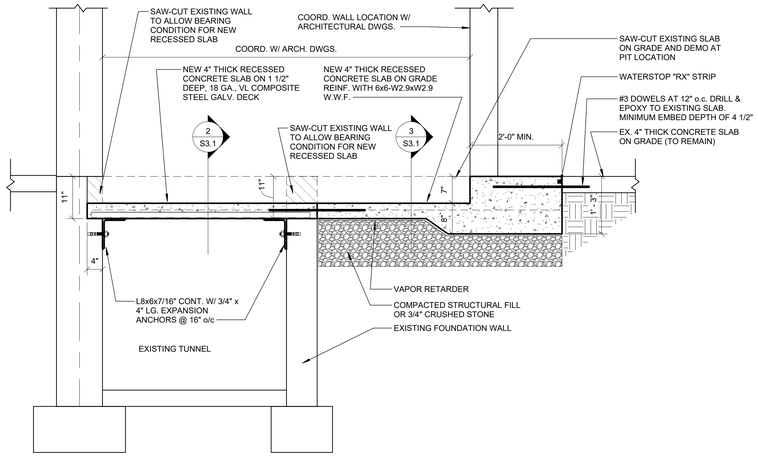
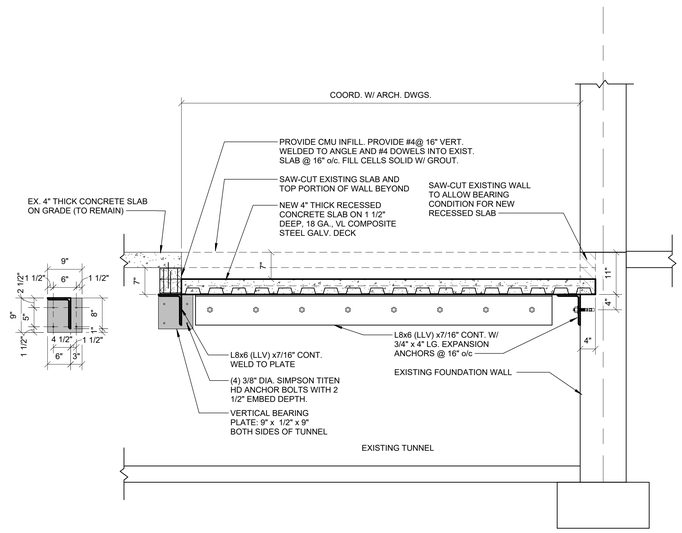


1 SECTION AT RECESSED SLAB
3/4" = 1'-0"

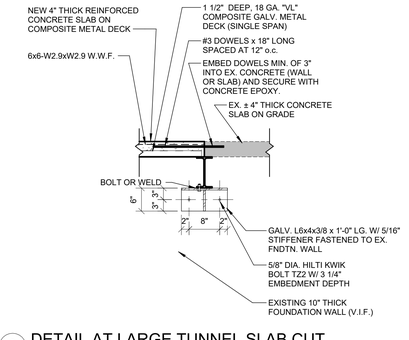


2 DETAIL AT SLAB RECESSION
3/4" = 1'-0"

3 DETAIL AT SLAB ON GRADE RECESSION
3/4" = 1'-0"

4 TYPICAL TUNNEL SLAB PATCH DETAIL
3/4" = 1'-0"

5 SECTION AT LARGE TUNNEL SLAB CUT
3/4" = 1'-0"



6 DETAIL AT LARGE TUNNEL SLAB CUT
3/4" = 1'-0"

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FOUNDATION SECTIONS

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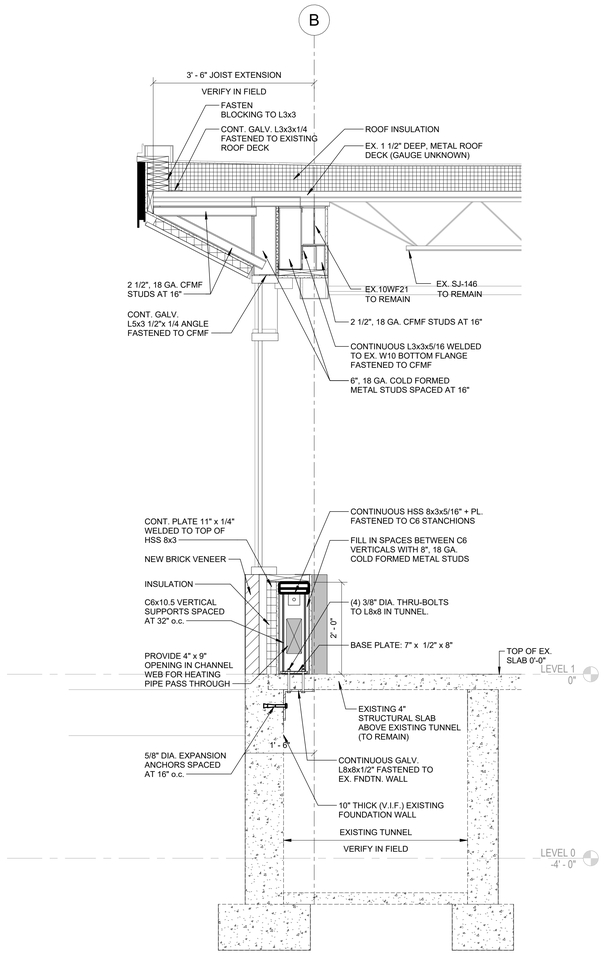
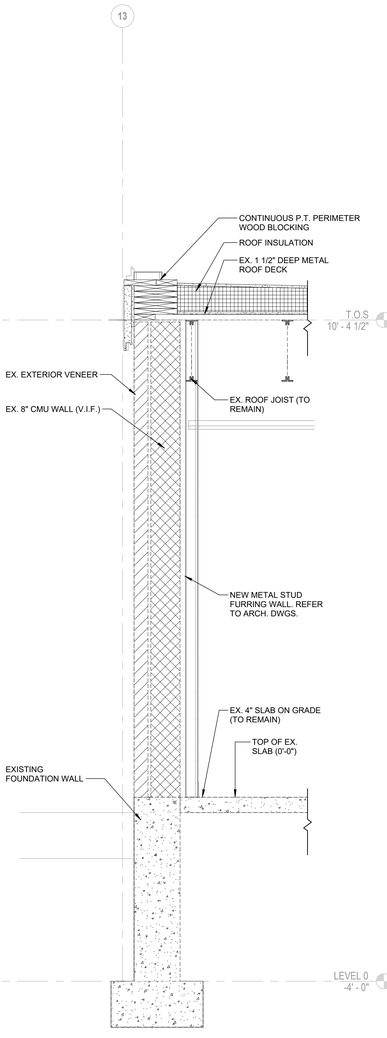
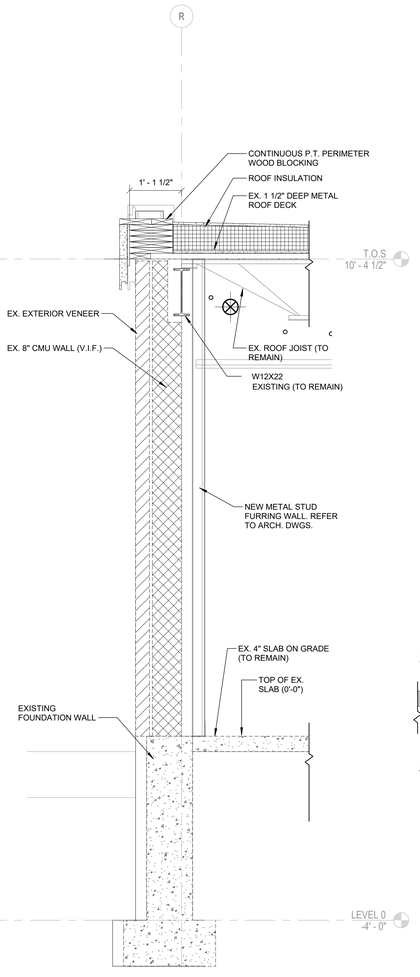


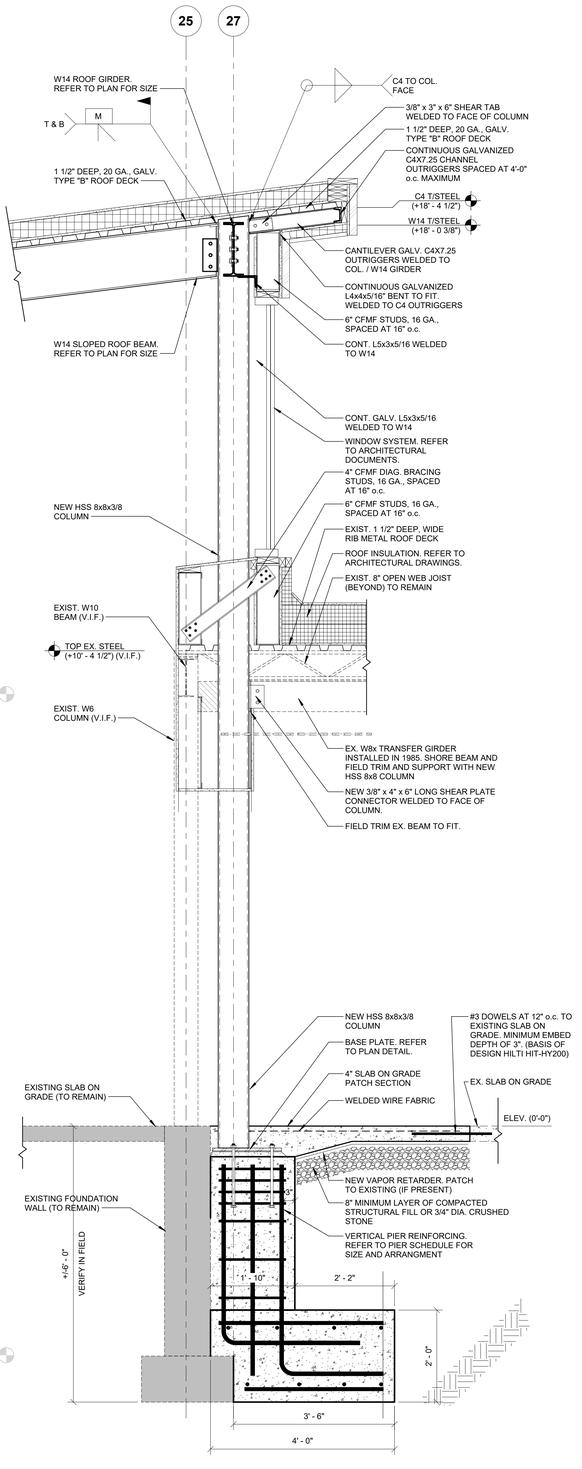
W1 S4.0 WALL SECTION W1 (1956 CLASSROOM)
3/4" = 1'-0"



W2 S4.0 WALL SECTION W2
3/4" = 1'-0"



W3 S4.0 WALL SECTION W3
3/4" = 1'-0"



W4 S4.0 WALL SECTION W4
3/4" = 1'-0"

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STATE OF CONNECTICUT CHRISTOPHER J. MARTIN REGISTERED PROFESSIONAL ENGINEER

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EDGEWOOD PRE-K ACADEMY
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BRISTOL, CT
State Project #: 017-0090 RNV
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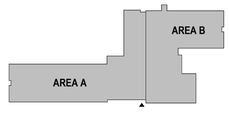

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WALL SECTIONS

S4.0

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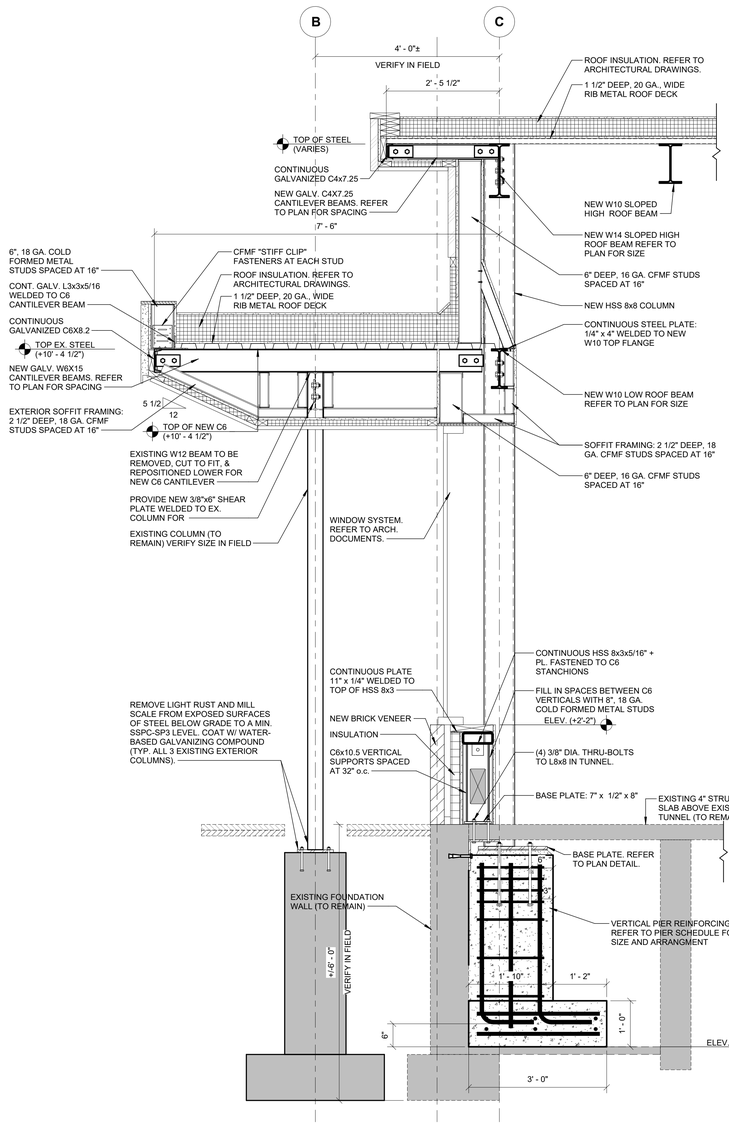
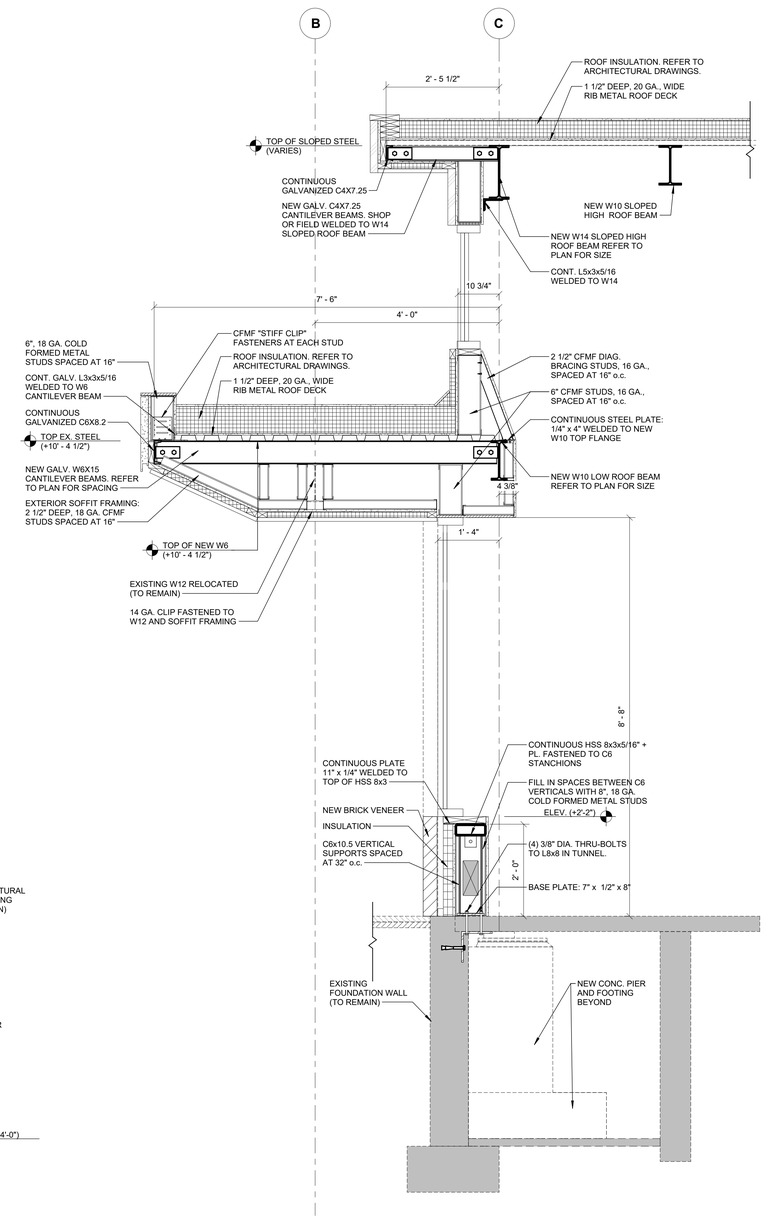
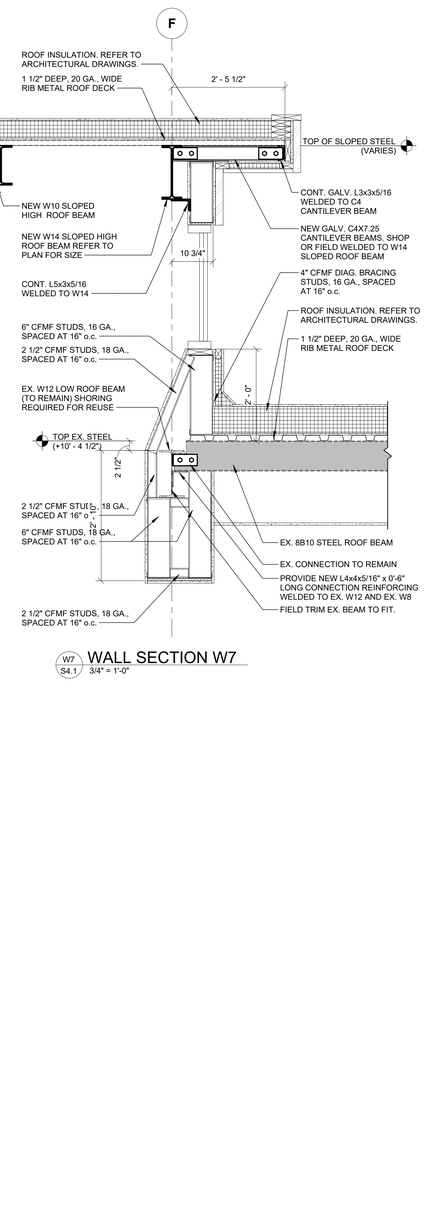


W5 S4.1 WALL SECTION W5
3/4" = 1'-0"



W6 S4.1 WALL SECTION W6
3/4" = 1'-0"



W7 S4.1 WALL SECTION W7
3/4" = 1'-0"

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GM2

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

WALL SECTIONS

S4.1

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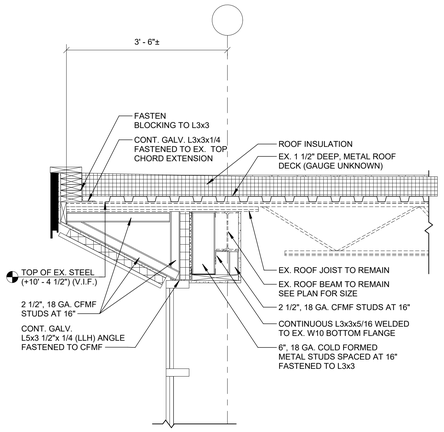
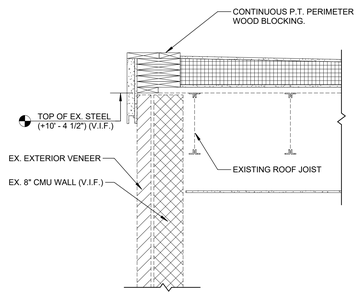


R1 ROOF EDGE DETAIL R1
3/4" = 1'-0"



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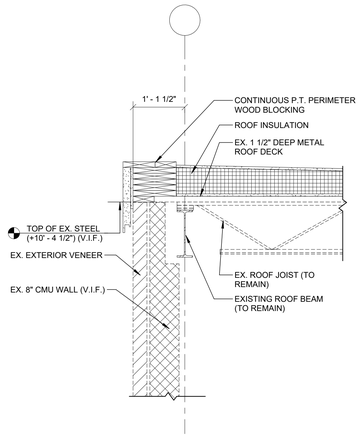

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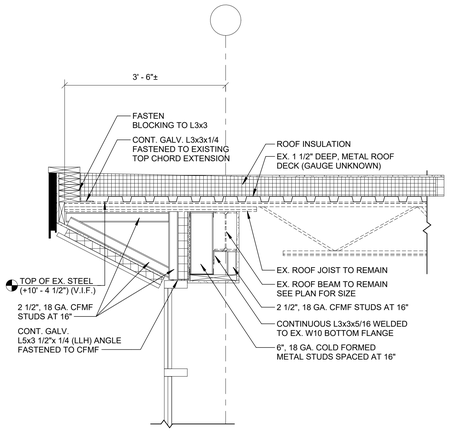

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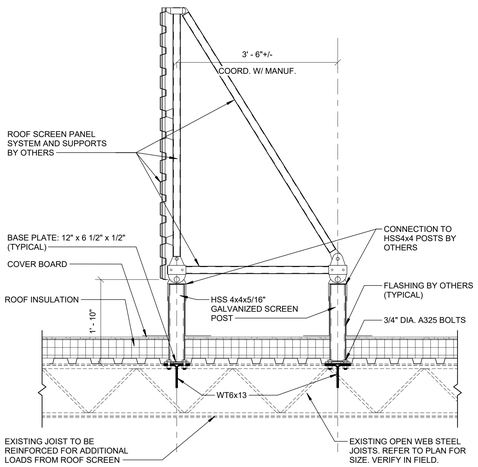

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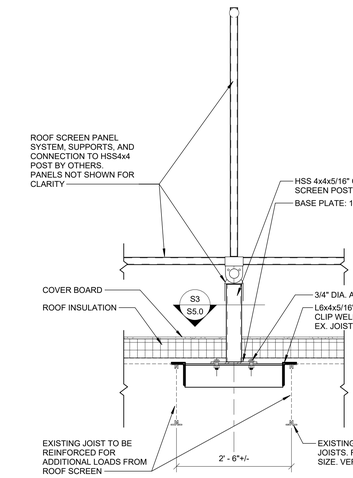

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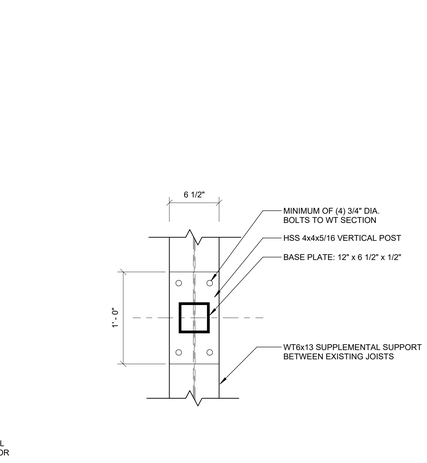

R7 ROOF EDGE DETAIL R7
3/4" = 1'-0"

R8 ROOF EDGE DETAIL R8
3/4" = 1'-0"

ADD-ALTERNATE No. 1
S1 ROOF SCREEN DETAIL S1
3/4" = 1'-0"

ADD-ALTERNATE No. 1
S2 ROOF SCREEN DETAIL S2
3/4" = 1'-0"

ADD-ALTERNATE No. 1
S3 ROOF SCREEN DETAIL S3
1 1/2" = 1'-0"

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STATE OF CONNECTICUT
CHRISTOPHER J. MARTIN
LICENSED PROFESSIONAL ENGINEER

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF SECTIONS

S5.0

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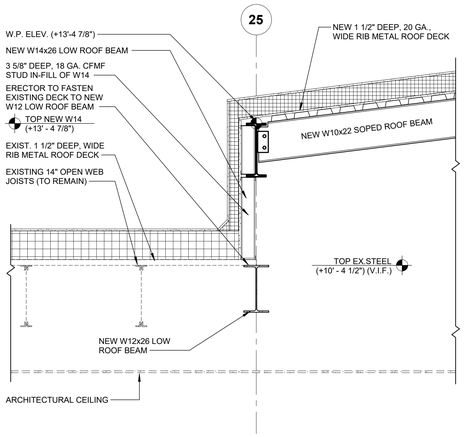

R9 S5.1 ROOF EDGE DETAIL R9
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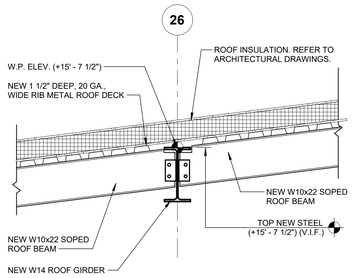

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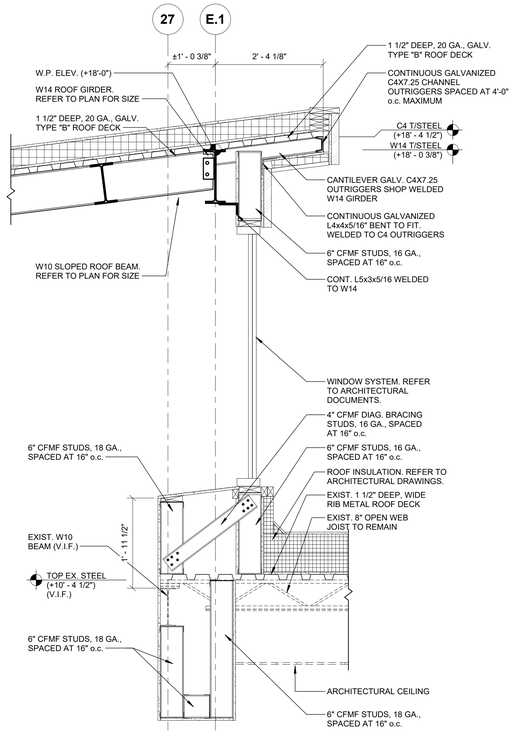

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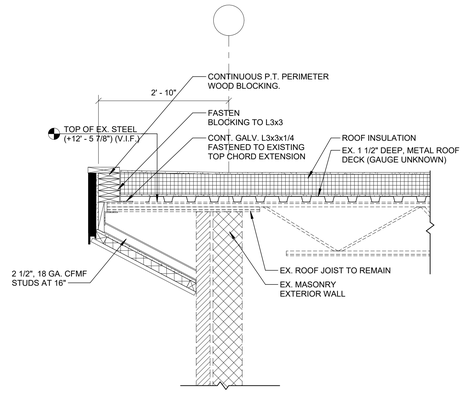
3/4" = 1'-0"



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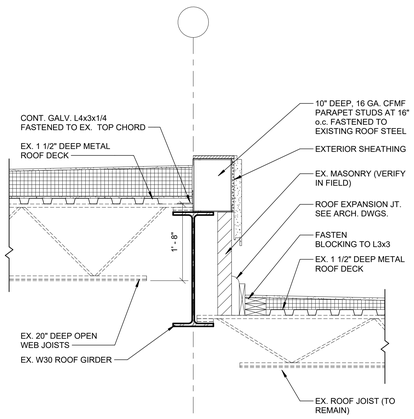
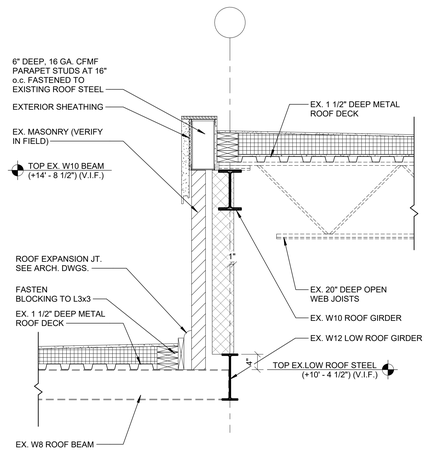


R13 S5.1 ROOF EDGE DETAIL R13
3/4" = 1'-0"



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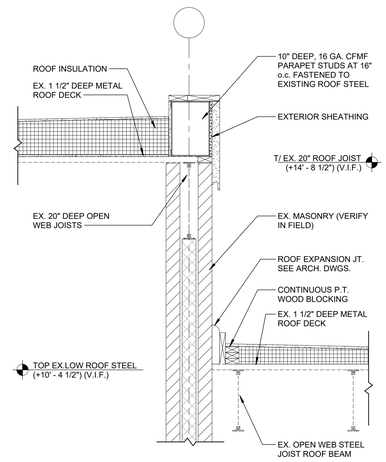
3/4" = 1'-0"



R15 S5.1 ROOF EDGE DETAIL R15
3/4" = 1'-0"

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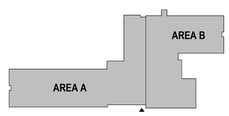

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF SECTIONS

S5.1

ABBREVIATIONS

AC	AIR COMPRESSOR
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AMB	AMBIENT
APROX	APPROXIMATE
AS	AIR SEPERATOR
ATC	AUTOMATIC TEMPERATURE CONTROL
AVG	AVERAGE
AWT	AVERAGE WATER TEMPERATURE
BAS	BUILDING AUTOMATION SYSTEM
BDD	BACK DRAFT DAMPER
BFW	BOILER FEED WATER
BHP	BRAKE HORSEPOWER
BMS	BULIDING MANAGEMENT SYSTEM
BTUH	BRITISH THERMAL UNITS PER HOUR
CC	COOLING COIL
CD	CONDENSATE DRAIN
CDR	CONDENSER WATER RETURN
CDS	CONDENSER WATER SUPPLY
CFM	CUBIC FEET PER MINUTE
CFP	CHEMICAL FEED PUMPS
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	CEILING
CO	CLEANOUT
CO2	CARBON DIOXIDE
COMP	COMPRESSOR
COND	CONDENSER
CONV	CONVECTOR
CP	CONDENSATE PUMP
CPU	CENTRAL PROCESSING UNIT
CT	COOLING TOWER
CU	CONDENSING UNIT
CU FT	CUBIC FEET
CUH	CABINET UNIT HEATER
CV	COEFFICIENT, VALVE FLOW
CV	CONSTANT VOLUME
D	DEPTH
DB	DRY BULB TEMPERATURE
dB	DECIBEL
DEG or °	DEGREE
DIA or Ø	DIAMETER
DN	DOWN
DP	DIFFERENTIAL PRESSURE
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EBB	ELECTRIC BASEBOARD RADIATION
EDR	EQUIVALENT DIRECT RADIATION
EF	EXHAUST FAN
EFF	EFFICIENCY
ELEC	ELECTRICAL
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR
EWB	ENTERING WET BULB TEMPERATURE
EWT	ENTERING WATER TEMPERATURE
F	FAHRENHEIT
FCU	FAN COIL UNIT
FD	FIRE DAMPER
FD	FLOOR DRAIN
FD/SB	FIRE DAMPER WITH INTEGRAL SECURITY BARS
FM	FLOW METER
FOB	FLAT ON BOTTOM
FOF	FUEL OIL FILL
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOT	FLAT ON TOP
FOV	FUEL OIL VENT
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FS	FLOOR SINK
FSD	FIRE/SMOKE DAMPER
FT	FOOT OR FEET
G	GAS
GA	GAUGE
GAL	GALLONS
GND	GROUND
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRAINS
H	HEIGHT
H/C	HEATING/COOLING
HC	HEATING COIL
HD	HEAD
HP	HEAT PUMP
HP	HORSEPOWER
HPC	HIGH PRESSURE CONDENSATE
HPG	HIGH PRESSURE GAS
HPS	HIGH PRESSURE STEAM
HR	HOUR(S)
HT	HEAT

ABBREVIATIONS

HTHW	HIGH TEMPERATURE HOT WATER
HTHWR	HIGH TEMPERATURE HOT WATER RETURN
HTHWS	HIGH TEMPERATURE HOT WATER SUPPLY
HTR	HEATER
HUM	HUMIDIFIER
HV	HEATING/VENTILATION UNIT
HW	HOT WATER
HWR	HOT WATER RETURN
HWRP	HOT WATER RETURN PUMP
HWRR	HOT WATER REVERSE RETURN
HWS	HOT WATER SUPPLY
HX	HEAT EXCHANGER
HZ	FREQUENCY (CYC, PER SEC.)
ID	INSIDE DIAMETER
IN	INCHES
IN WG	INCHES OF WATER, GAUGE (PRESS.)
IW	INDIRECT WASTE
KEF	KITCHEN EXHAUST FAN
KW	KILOWATT
L	LENGTH
LA	LABORATORY COMPRESSED AIR
LAT	LEAVING AIR TEMPERATURE
LAV	LAVATORY
LBS/HR	POUNDS PER HOUR
LF	LINEAR FEET
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
LV	LABORATORY VACUUM
LWT	LEAVING WATER TEMPERATURE
MA	MIXED AIR
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MBH	BTU PER HOUR (THOUSAND)
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MFR	MANUFACTURER
MH	METAL HALIDE
MIN	MINIMUM
MPC	MEDIUM PRESSURE CONDENSATE
MPS	MEDIUM PRESSURE STEAM
N2	NITROGREN
N2O	NITROUS OXIDE
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
N.T.S.	NOT TO SCALE
N/A	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NIC	NOT IN CONTRACT
OA	OUTSIDE AIR
PCD	PUMPED CONDENSATE DRAIN (COOLING)
PCR	PUMPED CONDENSATE RETURN (STEAM)
PD	PRESSURE DROP
PH or Ø	PHASE
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
RA	RETURN AIR
RG	REFRIGERANT GAS
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RHG	REFRIGERANT HOT GAS
RL	REFRIGERANT LIQUID
RM	ROOM
RP	RADIANT CEILING PANEL
RPD	REDUCED PRESSURE DEVICE
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
RTU	ROOFTOP UNIT
S&R	SUPPLY AND RETURN
SA	SUPPLY AIR
SCP	STEAM CONDENSATE PUMP
SD	SMOKE DAMPER
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
TSTAT	THERMOSTAT
TD	TEMPERATURE DIFFERENCE
TEMP	TEMPERATURE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UH	UNIT HEATER
V	VOLTAGE
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
VIF	VERIFY IN FIELD
VOL	VOLUME
W	WATT
W	WIDTH
WB	WET BULB TEMPERATURE
WP	WEATHERPROOF
WPD	WATER PRESSURE DROP
WWM	WELDED WIRE MESH

ACOUSTICAL GENERAL NOTES

1. PROVIDE A MINIMUM OF 10'-0" OF 1" THICK ACOUSTICAL DUCT LINER UPSTREAM AND DOWNSTREAM OF EACH GENERAL DEDICATED OUTDOOR AIR SYSTEM (DOAS-) AND ROOFTOP UNIT (RTU-).
2. PROVIDE A MINIMUM OF 5'-0" OF 1" THICK ACOUSTICAL DUCT LINER UPSTREAM AND DOWNSTREAM OF ALL HORIZONTAL DUCTED FAN COIL UNITS.
3. ALL SUPPLY, RETURN AND EXHAUST DIFFUSERS AND GRILLES SHALL BE SELECTED AT 25 NC OR LOWER.
4. LOCATE ALL VOLUME DAMPERS A MINIMUM OF 6'-0" TO 8'-0" FROM DIFFUSERS AND GRILLES. IF DUCT IS SHORTER THAN 6'-0", LOCATE IT AS FAR AWAY AS POSSIBLE.

HVAC SYMBOLS

	RECTANGULAR, FLAT OVAL OR ROUND AIR DUCT
	AIR DUCT WITH ACOUSTICAL LINING
	SUPPLY AIR DUCT UP
	SUPPLY AIR DUCT DOWN
	RETURN AIR DUCT UP
	RETURN AIR DUCT DOWN
	EXHAUST AIR DUCT UP
	EXHAUST AIR DUCT DOWN
	TURNING VANES
AD	ACCESS DOOR
	FLEXIBLE DUCT CONNECTION
	CEILING SUPPLY DIFFUSERS
	CEILING RETURN / EXHAUST GRILLE
	HARD DUCTED DIFFUSER OR GRILLE WITH FULL SIZE BOTTOM TAKE-OFF
	DIRECTION OF SUPPLY OR OUTDOOR AIRFLOW
	DIRECTION OF RETURN OR EXHAUST AIRFLOW
	DOOR UNDERCUT
BDD	BACK DRAFT DAMPER
VD	VOLUME DAMPER
FD	FIRE DAMPER
FD/SB	FIRE DAMPER WITH INTEGRAL SECURITY BARS
FS	FIRE/SMOKE DAMPER
SD	SMOKE DAMPER SYSTEM AND ASSOCIATED DEVICES PER SPECIFICATIONS AND MEP DETAILS
M	MOTORIZED DAMPER
H	HUMIDIFIER TUBE/PANEL
XXX	SUPPLY PIPING, REFER TO ABBREVIATION LIST FOR DESIGNATION (XXX)
XXX	RETURN PIPING, REFER TO ABBREVIATION LIST FOR DESIGNATION (XXX)
DS	DUCT SMOKE DETECTOR WITH REMOTE INDICATING LIGHT AND TEST SWITCH
SP	DUCT STATIC PRESSURE SENSOR
DP	DIFFERENTIAL PRESSURE SENSOR
VFD	VARIABLE FREQUENCY DRIVE
AFS	AIR FLOW STATION
SA	DUCT SOUND ATTENUATOR
T	ROOM THERMOSTAT
T	ROOM TEMPERATURE SENSOR
CO	CARBON MONOXIDE SENSOR
C	CARBON DIOXIDE SENSOR
H	HUMIDISTAT
S	MECHANICAL SWITCH
	FINNED TUBE RADIATION
FM	FLOW METER
RC	VRF REMOTE CONTROL

FITTINGS AND VALVES

	BACKFLOW PREVENTOR
	STRAINER OR STRAINER WITH BLOW-DOWN VALVE HOSE END, CAP AND CHAIN
	PIPE ELBOW UP OR PIPE TEE UP
	PIPE ELBOW DOWN
	PIPE TEE DOWN
	TAKEOFF FROM BOTTOM OF MAIN PIPE
	TAKEOFF FROM TOP OF MAIN PIPE
	IN-LINE EXPANSION COMPENSATOR
	PIPE ANCHOR
	COMPANION FLANGE
	PIPE CAP OR CAPPED END OF PIPE
	UNION
	PIPE GUIDES
	PUMP
	DIRECTION OF FLUID FLOW
	VALVE ON RISER
	VALVE ON DROP
	AIR VENT
	FLOW SENSOR
	2-WAY CONTROL VALVE
	3-WAY CONTROL VALVE
	BALL VALVE
	AUTO FLOW BALANCING VALVE
	SHUT-OFF VALVE (SEE SPECIFICATIONS FOR APPLICATION TYPE)
	BUTTERFLY VALVE
	CHECK VALVE
	GLOBE VALVE
	GATE VALVE
	PRESSURE REDUCING VALVE
	TRIPLE DUTY VALVE
	OS&Y VALVE
	DRAIN VALVE WITH HOSE END, CAP & CHAIN OR WALL HYDRANT / HOSE BIBB
M	MOTORIZED BUTTERFLY VALVE
	PRESSURE RELIEF SAFETY VALVE
A	AQUASTAT
T	TEMPERATURE SENSOR WITH SEPARABLE SOCKET IN IMMERSIBLE WELL
T	TEMPERATURE GAUGE WITH SEPARABLE SOCKET IN IMMERSIBLE WELL
T	THERMOMETER WITH SEPARABLE SOCKET IN IMMERSIBLE WELL
P	PRESSURE GAUGE
P	PRESSURE SENSOR WITH SYPHON (STEAM)
	FLEXIBLE CONNECTOR
	DUCT SIZING
20x12	RECTANGULAR DUCT
20/12	FLAT OVAL DUCT
20"ø	ROUND DUCT

HVAC GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN COMPLIANCE WITH CURRENT APPLICABLE CODES, ORDINANCES, THE REGULATORY AGENCIES HAVING JURISDICTION AND THE SPECIFICATIONS. THE SPECIFICATIONS MAY EXCEED THE REQUIREMENTS OF THE CODE, IN WHICH CASE, THE SPECIFICATION MUST BE FOLLOWED.
2. THE INTENT OF THESE DOCUMENTS IS FOR THE MEP TRADES TO FURNISH AND INSTALL COMPLETE MECHANICAL AND ELECTRICAL SYSTEMS. THE SPECIFIED HVAC SYSTEM SHALL BE COMPLETE IN ALL RESPECTS; OPERATIONAL, TESTED, ADJUSTED, APPROVED BY THE AUTHORITIES HAVING JURISDICTION AND READY FOR BENEFICIAL USE BY THE OWNER.
3. THE TRADES SHALL OBTAIN AND REVIEW ALL CONTRACT DOCUMENTS BEFORE SUBMITTING A BID. INFORMATION IS PROVIDED ON THE VARIOUS DRAWINGS, SCHEDULES, SPECIFICATIONS AND ALL OF THE VARIOUS DOCUMENTS IN THE BIDDING PACKAGE. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND FORM A TOTAL PROJECT DESIGN AND INFORMATION SOURCE FOR CONSTRUCTION PURPOSES.
4. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT. COORDINATE LOCATIONS OF EQUIPMENT WITH OTHER TRADES BEFORE AND DURING CONSTRUCTION. ANY MODIFICATION TO THE EQUIPMENT LAYOUT, REQUIRED FOR INSTALLATION, IS TO BE PERFORMED UNDER THE CONTRACT AGREEMENT, AT NO ADDITIONAL COST. REFER TOP DETAILS, SCHEDULES AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
5. THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH THE PROJECT DOCUMENTS OF ALL TRADES. THE DRAWINGS ARE DIAGRAMMATIC AND SHOW THE GENERAL ARRANGEMENT OF EQUIPMENT AND PIPING. THE CONTRACTOR SHALL COORDINATE THE EXACT LOCATION OF EQUIPMENT AND PIPING INSTALLATION WITH ALL THE TRADES BEFORE COMMENCING WORK.
6. EQUIPMENT SHALL BE INSTALLED IN ACCESSIBLE LOCATIONS, WHEN EQUIPMENT MUST BE LOCATED ABOVE AN INACCESSIBLE CEILING (GYP BOARD OR EQUIVALENT), OR BEHIND A WALL, AN APPROPRIATE ACCESS DOOR SHALL BE PROVIDED. IF AN ACCESS DOOR IS REQUIRED, IT SHALL BE OF A RATING APPROPRIATE FOR THE WALL/CEILING IN WHICH IT IS TO BE INSTALLED. THE CONTRACTOR SHALL COORDINATE LOCATIONS OF ACCESS PANELS FOR ALL VALVES AND DEVICES, REQUIRING ACCESS, WITH THE ARCHITECT, PRIOR TO INSTALLATION OF SUCH DEVICES OR OTHER APPURTENANCES.
7. WHERE A CONFLICT OCCURS BETWEEN THE DOCUMENTS, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT. CARRY AS PART OF THE BID THE LARGER QUANTITY AND/OR MORE EXPENSIVE ITEM(S).
8. THIS CONTRACT SHALL INCLUDE ALL THE NECESSARY PIPING, FITTINGS, TRANSITIONS ETC. AS REQUIRED TO INSTALL PIPING AND EQUIPMENT, AND TO AVOID ANY CONFLICTS WITH OTHER TRADES AND THE BUILDING STRUCTURE. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY ASSUMPTIONS, OMISSIONS OR ERRORS HE MAKES AS A RESULT OF HIS FAILURE TO COORDINATE WITH OTHER TRADES OR BECOME FULLY FAMILIAR WITH THE PROJECT DOCUMENTS OF ALL TRADES.
9. DO NOT INSTALL ANY PIPING OVER ELECTRICAL PANELS, TRANSFORMERS, SPECIAL EQUIPMENT, OR THROUGH ELECTRICAL ROOMS, DATA ROOMS, ELEVATOR MACHINE ROOM, STAIRWELL OR STAIRWELL WALLS THAT ARE NOT ASSOCIATED WITH OR SERVE THE RESPECTIVE ROOMS. COORDINATE THE LOCATION OF ELECTRICAL EQUIPMENT IN THE FIELD AND ADJUST AS NECESSARY.
10. INSTALL SMOKE DETECTORS IN BOTH SUPPLY & RETURN AIR DUCTS FOR AIR HANDLING EQUIPMENT 2,000 CFM AND GREATER.
11. PROVIDE SMOKE DAMPERS IN BOTH SUPPLY & RETURN AIR DUCTS FOR AIR HANDLING EQUIPMENT 15,000 CFM AND GREATER.
12. PROVIDE SMOKE DAMPERS AND SMOKE DETECTORS AT DUCT PENETRATIONS OF SMOKE-BARRIERS, AND AT ELEVATOR SHAFT VENTS PER CODE REQUIREMENTS.
13. PROVIDE FIRE DAMPERS AT DUCT PENETRATIONS OF FIRE-RATED CONSTRUCTION, INCLUDING WALLS, SHAFTS AND FLOOR PENETRATIONS. COORDINATE WITH ARCHITECTURAL DRAWINGS.
14. PROVIDE AN AUTOMATIC TEMPERATURE CONTROL SYSTEM COMPLETE IN ALL REGARDS. ALL ZONES, VAV'S AND SYSTEM SHALL BE THERMOSTATICALLY CONTROLLED. REVIEW THE PLANS AND SPECIFICATIONS OF ALL MEP TRADES FOR A COMPLETE SCOPE OF THE WORK.
15. PIPING SHALL BE SUPPORTED FROM STRUCTURE ABOVE. TO MAXIMIZE HEAD ROOM, INSTALL PIPING TIGHT TO BOTTOM OF BEAMS WHEN RUNNING PERPENDICULAR TO BEAM; INSTALL PIPING TIGHT TO FLOOR SLAB WHEN RUNNING PARALLEL TO BEAM; PROVIDE ALL NECESSARY FITTINGS AND TRANSITIONS.
16. PROVIDE THROTTLING VALVES AND SHUT-OFF VALVES AS INDICATED IN SPECIFICATIONS IN ADDITION TO THOSE INDICATED ON THE DOCUMENTS.
17. INSTALL ALL EQUIPMENT VALVES AS REQUIRED BY MANUFACTURERS INSTRUCTIONS AND RECOMMENDATIONS AND AS DETAILED.
18. PROVIDE AIR VENTS AT ALL HIGH POINTS AND DRAINS AT ALL LOW POINTS.
19. PROVIDE PRESSURE RELIEF DOORS FOR AIR SYSTEMS, PER THE SPECIFICATIONS.
20. PROVIDE MOTORIZED DAMPERS AT ALL PERMANENT OPENINGS (EXHAUST, SUPPLY, RELIEF, O.A. INTAKES, MAKE-UP AIR, SMOKE VENTS, ETC.) EXCEPT DRYER, KITCHEN, AND FUME EXHAUST AND PROVIDE A MEANS TO CONTROL THE DAMPER OPERATION.
21. ALL SUPPLY RECTANGULAR 90° ELBOWS SHALL HAVE TURNING VANES.
22. PROVIDE DUCT TAKE-OFF TYPES AND VOLUME DAMPERS PER THE SPECIFICATIONS AND DUCT TAKE-OFF DETAILS ON DRAWINGS. TAKE-OFFS SHOWN ON FLOOR PLANS DO NOT REPRESENT THE SPECIFIC TYPE OF TAKE-OFF REQUIRED; CONSULT THE DETAILS AND SPECIFICATIONS.
23. PROVIDE VOLUME DAMPERS ON ALL SUPPLY, EXHAUST, AND RETURN BRANCH DUCTS.
24. COORDINATE AND VERIFY LOCATIONS OF ALL ITEMS REQUIRING ACCESS WITH ARCHITECT IN FIELD., INCLUDING VALVES, VOLUME DAMPERS, FIRE DAMPERS, ETC.
25. ALL EQUIPMENT LOCATED ON THE ROOF THAT REQUIRES SERVICING SHALL BE LOCATED A MINIMUM 10'-0" FROM EDGE OF THE ROOF.
26. ALL EXPOSED DUCTWORK SHALL BE FLAT, OVAL, OR ROUND. COORDINATE WITH ARCHITECT'S CEILING PLANS AND IDENTIFY ON DUCTWORK SHOP DRAWINGS.
27. ALL DUCTWORK AND PIPING CROSSING SEISMIC JOINTS SHALL ACCOMMODATE DIFFERENTIAL MOTION. REFER TO DETAILS AND SPECIFICATIONS FOR MORE INFORMATION. SEE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR LOCATIONS.
28. MOUNT THERMOSTATS/TEMPERATURE SENSORS 48" AFF UNLESS OTHERWISE NOTED; COORDINATE WITH ARCHITECT. INCLUDE INSULATED PAD FOR ANY THERMOSTATS/TEMPERATURE SENSORS LOCATED ON AN OUTSIDE WALL.
29. ALL MOTORIZED DAMPERS SHALL BE WIRED BY ATC CONTRACTOR, COORDINATE VOLTAGE REQUIREMENTS WITH EQUIPMENT.
30. ALL TOILETS & BATHROOMS SHALL HAVE 3/4" UNDERCUT DOORS.
31. ALL LOUVERS ARE SELECTED AND SCHEDULED BY ARCHITECT. LOUVER TAGS ARE SHOWN FOR COORDINATION ONLY.
32. SEISMICALLY SUPPORT THE EQUIPMENT AS REQUIRED BY CODE, THE AUTHORITY HAVING JURISDICTION, AND/OR AS SPECIFIED. SUBMIT ENGINEERED INSTALLATION DETAILS PER THE SPECIFICATIONS. THE CONTRACTOR'S SEISMIC ENGINEER SHALL REVIEW THE INSTALLATION AND PROVIDE A DETAILED REPORT FOR THE RECORD.
33. PROVIDE PIPE EXPANSION COMPENSATION FOR THE VARIOUS PIPING SYSTEMS. SUBMIT ENGINEERED DETAILS FOR APPROVAL AND VERIFY INSTALLATION IS IN ACCORDANCE WITH THE CODE. THE CONTRACTOR'S CONSULTING ENGINEER SHALL REVIEW THE INSTALLATION AND PROVIDE A REPORT OF THE FINDINGS.

GENERAL LINETYPES

	THICK, DARK LINES INDICATE NEW OR RELOCATED ITEMS
	THIN, LIGHT LINES INDICATE EXISTING ITEMS TO REMAIN IN PLACE AND BE REUSED
	ON DEMOLITION DRAWINGS, THICK, DASHED LINES INDICATE EXISTING ITEMS TO BE REMOVED
	POINT OF NEW TO EXISTING CONNECTION, INCLUDING TRANSITIONS

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STATE OF CONNECTICUT
MICHAEL J. SCHUTT
No. 21720
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MECHANICAL GENERAL INFORMATION

M0.1

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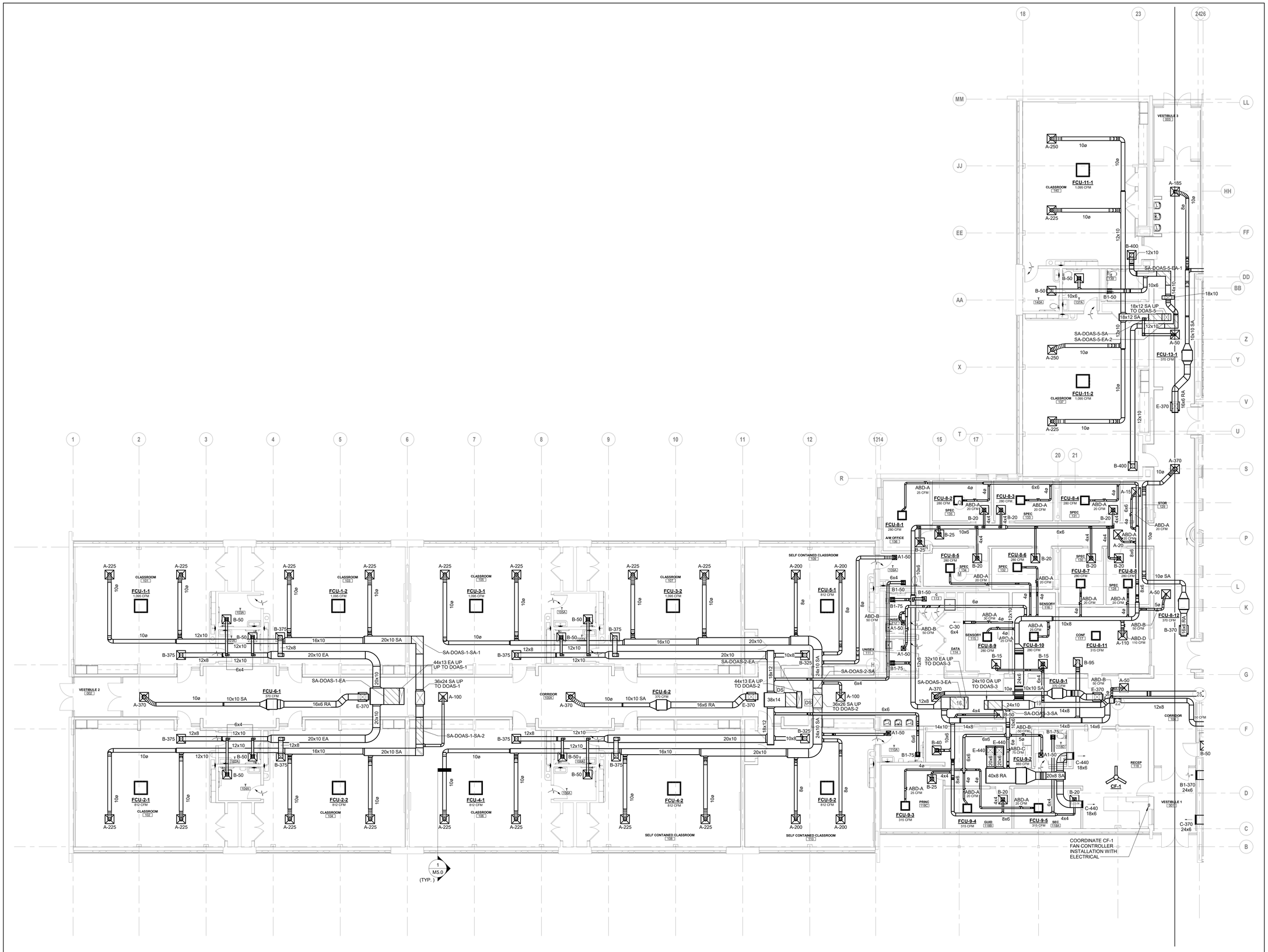

1 FIRST FLOOR MECHANICAL DUCT PLAN - AREA A
1/8" = 1'-0"

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RENOVATIONS TO:

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AREA A

CONSTRUCTION DOCUMENTS
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FIRST FLOOR MECHANICAL DUCT PLAN - AREA A

M1.1A

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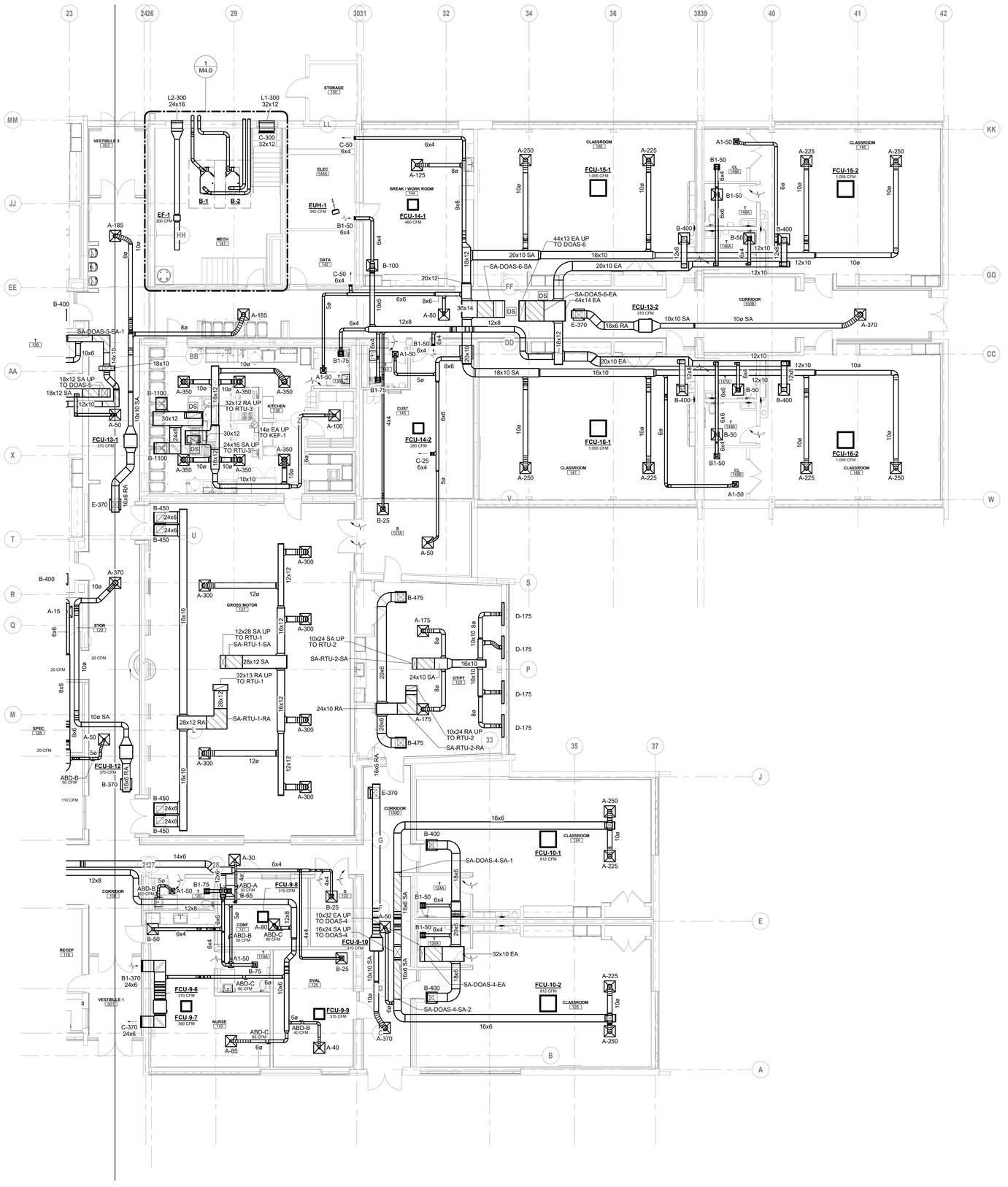

1 FIRST FLOOR MECHANICAL DUCT PLAN - AREA B
1/8" = 1'-0"

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

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BRISTOL, CT 06010

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AREA B

CONSTRUCTION DOCUMENTS
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FIRST FLOOR MECHANICAL DUCT PLAN - AREA B

M1.1B

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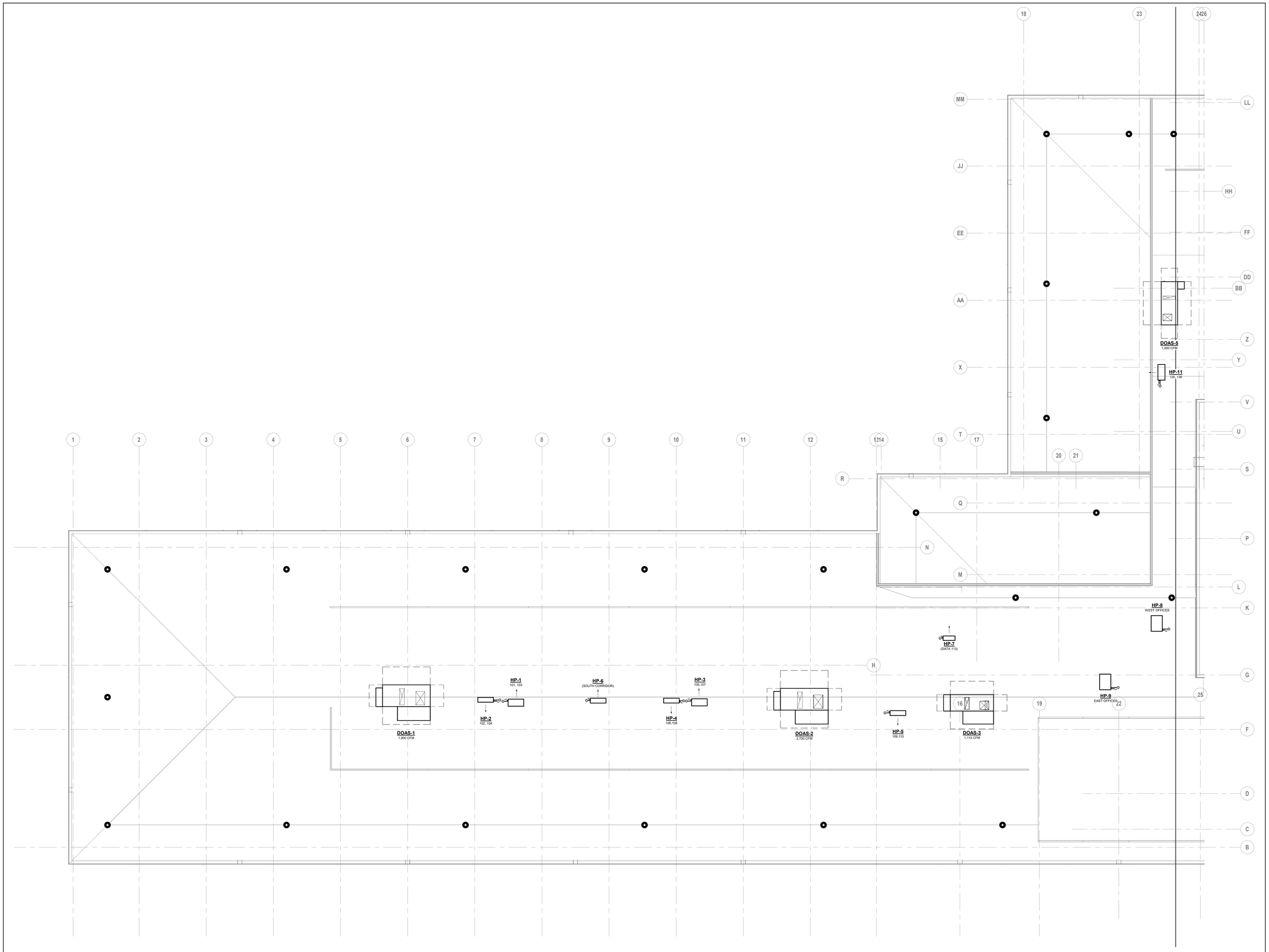

1 MECHANICAL ROOF PLAN - AREA A
1/8" = 1'-0"

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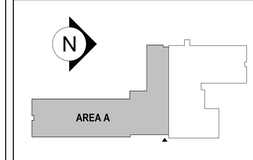

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MECHANICAL ROOF PLAN - AREA A

M1.2A

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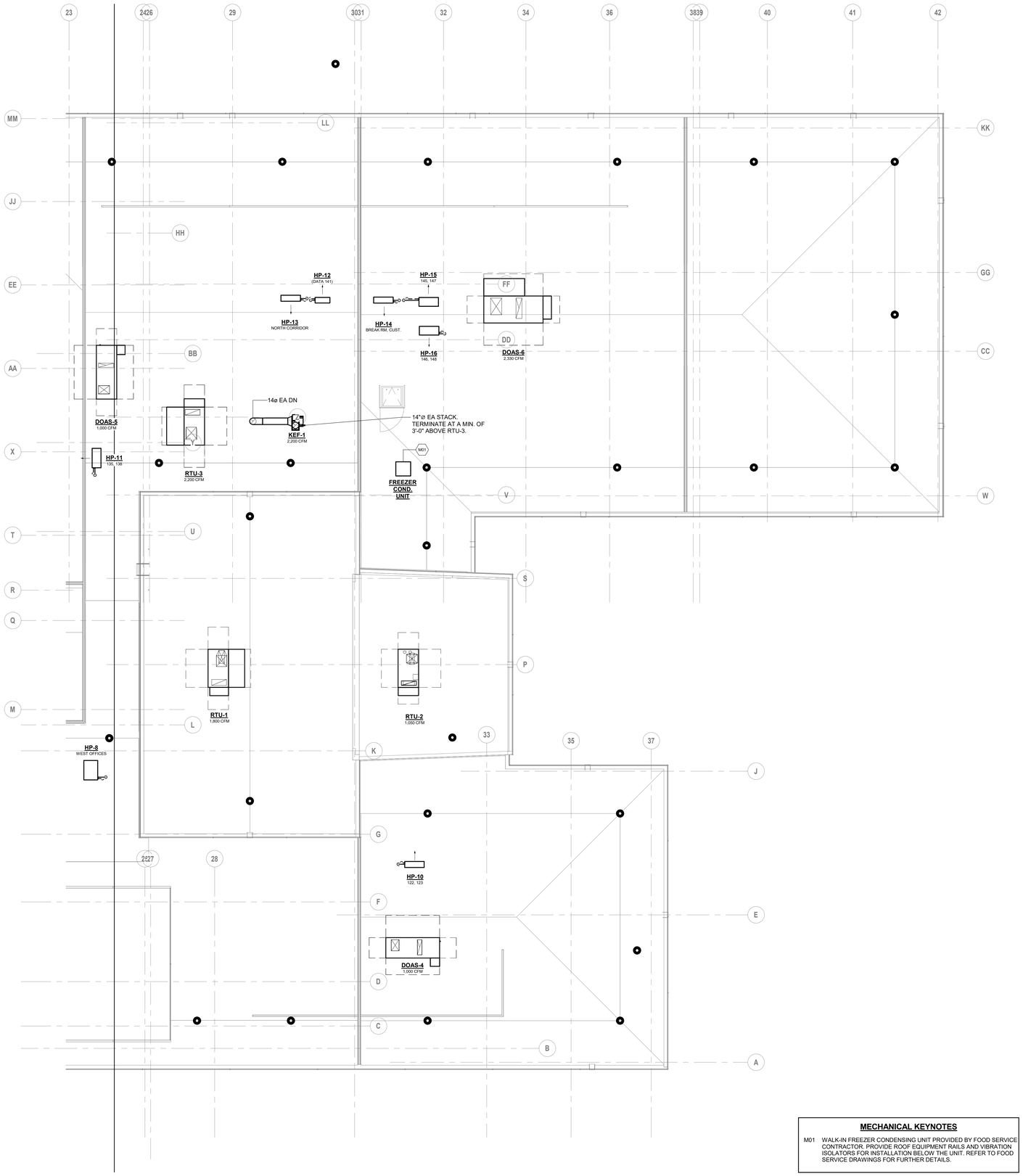

1 MECHANICAL ROOF PLAN - AREA B
1/8" = 1'-0"

MECHANICAL KEYNOTES

M01 WALK-IN FREEZER CONDENSING UNIT PROVIDED BY FOOD SERVICE CONTRACTOR. PROVIDE ROOF EQUIPMENT RAILS AND VIBRATION ISOLATORS FOR INSTALLATION BELOW THE UNIT. REFER TO FOOD SERVICE DRAWINGS FOR FURTHER DETAILS.

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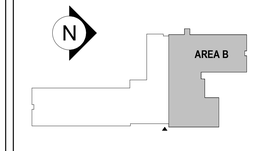

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MECHANICAL ROOF PLAN - AREA B

M1.2B

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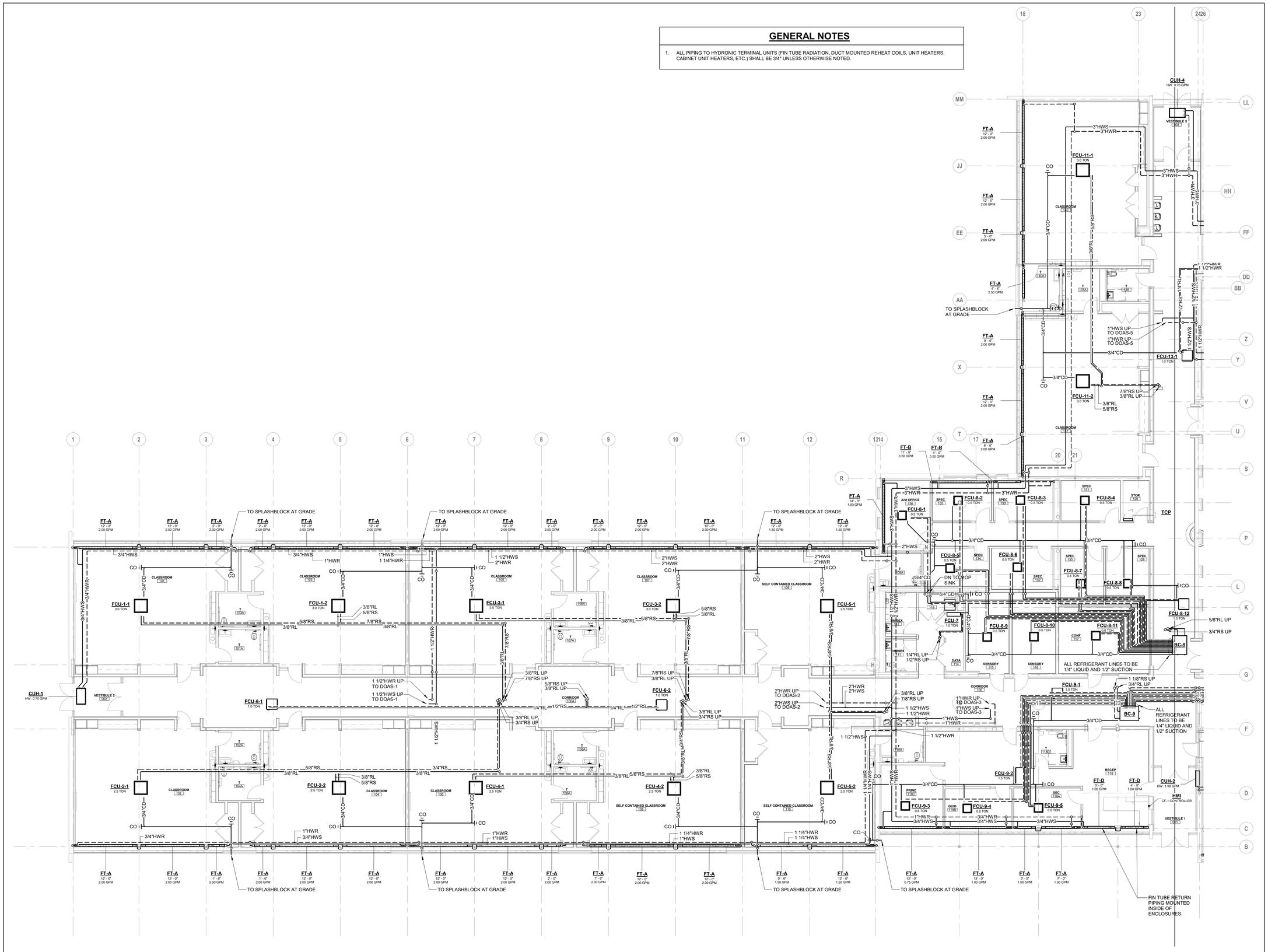
GENERAL NOTES

1. ALL PIPING TO HYDRONIC TERMINAL UNITS (FIN TUBE RADIATION, DUCT MOUNTED REHEAT COILS, UNIT HEATERS, CABINET UNIT HEATERS, ETC.) SHALL BE 3/4" UNLESS OTHERWISE NOTED.



1 FIRST FLOOR MECHANICAL PIPE PLAN - AREA A
1/8" = 1'-0"

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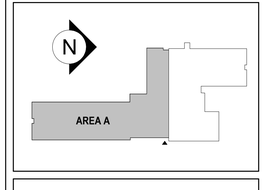

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR MECHANICAL PIPE PLAN - AREA A

M2.1A

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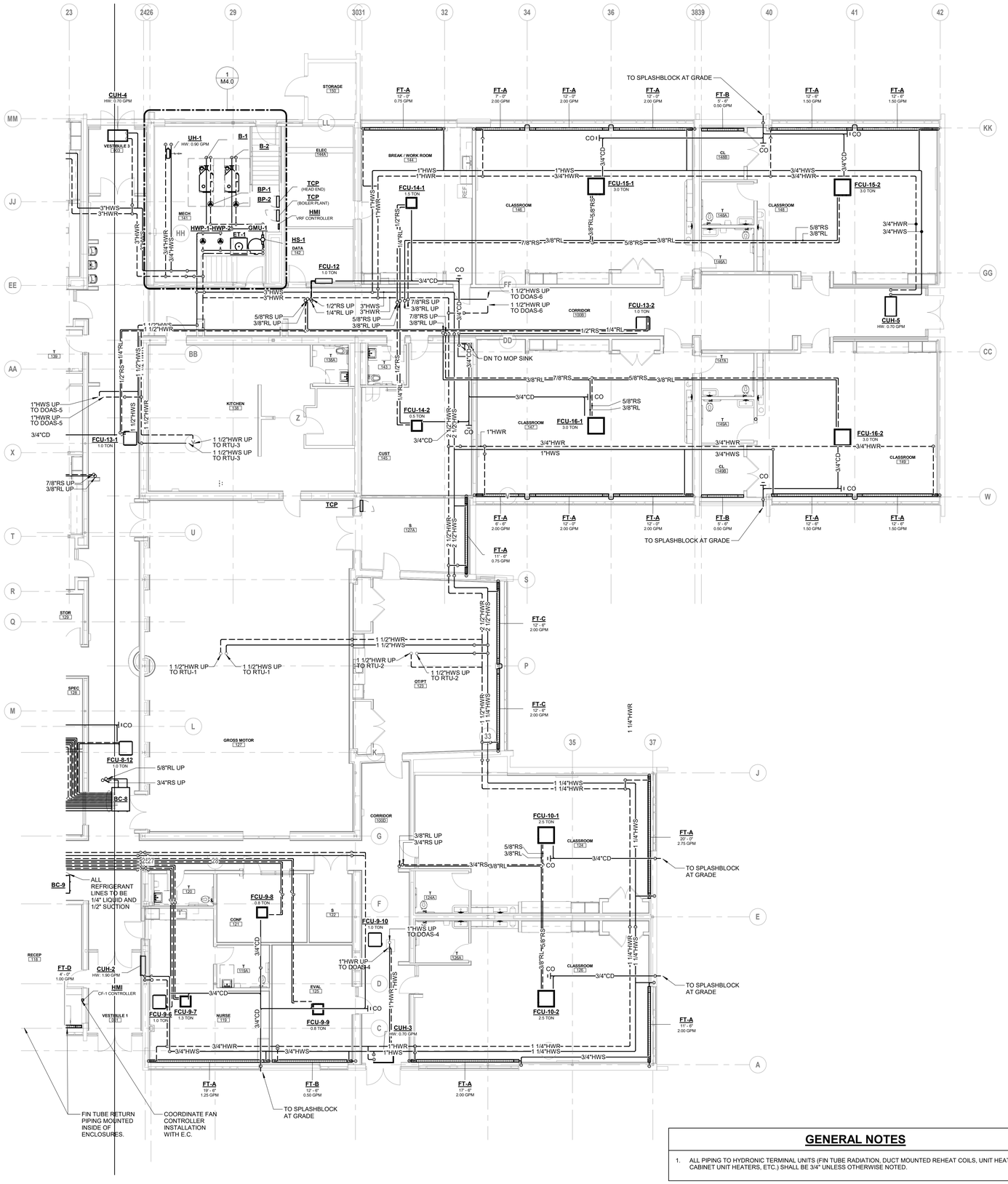

1 FIRST FLOOR MECHANICAL PIPE PLAN - AREA B
1/8" = 1'-0"

GENERAL NOTES

1. ALL PIPING TO HYDRONIC TERMINAL UNITS (FIN TUBE RADIATION, DUCT MOUNTED REHEAT COILS, UNIT HEATERS, CABINET UNIT HEATERS, ETC.) SHALL BE 3/4" UNLESS OTHERWISE NOTED.

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STATE OF CONNECTICUT
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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR MECHANICAL PIPE PLAN - AREA B

M2.1B

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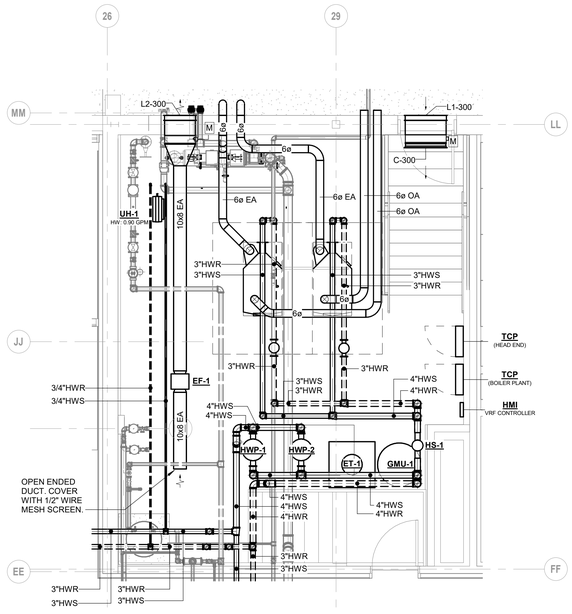
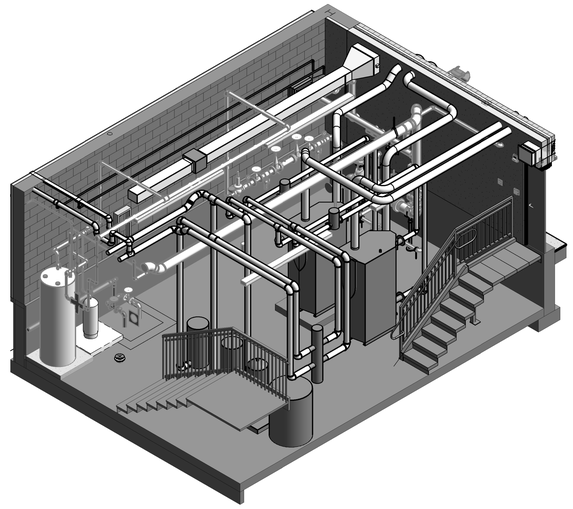
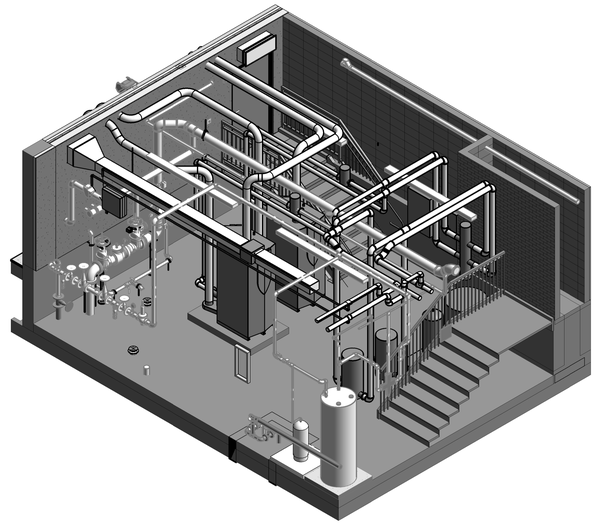


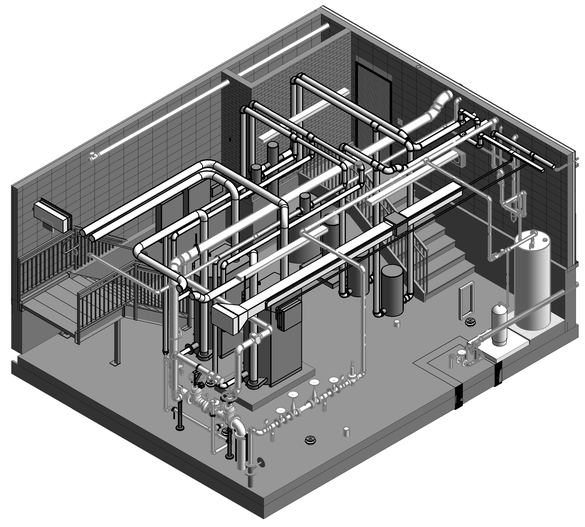
1 MECH ROOM ENLARGED PLAN
1/4" = 1'-0"



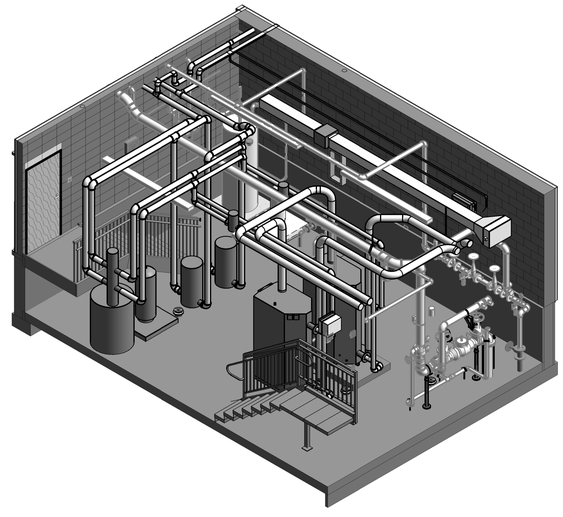
2 MECHANICAL ROOM ORTHOGRAPHIC VIEW 1



3 MECHANICAL ROOM ORTHOGRAPHIC VIEW 2



4 MECHANICAL ROOM ORTHOGRAPHIC VIEW 3



5 MECHANICAL ROOM ORTHOGRAPHIC VIEW 4

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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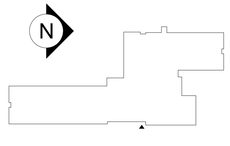
Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MECHANICAL
ENLARGED PLANS

M4.0

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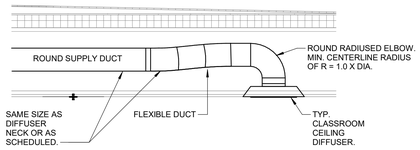
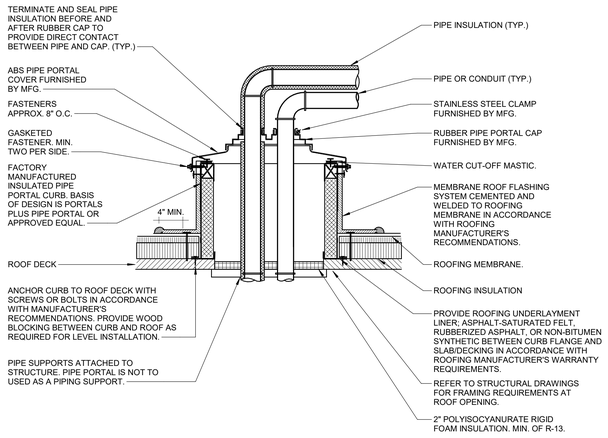
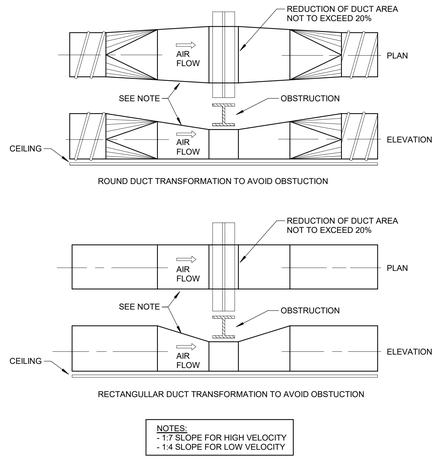


1 TYPICAL CLASSROOM CEILING DIFFUSER DETAIL.
NOT TO SCALE



2 ROOF PIPING PENETRATION DETAIL
3/4" = 1'-0"



3 DUCT OBSTRUCTION TRANSFORMATION DETAILS
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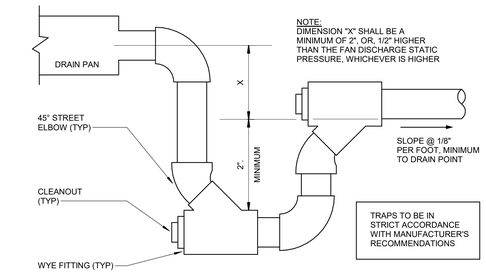

4 COOLING COIL CONDENSATE TRAP DETAIL FOR DRAW-THRU COILS
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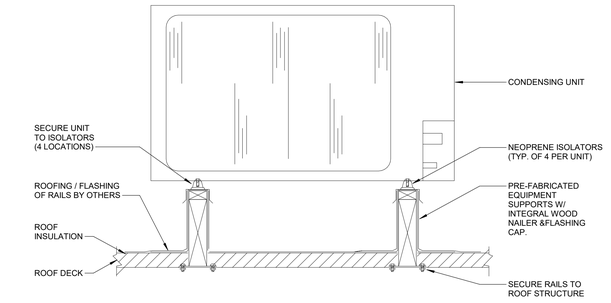

5 TYPICAL ROOF MOUNTED CONDENSING UNIT DETAIL
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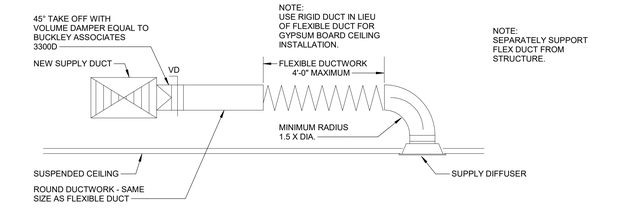
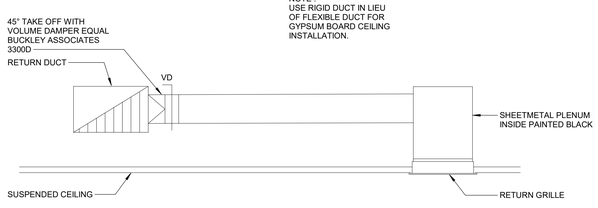
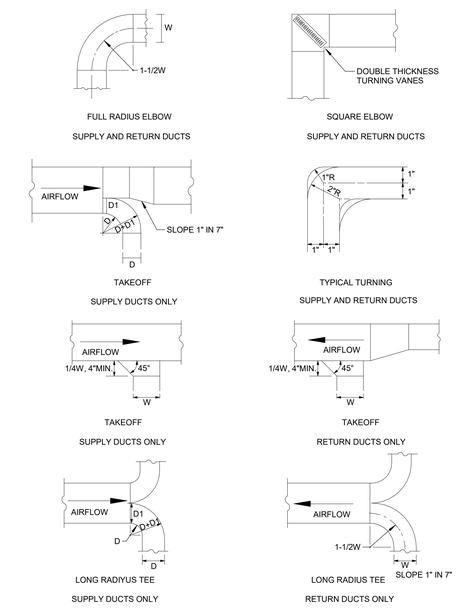


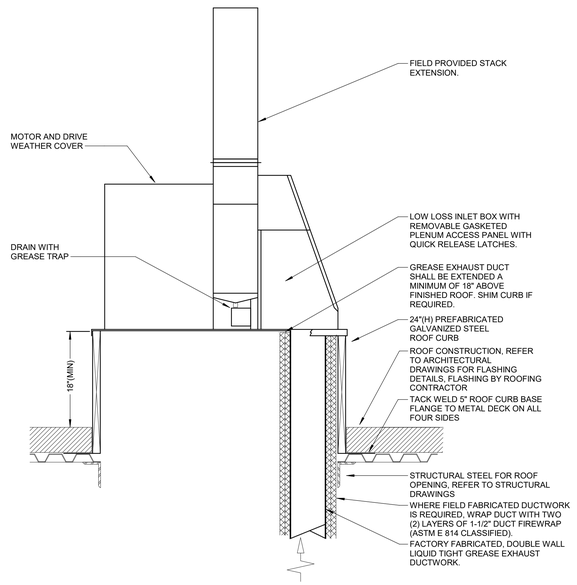
6 TYPICAL CEILING MOUNTED SUPPLY DIFFUSER DETAIL
NOT TO SCALE



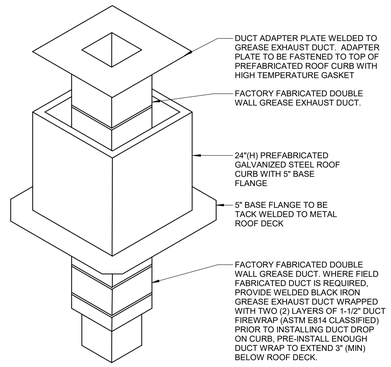
7 TYPICAL CEILING MOUNTED RETURN AIR GRILL DETAIL
NOT TO SCALE



8 TYPICAL DUCT DETAILS
NOT TO SCALE



9 UTILITY SET KITCHEN HOOD EXHAUST FAN DETAIL
NTS



NOTE: FOR KITCHEN HOOD EXHAUST FAN INSTALLATIONS, FANS SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS AND AS REQUIRED BY IMC-2021 AND NFPA 96.

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MECHANICAL DETAILS

M5.0

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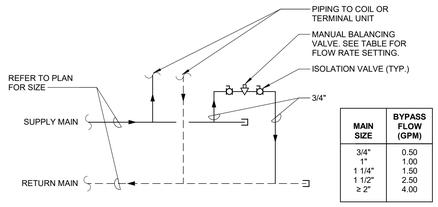
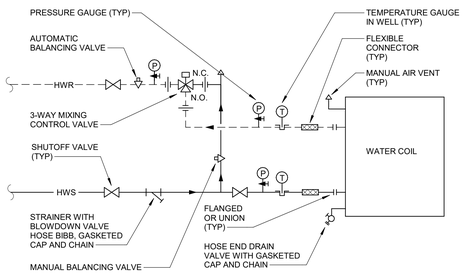


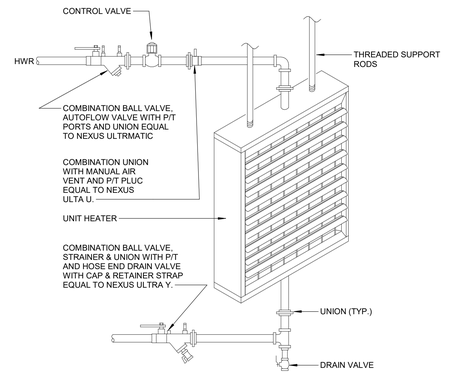
MAIN SIZE	BYPASS FLOW (GPM)
3/4"	0.50
1"	1.00
1 1/4"	1.50
1 1/2"	2.50
≥ 2"	4.00

1 END OF MAIN MIN. FLOW BYPASS LINE PIPING DETAIL
NTS

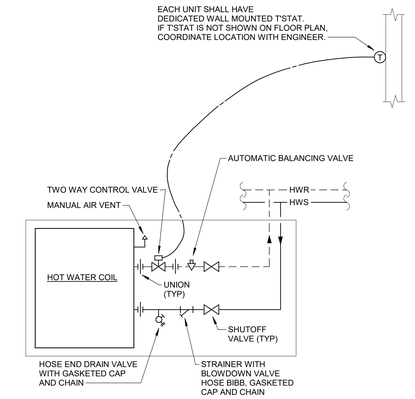


NOTE:
PROVIDE UNIONS IN LIEU OF FLANGES AT CONTROL VALVES AND COIL CONNECTIONS WHERE APPLICABLE.

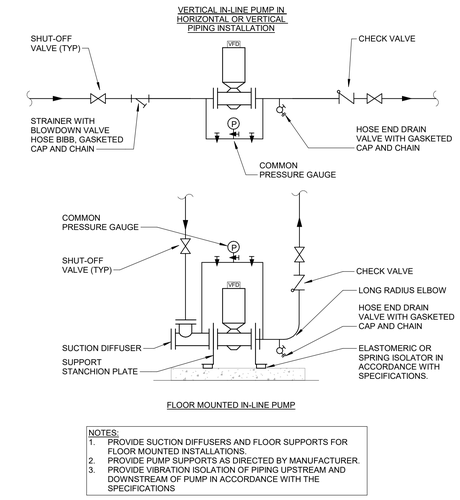
2 3-WAY COIL PIPING DETAIL
NTS



3 HORIZONTAL UNIT HEATER PIPING DETAIL
NOT TO SCALE



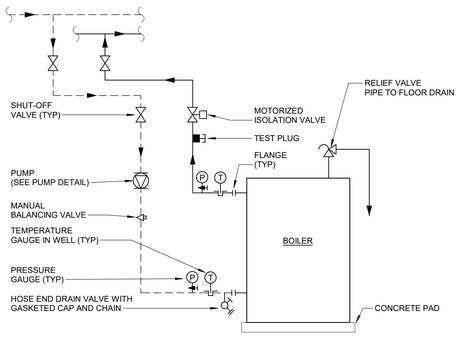
4 CABINET UNIT HEATER PIPING DETAIL
NOT TO SCALE



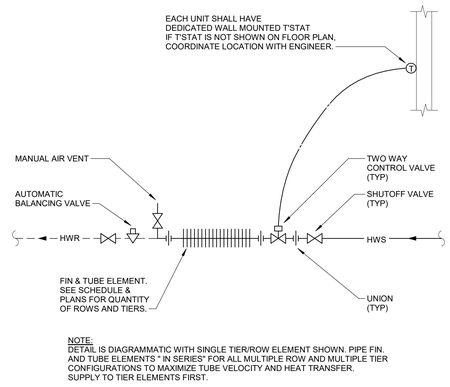
FLOOR MOUNTED IN-LINE PUMP

NOTES:
1. PROVIDE SUCTION DIFFUSERS AND FLOOR SUPPORTS FOR FLOOR MOUNTED INSTALLATIONS.
2. PROVIDE PUMP SUPPORTS AS DIRECTED BY MANUFACTURER.
3. PROVIDE VIBRATION ISOLATION OF PIPING UPSTREAM AND DOWNSTREAM OF PUMP IN ACCORDANCE WITH THE SPECIFICATIONS

5 VERTICAL IN-LINE PUMP DETAIL
NOT TO SCALE

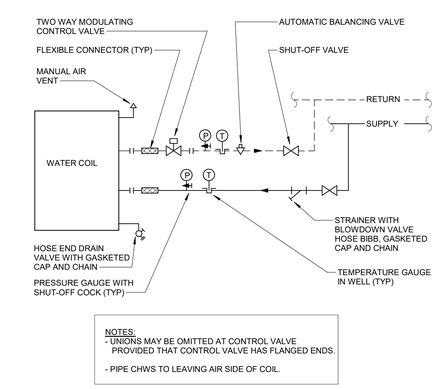


6 HYDRONIC BOILER PIPING DETAIL
NOT TO SCALE



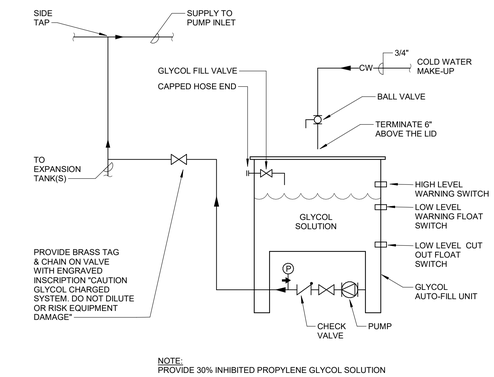
NOTE:
DETAIL IS DIAGRAMMATIC WITH SINGLE TIER/ROW ELEMENT SHOWN. PIPE FIN. AND TUBE ELEMENTS " IN SERIES" FOR ALL MULTIPLE ROW AND MULTIPLE TIER CONFIGURATIONS TO MAXIMIZE TUBE VELOCITY AND HEAT TRANSFER. SUPPLY TO TIER ELEMENTS FIRST.

7 HOT WATER RADIATION PIPING DETAIL
NOT TO SCALE



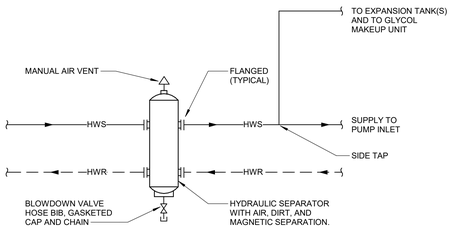
NOTES:
- UNIONS MAY BE OMITTED AT CONTROL VALVE PROVIDED THAT CONTROL VALVE HAS FLANGED ENDS.
- PIPE CHWS TO LEAVING AIR SIDE OF COIL.

8 AHU WATER COIL PIPING DETAIL
NOT TO SCALE

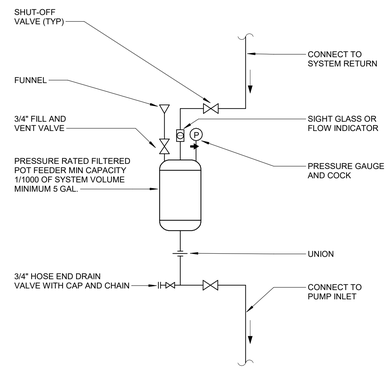


NOTE:
PROVIDE 30% INHIBITED PROPYLENE GLYCOL SOLUTION

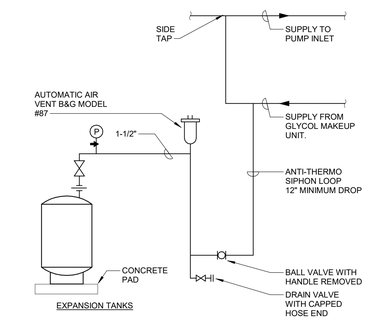
9 GLYCOL MAKEUP UNIT DETAIL
NOT TO SCALE



10 HYDRAULIC AIR & DIRT SEPARATOR DETAIL
NOT TO SCALE



11 CHEMICAL POT FEEDER DETAIL
NOT TO SCALE



12 EXPANSION TANK DETAIL
NOT TO SCALE

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

MECHANICAL DETAILS

M5.1

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GRILLES, DIFFUSERS AND REGISTERS SCHEDULE

(BASED ON PRICE)

SEE ARCHITECTURAL DRAWINGS FOR CEILING TYPES AND CONSTRUCTION, AND COLOR SELECTION. SIZE AND CFM INDICATED ON MECHANICAL DRAWINGS.

A - MODEL SMD DIRECTIONAL DIFFUSER, LOUVERED FACE, 4-WAY THROW (UNLESS SHOWN OTHERWISE), 24X24 MODULE SIZE, LAY-IN BORDER, STEEL CONSTRUCTION. PROVIDE MODEL SR ADAPTER.

A1 - MODEL SMD DIRECTIONAL DIFFUSER, LOUVERED FACE, 4-WAY THROW (UNLESS SHOWN OTHERWISE), 12X12 MODULE SIZE, SURFACE MOUNT, STEEL CONSTRUCTION. PROVIDE MODEL SR ADAPTER.

B - MODEL 530 RETURN GRILLE, 45° FIXED LOUVERS, 3/4" BLADE SPACING, 24X24 MODULE SIZE, LAY-IN BORDER, STEEL CONSTRUCTION.

B1 - MODEL 530 RETURN GRILLE, 45° FIXED LOUVERS, 3/4" BLADE SPACING PARALLEL TO LONG DIMENSION, FLAT SURFACE MOUNT BORDER, STEEL CONSTRUCTION. FACE SIZE TO BE A MINIMUM OF 12X12 UNLESS SIZE IS NOTED ON PLANS.

C - MODEL 520 LOUVERED SUPPLY REGISTER, DOUBLE DEFLECTION CORE, 3/4" BLADE SPACING PARALLEL TO LONG DIMENSION, SURFACE MOUNT FRAME, STEEL CONSTRUCTION.

D - PRICE MODEL SDS LINEAR SLOT DIFFUSER, 1" SLOTS, SURFACE MOUNT FRAME, ALUMINUM CONSTRUCTION, BLACK PATTERN CONTROLLERS. PROVIDE INSULATED PLENUM.

E - MODEL 530FF FILTER RETURN GRILLE, 45° FIXED LOUVERS, 3/4" BLADE SPACING, 24X24 MODULE SIZE, LAY-IN BORDER, STEEL CONSTRUCTION. PROVIDE WITH 1" MERV 8 HIGH CAPACITY FILTER AND PLENUM BOX.

CEILING SUPPLY DIFFUSER TYPE A & A1		CEILING RETURN/EXHAUST DIFFUSER TYPE B & B1		FLEIXBLE DUCT SIZE	
CFM	NECK SIZE	CFM	NECK SIZE	CFM	NECK SIZE
0 - 100	6 X 6	0 - 100	6 X 6	0 - 45	4"Ø
101 - 225	9 X 9	101 - 150	8 X 8	50 - 70	5"Ø
226 - 400	12 X 12	151 - 250	10 X 10	71 - 100	6"Ø
401 - 625	15 X 15	251 - 350	12 X 12	101 - 150	8"Ø
626 - 900	18 X 18	351 - 500	14 X 14	151 - 225	9"Ø
		501 - 650	16 X 16	226 - 275	10"Ø
		651 - 800	18 X 18	276 - 400	12"Ø
		801 - 1200	22 X 22	401 - 500	14Ø
				501 - 700	16"Ø
				701 - 900	18"Ø
				901 - 1100	20"Ø
				1101 - 1300	22"Ø

AUTOMATIC BALANCING DAMPER SCHEDULE

TAG	MANUFACTURER	MODEL	SIZE	CFM RANGE	PRESSURE RANGE (IN. W.G.)
ABD-A	AMERICAN ALDES	CAR3-L	4"	0 TO 35	0.12 TO 1.2
ABD-B	AMERICAN ALDES	CAR3-L	5"	36 TO 70	0.12 TO 1.2
ABD-C	AMERICAN ALDES	CAR3-L	6"	71 TO 95	0.12 TO 1.2
ABD-D	AMERICAN ALDES	CAR3-L	8"	96 TO 150	0.12 TO 1.2

DEDICATED OUTDOOR AIR SYSTEM UNIT SCHEDULE

				OUTSIDE AIRFLOW		FANS									SOUND POWER LEVEL (db) DISCHARGE/INLET/RADIATED								EFFICIENCY				ELECTRICAL DATA				
						SUPPLY					EXHAUST																					
TAG	MANUFACTURER	MODEL	SERVES	MAX (CFM)	MIN (CFM)	FLOW (CFM)	ESP (in-wg)	QTY	POWER (hp)	RPM	FLOW (CFM)	ESP (in-wg)	QTY	POWER (hp)	RPM	63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	SEER2	EER	IEER	COP	MCA	MOCP	VOLT	PH	REMARKS
DOAS-1	AAON	RNA-009	CLASSROOMS 101-104	1900	1900	1900	1	1	1.51	1769	1700	1	1	0.95	1371	85	83	86	82	74	71	68	62		12.74	16.56	6.21	57 A	70 A	208 V	3	ALL
DOAS-2	AAON	RNA-013	CLASSROOMS 105-110	2700	2700	2700	1	1	3.11	2031	2350	1	1	1.56	1580	88	86	89	86	78	75	72	67		11.07	14.6	5.06	92 A	110 A	208 V	3	ALL
DOAS-3	AAON	RNA-006	OFFICES	1115	1115	1115	1.2	1	1	2049	1055	1.2	1	0.52	1724	80	80	82	78	71	67	64	59		12.74	14.5	5.69	51 A	70 A	208 V	3	ALL
DOAS-4	AAON	RQA-004	CLASSROOMS 123, 125	1000	1000	1000	1	1	1.08	1857	900	1	1	0.53	1654	85	83	86	79	71	69	67	61	14.5	14		5.9	39 A	50 A	208 V	3	ALL
DOAS-5	AAON	RQA-004	CLASSROOMS 137, 140	1000	1000	1000	1	1	1.08	1857	950	1	1	0.55	1676	85	83	86	79	72	69	67	61	14.5	14		5.87	39 A	50 A	208 V	3	ALL
DOAS-6	AAON	RNA-009	CLASSROOMS 146-149, BREAK RM, CUST.	2330	2330	2330	1	1	2.07	1974	2200	1	1	1.4	1529	87	85	88	85	77	74	71	66		12.74	16.56	6.7	62 A	70 A	208 V	3	ALL

ROOFTOP UNIT SCHEDULE

				OUTSIDE AIRFLOW		FANS										SOUND POWER LEVEL (db) DISCHARGE/INLET/RADIATED								EFFICIENCY				ELECTRICAL DATA				
						SUPPLY					RETURN																					
TAG	MANUFACTURER	MODEL	TYPE	MAX (CFM)	MIN (CFM)	FLOW (CFM)	ESP (in-wg)	QTY	POWER (hp)	RPM	FLOW (CFM)	ESP (in-wg)	QTY	POWER (hp)	RPM	63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	SEER2	EER	IEER	COP	MCA	MOCP	VOLT	PH	REMARKS
RTU-1	AAON	RNA-006-A	GROSS MOTOR	1800	750	1800	0.75	1	1.32	1691	1750	0.75	1	0.56	861	82	84	82	80	72	70	67	61		12.74	14.5	2.03	50 A	70 A	208 V	3	ALL
RTU-2	AAON	RQA-002-A	OT/PT	1050	250	1050	0.75	1	0.83	1688	950	0.75	1	0.4	1472	84	82	85	77	70	67	64	58	16.4	8.9		1.79	27 A	35 A	208 V	3	ALL
RTU-3	AAON	RNA-010-A	KITCHEN	2200	0	2200	1	1	1.67	1779	2200	0.6				84	82	85	81	72	70	68	63		11.86	14.9		52 A	80 A	208 V	3	ALL

PRIMARY AIRSIDE ENERGY RECOVERY

	SUMMER DESIGN ENERGY RECOVERY										WINTER DESIGN ENERGY RECOVERY									
	OUTSIDE AIR				EFF				EXHAUST AIR				OUTSIDE AIR				EFF				EXHAUST AIR	
TAG	EAT(db) (°F)	EAT(wb) (°F)	LAT(db) (°F)	LAT(wb) (°F)	SENSIBLE	LATENT	TOTAL	CAPACITY (Btu/h)	EAT(db) (°F)	EAT(wb) (°F)	LAT(db) (°F)	LAT(wb) (°F)	EAT(db) (°F)	EAT(wb) (°F)	LAT(db) (°F)	LAT(wb) (°F)	SENSIBLE	LATENT	TOTAL	CAPACITY (Btu/h)	EAT(db) (°F)	EAT(wb) (°F)	LAT(db) (°F)	LAT(wb) (°F)
DOAS-1	95	75	81.4	67.2	76.3	65.9	70.3	56,500	75	62	90.2	71.6	0	-1	45.8	41.4	76.3	66.1	73.2	134,200	70	58	19.6	19.6
DOAS-2	95	75	83.3	68.3	68.2	58.6	62.5	69,500	75	62	88.5	70.6	0	-1	39.7	36.9	68.2	58.9	65.3	165,900	70	58	24.9	24.9
DOAS-3	95	75	80.7	66.4	78.4	73.3	75.5	37,400	75	62	90.7	72.2	0	-1	48	43.8	78.4	74	77.1	87,100	70	58	17	16.9
DOAS-4	95	75	84.2	69.1	60.9	47.7	53.1	22,500	75	62	87	69.5	0	-1	36.3	33.3	60.9	46.4	56.5	54,600	70	58	30.2	30.1
DOAS-5	95	75	84.2	69	58.5	47.4	51.8	22,900	75	62	86.5	69.3	0	-1	36.4	33.6	58.5	46	54.7	55,300	70	58	31.2	31.2
DOAS-6	95	75	81.8	67.5	70.4	60.3	64.5	67,100	75	62	88.9	70.9	0	-1	44.5	40.4	70.4	60.6	67.4	160,200	70	58	23.6	23.5

HEAT PUMP COIL

	COOLING COIL						HEATING			HOT GAS REHEAT		
	CAPACITY (Btu/h)	AIRSIDE										
TAG	TOTAL	SENSIBLE	EAT(db) (°F)	EAT(wb) (°F)	LAT(db) (°F)	LAT(wb) (°F)	CAPACITY (Btu/h)	EAT(db) (°F)	LAT(db) (°F)	CAPACITY (Btu/h)	EAT(db) (°F)	RELATIVE HUMIDITY (%)
DOAS-1	93,900	63,600	81.4	67.2	52	50.8	40,400	46 °F	65 °F	50,500	75	41.1
DOAS-2	152,600	99,700	83.3	68.3	51.4	49.8	65,200	40 °F	61 °F	75,700	75	39.1
DOAS-3	62,700	41,600	80.7	66.4	48.8	47.5	28,000	48 °F	70 °F	34,400	75	36.1
DOAS-4	48,500	33,100	84.2	69.1	56	54.1	20,000	36 °F	54 °F	23,300	75	46
DOAS-5	48,400	33,300	84.2	69	55.9	54	20,000	36 °F	54 °F	23,400	75	45.8
DOAS-6	97,900	70,600	81.8	67.5	55.7	54.2	42,200	45 °F	60 °F	53,500	75	46.5
RTU-1	72,300	54,700	83.3	67.9	56.4	55.2	28,500	41 °F	55 °F	38,600	75	48.4
RTU-2	28,000	25,800	79.8	65.4	59.1	57.4	12,400	53 °F	64 °F	20,400	75	52.2
RTU-3	126,600	86,100	95	75	59.5	58.2				40,000	75	54.2

HEATING WATER COIL

	AIRSIDE					WATERSIDE			
TAG	CAPACITY (Btu/h)	FLOW (CFM)	EAT(db) (°F)	LAT(db) (°F)	ROWS	FLOW (GPM)	EWT (°F)	LWT (°F)	PD (FT)
DOAS-1	127,700	1,900	64.5	125.9	4	16	140	123.1	5.7
DOAS-2	169,600	2,700	60.7	117.7	4	24	140	125.1	2.8
DOAS-3	38,700	1,115	69.7	101	4	6	140	126.4	0.8
DOAS-4	58,300	1,000	53.5	105.7	4	7	140	122.4	0.6
DOAS-5	58,200	1,000	53.7	105.8	4	7	140	122.4	0.6
DOAS-6	146,000	2,330	60.4	117.1	4	16	140	120.7	5.7
RTU-1	107,400	1,800	54.6	108.1	4	16	140	125.8	1.2
RTU-2	58,300	1,050	63.9	114.4	4	16	140	132.3	2.6
RTU-3	204,600	2,200	0	74.8	4	16	140	113	1.2

REMARKS:
1. HEATING COIL PERFORMANCE BASED ON 30% PROPYLENE GLYCOL SOLUTION.
2. PROVIDE BACNET CARDS.
3. UNITS SHALL BE PREWIRED FOR A SINGLE POINT CONNECTION.
4. ALTERNATE MANUFACTURER OF EQUAL PERFORMANCE AND CAPACITY MUST HAVE SIMILAR PHYSICAL DIMENSIONS, OTHERWISE BASE MANUFACTURER MUST BE SUPPLIED. CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING DIMENSIONS IN FIELD.
5. R-454B REFRIGERANT.
6. PROVIDE 2" MERV 8 AND 4" MERV 13 HIGH EFFICIENCY FILTERS.
7. PROVIDE DUCT TRANSITION AT THE UNIT AS NECESSARY, V.I.F.
8. PROVIDE OA INTAKE HOODS.
9. ROOF OPENING AROUND BOTH SUPPLY AND RETURN DUCTS BELOW EACH ROOFTOP UNIT SHALL BE COMPLETELY SEALED TO PREVENT ANY NOISE TRANSFER.
10. PROVIDE VFD'S ON BOTH SUPPLY AND EXHAUST FANS.
11. PROVIDE MANUFACTURER SUPPLIED AND WIRED DISCONNECT SWITCH.
12. UNITS SHALL BE DOUBLE-WALL CABINET WITH R-13 INSULATION.
13. PROVIDE STAINLESS STEEL DRAIN PAN WITH CONDENSATE OVERFLOW SWITCH.
14. PROVIDE WITH WIND RATED VIBRATION ISOLATION CURB. CURB SHALL BE A MINIMUM OF 18" HIGH UNLESS OTHERWISE NOTEDED. THE HEIGHT OF THE STATIONARY PORTION OF THE CURB SHALL BE A MINIMUM OF 8" ABOVE THE FINISHED ROOF ELEVATION. COORDINATE WITH ARCHITECTURAL ROOF PLANS.
15. FACTORY WIRED 115V CONVENIENCE OUTLET.

CEILING FAN SCHEDULE

						MOTOR	ELECTRICAL DATA		
TAG	MANUFACTURER	MODEL	AIRFLOW (CFM)	TYPE	SERVES	WATTS	VOLT	PH	REMARKS
CF-1	BIG ASS FANS	HAIKU	7632	CEILING FAN	RECEPTION	25.1	120 V	1	ALL

REMARKS:
1. COLOR BY ARCHITECT FROM STANDARD COLORS/FINISHES.
2. HIGH-EFFICIENCY BRUSHLESS DC/EC MOTOR.
3. ONBOARD TEMPERATURE AND MOTION SENSORS
4. UNIVERSAL MOUNTING WITH 32" DOWNROD.
5. FIXED WALL MOUNT REMOTE.

FAN SCHEDULE

					FAN						SOUND PRESS LEVEL (dBA)		ELECTRICAL DATA			
									MOTOR POWER							
TAG	MANUFACTURER	MODEL	SERVES	TYPE	FLOW (CFM)	ESP (in-wg)	RPM	DRIVE TYPE	HP	WATTS		SONES	VOLT	PH	REMARKS
EF-1	GREENHECK	CSP-A390-VG	MECHANICAL ROOM	INLINE	300	0.25	1153	DIRECT DRIVE		98		2.5	120 V	1	ALL
KEF-1	GREENHECK	USF-20-B6	KITCHEN	UTILITY	2200	1.5	1071	DIRECT DRIVE	1		64	14.7	208 V	3	ALL

REMARKS:
1. VARIABLE SPEED ELECTRONICALLY COMMUTATED MOTOR WITH DIAL SPEED CONTROL OR INVERTER DUTY MOTOR WITH VARIABLE FREQUENCY DRIVE.
2. MANUFACTURER MOUNTED AND WIRED DISCONNECT.
3. AIRFLOW AND SOUND PERFORMANCE IN ACCORDANCE WITH AMCA STANDARDS.
4. PROVIDE WITH UL 705 LISTING.
5. PROVIDE EF-1 WITH REVERSE ACTING THERMOSTAT.
6. PROVIDE KEF-1 WITH INTEGRATED CURB CAP AND LOW LOSS INLET BOX, GREASE TRAP AND SELF SUPPORTED, FIELD STACK EXTENSION. OUTLET TO BE MINIMUM OF 3' ABOVE RTU-3 INTAKE.

AIR LOUVER SCHEDULE

TAG	QUANTITY	MANUFACTURER	MODEL	AIR FLOW DIRECTION	AIRFLOW	MAXIMUM FACE VELOCITY	MINIMUM FREE AREA (FT2)	WIDTH (IN.)	HEIGHT (IN.)	SERVES	REMARKS
L1	1	GREENHECK	ESD-635	INTAKE LOUVER	300	380 FPM	0.4	32	12	MECHANICAL ROOM	ALL
L2	1	GREENHECK	ESD-635	EXHAUST LOUVER	300	960 FPM	0.4	24	16	MECHANICAL ROOM	ALL

REMARKS:
1. COLOR TO BE SELECTED BY ARCHITECT FROM LIST OF STANDARD COLORS.

VARIABLE REFRIGERANT FLOW AIR-SOURCED HEAT PUMP SCHEDULE

			NOMINAL CAPACITY		EFFICIENCY			ELECTRICAL DATA				
TAG	MANUFACTURER	MODEL	COOLING (Btu/h)	HEATING (Btu/h)	EER	IEER	COP	MCA	MOCP	VOLT	PH	REMARKS
HP-1	MITSUBISHI	MXZ-SM72TL-U1	72,000	80,000	12.15		4.2	32 A	58 A	208 V	3	ALL
HP-2	MITSUBISHI	MXZ-SM60NL	60,000	66,000		10.7	3.74	45 A	80 A	208 V	1	ALL
HP-3	MITSUBISHI	MXZ-SM72TL-U1	72,000	80,000	12.15		4.2	32 A	58 A	208 V	3	ALL
HP-4	MITSUBISHI	MXZ-SM60NL	60,000	66,000		10.7	3.74	45 A	80 A	208 V	1	ALL
HP-5	MITSUBISHI	MXZ-SM60NL	60,000	66,000		10.7	3.74	45 A	80 A	208 V	1	ALL
HP-6	MITSUBISHI	MXZ-SM36NL	36,000	41,000		12.05	3.74	36 A	64 A	208 V	1	ALL
HP-8	MITSUBISHI	PURY-HM72TXU-A	72,000	80,000	14.75		4.35	51 A	80 A	208 V	3	ALL
HP-9	MITSUBISHI	PURY-HM120TXU-A	120,000	135,000	13.55		3.98	60 A	100 A	208 V	3	ALL
HP-10	MITSUBISHI	MXZ-SM60NL	60,000	66,000		10.7	3.74	45 A	80 A	208 V	1	ALL
HP-11	MITSUBISHI	MXZ-SM72TL-U1	72,000	80,000	12.15		4.2	32 A	58 A	208 V	3	ALL
HP-13	MITSUBISHI	MXZ-SM36NL	36,000	41,000		12.05	3.74	36 A	64 A	208 V	1	ALL
HP-14	MITSUBISHI	MXZ-SM36NL	36,000	41,000		12.05	3.74	36 A	64 A	208 V	1	ALL
HP-15	MITSUBISHI	MXZ-SM72TL-U1	72,000	80,000	12.15		4.2	32 A	58 A	208 V	3	ALL
HP-16	MITSUBISHI	MXZ-SM72TL-U1	72,000	80,000	12.15		4.2	32 A	58 A	208 V	3	ALL

REMARKS:
1. NOMINAL COOLING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 80/67°F (DB/WB), OUTDOOR OF 95°F (DB)
2. NOMINAL HEATING CAPACITIES ARE BASED ON INDOOR COIL EAT OF 70°F (DB), OUTDOOR OF 43°F (WB)
3. EFFICIENCY VALUES FOR EER, IEER, COP ARE BASED ON AHRI 1230 TEST METHOD FOR MIXTURE OF DUCTED & NON-DUCTED INDOOR UNITS.
4. PROVIDE ADDED FIELD CHARGE REQUIRED IN ADDITION TO FACTORY CHARGE

VARIABLE REFRIGERANT FLOW FAN COIL UNIT SCHEDULE

				AIRFLOW		SENSIBLE CAPCAITY (BTU/H)	COIL CAPACITY		SOUND PRESS LEVEL			ELECTRICAL DATA				
TAG	MANUFACTURER	MODEL	TYPE	SUPPLY (CFM)	OUTSIDE (CFM)		COOLING (Btu/h)	HEATING (Btu/h)	LOW (dBA)	MID (dBA)	HIGH (dBA)	MCA	MOCP	VOLT	PH	REMARKS
FCU-1-1	MITSUBISHI	PLFY-EM36NEMU-A	3' X 3' CEILING CASSETTE	1095	0	26969	31165	22759	35	38	41	0.9 A	0 A	208 V	1	ALL
FCU-1-2	MITSUBISHI	PLFY-EM36NEMU-A	3' X 3' CEILING CASSETTE	1095	0	23903	31165	22759	35	38	41	0.9 A	0 A	208 V	1	ALL
FCU-2-1	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23538	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-2-2	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23538	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-3-1	MITSUBISHI	PLFY-EM36NEMU-A	3' X 3' CEILING CASSETTE	1095	0	26969	31165	22873	35	38	41	0.9 A	0 A	208 V	1	ALL
FCU-3-2	MITSUBISHI	PLFY-EM36NEMU-A	3' X 3' CEILING CASSETTE	1095	0	26969	31165	22873	35	38	41	0.9 A	0 A	208 V	1	ALL
FCU-4-1	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23665	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-4-2	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23665	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-5-1	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23855	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-5-2	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23855	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-6-1	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	7962	10355	12918	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-6-2	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	7962	10355	12918	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-8-1	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	25	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-2	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-3	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-4	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-5	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-6	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-7	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-8	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	20	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-9	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	25	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-10	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	25	4757	4757	5387	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-8-11	MITSUBISHI	PLFY-M08NFMU-A	2' X 2' CEILING CASSETTE	315	0	7196	7612	8657	26	30	33	0.4 A	0 A	208 V	1	ALL
FCU-8-12	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	8697	11418	12986	26	30	34	1.2 A	0 A	208 V	1	ALL
FCU-9-1	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	8530	11614	12873	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-9-2	MITSUBISHI	PEFY-L18NMAU-A	HORIZ. CONCEALED DUCTED	883	75	17035	17420	19072	31	35	39	2.5 A	0 A	208 V	1	ALL
FCU-9-3	MITSUBISHI	PLFY-M08NFMU-A	2' X 2' CEILING CASSETTE	315	25	7250	7742	8582	26	30	33	0.4 A	0 A	208 V	1	ALL
FCU-9-4	MITSUBISHI	PLFY-M08NFMU-A	2' X 2' CEILING CASSETTE	315	20	7250	7742	8582	26	30	33	0.4 A	0 A	208 V	1	ALL
FCU-9-5	MITSUBISHI	PLFY-M08NFMU-A	2' X 2' CEILING CASSETTE	315	20	7250	7742	8582	26	30	33	0.4 A	0 A	208 V	1	ALL
FCU-9-6	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	8530	11614	12873	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-9-7	MITSUBISHI	PLFY-M15NFMU-A	2' X 2' CEILING CASSETTE	390	0	11087	14517	16211	28	33	39	0.4 A	0 A	208 V	1	ALL
FCU-9-8	MITSUBISHI	PLFY-M08NFMU-A	2' X 2' CEILING CASSETTE	315	0	7250	7742	8582	26	30	33	0.4 A	0 A	208 V	1	ALL
FCU-9-9	MITSUBISHI	PLFY-M08NFMU-A	2' X 2' CEILING CASSETTE	315	0	7250	7742	8582	26	30	33	0.4 A	0 A	208 V	1	ALL
FCU-9-10	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	8530	11614	12873	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-10-1	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23783	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-10-2	MITSUBISHI	PLFY-EM30NEMU-A	3' X 3' CEILING CASSETTE	812	0	21181	25886	23783	28	32	35	0.6 A	0 A	208 V	1	ALL
FCU-11-1	MITSUBISHI	PLFY-EM36NEMU-A	3' X 3' CEILING CASSETTE	1095	0	26969	31165	22932	35	38	41	0.9 A	0 A	208 V	1	ALL
FCU-11-2	MITSUBISHI	PLFY-EM36NEMU-A	3' X 3' CEILING CASSETTE	1095	0	26969	31165	22932	35	38	41	0.9 A	0 A	208 V	1	ALL
FCU-13-1	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	7962	10355	12918	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-13-2	MITSUBISHI	PEFY-L12NMAU-A	HORIZ. CONCEALED DUCTED	370	0	7962	10355	12918	26	30	34	1.9 A	0 A	208 V	1	ALL
FCU-14-1	MITSUBISHI	PLFY-M18NFMU-A	2' X 2' CEILING CASSETTE	460	0	11310	15532	19138	33	39	43	0.4 A	0 A	208 V	1	ALL
FCU-14-2	MITSUBISHI	PLFY-M05NFMU-A	2' X 2' CEILING CASSETTE	280	0	4203	4314	5359	26	28	30	0.4 A	0 A	208 V	1	ALL
FCU-15-1	MITSUBISHI	PL

GAS-FIRED BOILER SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	GAS BURNER						WATERSIDE					AFUE (%)	THERMAL EFF (%)	INLET DIAMETER	FLUE DIAMETER	ELECTRICAL DATA			REMARKS
				INPUT (BTUH)	OUTPUT (BTUH)	TURN DOWN RATIO	FUEL TYPE	PIPE PRESSURE (in-wg) MIN	PIPE PRESSURE (in-wg) MAX	FLOW (GPM)	EWT (°F)	LWT (°F)	PD (FT)	VOL (gal)					FLA	VOLT	PH	
B-1	LOCHINVAR	FBN1001	CONDENSING FIRETUBE	999,000	961,000	20:1	NATURAL GAS	7	14	67	110	140	6.5	77	96.2	9620	6"	6"	6 A	120 V	1	ALL
B-2	LOCHINVAR	FBN1001	CONDENSING FIRETUBE	999,000	961,000	20:1	NATURAL GAS	7	14	67	110	140	6.5	77	96.2	9620	6"	6"	6 A	120 V	1	ALL

REMARKS:
1. PROVIDE WITH 75 PSIG PRESSURE RELIEF VALVE.
2. HEATING WATER FLUID SHALL BE 30% PROPYLENE GLYCOL.
3. PROVIDE INTERNAL MANUAL HIGH LIMIT AND AUTOMATIC LIMIT.
4. PROVIDE CONDENSATE NEUTRALIZING TUBES.
5. PROVIDE INTERNAL LOW WATER CUT-OFF.
6. PROVIDE WITH BACNET MSTP CARD.
7. PROVIDE CONCRETE HOUSEKEEPING PAD.

AIR SEPARATOR SCHEDULE

TAG	MANUFACTURER	MODEL	SERVES	TYPE	PIPE SIZE (IN.)	PRIMARY FLOW RATE (GPM)	SECONDARY FLOW RATE (GPM)	MAX. PRESS. DROP (FT. W.G.)	VOL. (GAL.)	DRY WEIGHT (LBS.)	REMARKS
HS-1	SPIROTHERM	VDX400FAM	HW SYSTEM	COMBINATION HYDRAULIC / AIR / DIRT / MAGNETIC	4	67	240	1.00	9.4	197	ALL

REMARKS:
1. ASME STAMPED. MAXIMUM PRESSURE RATING OF 150 PSIG..
2. PROVIDE WITH AUTOMATIC AIR VALVE AND BALL TYPE BLOWDOWN VALVE WITH CAPPED HOSE END.

DUCT SOUND ATTENUATOR SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	SYSTEM	AIRFLOW (CFM)	MAX PD (in-wg)	OVERALL SIZE (IN.) L	W	H	INSERTION LOSS OCTAVE BAND FREQUENCIES (Hz) 63	125	250	500	1000	2000	4000	8000	REMARKS
SA-DOAS-1-EA	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	1,900	0.22	60	12	44	8	16	26	37	37	37	27	20	ALL
SA-DOAS-1-SA-1	VIBRO-ACOUSTICS	RED	ELBOW	SUPPLY	950	0.23	60	20	10	5	11	19	32	41	35	22	15	ALL
SA-DOAS-1-SA-2	VIBRO-ACOUSTICS	RD	RECTANGULAR	SUPPLY	950	0.26	72	20	10	10	17	30	30	39	25	18	14	ALL
SA-DOAS-2-EA	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	2,700	0.34	44	14	38	10	19	30	38	48	49	35	25	ALL
SA-DOAS-2-SA	VIBRO-ACOUSTICS	TRED	TRANSITIONAL	SUPPLY	2,700	0.14	72	24	10	9	18	30	36	44	40	36	27	ALL
SA-DOAS-3-EA	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	1,140	0.33	60	10	32	11	16	30	35	48	48	37	27	ALL
SA-DOAS-3-SA	VIBRO-ACOUSTICS	RED	ELBOW	SUPPLY	1,140	0.21	72	10	24	7	16	29	38	50	51	40	30	ALL
SA-DOAS-4-EA	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	1,000	0.25	60	10	32	11	16	30	35	48	48	37	27	ALL
SA-DOAS-4-SA-1	VIBRO-ACOUSTICS	RD	RECTANGULAR	SUPPLY	500	0.21	84	16	6	10	17	31	34	42	29	20	17	ALL
SA-DOAS-4-SA-2	VIBRO-ACOUSTICS	RD	RECTANGULAR	SUPPLY	500	0.21	84	16	6	10	17	31	34	42	29	20	17	ALL
SA-DOAS-5-EA-1	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	550	0.31	62	14	10	8	16	28	34	45	46	35	27	ALL
SA-DOAS-5-EA-2	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	450	0.26	60	12	10	7	16	29	34	47	49	38	29	ALL
SA-DOAS-5-SA	VIBRO-ACOUSTICS	RED	ELBOW	SUPPLY	1,000	0.25	60	12	18	9	14	25	32	38	39	28	19	ALL
SA-DOAS-6-EA	VIBRO-ACOUSTICS	RED	ELBOW	EXHAUST	2,300	0.29	60	14	44	9	16	27	37	37	36	26	20	ALL
SA-DOAS-6-SA	VIBRO-ACOUSTICS	RED	ELBOW	SUPPLY	2,330	0.27	84	14	36	7	14	24	33	44	40	34	29	ALL
SA-RTU-1-RA	VIBRO-ACOUSTICS	RED	ELBOW	RETURN	1,800	0.22	84	28	12	7	14	22	32	49	45	31	22	ALL
SA-RTU-1-SA	VIBRO-ACOUSTICS	RED	ELBOW	SUPPLY	1,800	0.26	60	12	28	8	13	20	31	32	33	26	22	ALL
SA-RTU-2-RA	VIBRO-ACOUSTICS	RED	ELBOW	RETURN	1,050	0.17	60	24	10	9	11	17	26	28	32	26	20	ALL
SA-RTU-2-SA	VIBRO-ACOUSTICS	RED	ELBOW	SUPPLY	1,050	0.31	72	10	24	7	15	23	34	47	48	36	25	ALL

REMARKS:
1. ELBOW AND TEE ATTENUATOR LENGTHS TO BE TOTAL OF EACH SIDE. CONTRACTOR IS RESPONSIBLE FOR FINAL COORDINATION.
2. PRESSURE DROP MAY BE ALTERED BY SYSTEM EFFECT. INSTALL EQUIPMENT PER MANUFACTURER'S SPECIFICATION.
3. MAXIMUM STATIC PRESSURE DROP PER ASTM E477-20 PLUS SYSTEM EFFECTS FOR NEARBY DUCT ELEMENTS.
4. MINIMUM DYNAMIC INSERTION LOSS DETERMINED PER ASTM E477-20.
5. LENGTH SHOWN FOR ELBOW SILENCERS IS CENTERLINE LENGTH.
6. CASING TO BE HTL EQUIVALENT TO 14 GAUGE DUCT WALL TO CONTROL BREAKOUT.
7. NON-BASIS OF DESIGN SILENCER MANUFACTURER SHALL PROVIDE, FOR APPROVAL, PROFESSIONAL ENGINEER STAMPED ACOUSTICAL CALCULATIONS FOR ALL SYSTEMS WITH SILENCERS TO DEMONSTRATE THAT THE RESULTANT DUCTBORNE FAN SOUND LEVELS, INCLUDING AIRBORNE AND BREAKOUT NOISE, MEET THE REQUIRED CRITERIA.
8. NON-BASIS OF DESIGN SILENCER MANUFACTURER SHALL PROVIDE, FOR APPROVAL, PROFESSIONAL ENGINEER STAMPED PRESSURE DROP CALCULATIONS FOR ALL SYSTEMS WITH SILENCERS TO DEMONSTRATE THAT THE RESULTANT INSTALLED PRESSURE DROP WITH SYSTEM EFFECTS DOES NOT EXCEED SCHEDULED VALUES.
9. FOR NON-BASIS OF DESIGN PRODUCT SUPPLIED, CONTRACTOR IS FINANCIALLY RESPONSIBLE TO ENSURE NOISE CONTROL SOLUTION IS DELIVERED TO ACHIEVE SPECIFIED NC LEVEL IN SPACES.

EXPANSION TANK SCHEDULE

TAG	MANUFACTURER	MODEL	SERVES	TYPE	TANK VOLUME (GAL.)	ACCEPTANCE VOLUME (GAL.)	DIAM. (IN.)	HEIGHT (IN.)	CHARGE PRESS. (PSIG)	DRY WEIGHT (LBS)	REMARKS
ET-1	WESSELS	NLAP-150	HW SYSTEM	BLADDER	39	39.0	16	49	30	115	ALL

REMARKS:
1. ASME STAMPED.
2. REPLACEABLE BLADDER TYPE.

GLYCOL MAKE-UP UNIT SCHEDULE

TAG	MANUFACTURER	MODEL NO.	SERVES	TYPE	PUMP FLOW RATE (GPM)	PUMP PRESS. (PSIG)	TANK VOLUME (GAL.)	MOTOR QTY	MOTOR POWER (HP)	MOTOR RPM	MOCP	VOLT	PH	REMARKS
GMU-1	WESSELS	GMP-13050	HW SYSTEM	SINGLE PUMP	1.80	70	50	1	0.33	1550	20 A	120 V	1	ALL

REMARKS:
1. SET TO 30 PSIG FILL PRESSURE.
2. PROVIDE WITH HIGH LEVEL AND LOW WATER LEVEL ALARMS, PUMP STARTER PANEL, AND REMOTE MONITORING TERMINAL STRIP.

PUMP SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	PUMP FLOW (GPM) DESIGN	PUMP FLOW (GPM) MIN	HEAD (FT)	MOTOR POWER HP	MOTOR POWER RPM	ELECTRICAL DATA VOLT	ELECTRICAL DATA PH	REMARKS
BP-1	GRUNDFOS	MAGNA3 65-150	CANNED-ROTOR CIRCULATOR	67	0	20.0	1	2832	115 V	1	ALL
BP-2	GRUNDFOS	MAGNA3 65-150	CANNED-ROTOR CIRCULATOR	67	0	20.0	1	2832	115 V	1	ALL
HWP-1	GRUNDFOS	VLS 40129 4P	VERTICAL, MULTISTAGE, INLINE	180	93	50.0	7.5	1173	208 V	3	ALL
HWP-2	GRUNDFOS	VLS 40129 4P	VERTICAL, INLINE, SPLIT-COUPLE	180	93	50.0	7.5	1173	208 V	3	ALL

REMARKS:
1. PROVIDE MAXIMUM IMPELLER DIAMETER FOR NON-OVERLOADING PERFORMANCE FOR THE SPECIFIED HORSEPOWER.
2. PROVIDE WITH ELECTRONICALLY COMMUTATED MOTOR OR INVERTER DUTY INDUCTION MOTOR WITH INTEGRAL VARIABLE FREQUENCY DRIVE.
3. PROVIDE EC MOTOR OR VFD WITH NATIVE BACNET COMMUNICATION.
4. PUMP FLUID SHALL BE 30% PROPYLENE GLYCOL.
5. FLOOR MOUNTED PUMP. PROVIDE WITH SUCTION DIFFUSER, FLOOR SUPPORT STANCHION PLATES OR STANDS AND CONCRETE HOUSEKEEPING PAD.

FIN TUBE RADIATION SCHEDULE

TAG	MANUFACTURER	ENCLOSURE MODEL	ELEMENT	ROWS OF ELEMENT	ENCLOSURE HEIGHT (IN.)	MOUNTING HEIGHT (IN.)	EWT (°F)	LWT (°F)	BTUH/LF	REMARKS
FT-A	ZEHNDER-RITTLING	BGHL5	3/4" x 4 1/4" x 4 1/4" x 32 FPF	2	20"	24"	140	120	594.3	ALL
FT-B	ZEHNDER-RITTLING	BGHL5	3/4" x 2 3/4" x 4" x 32 FPF	1	14"	18"	140	120	300.7	ALL
FT-C	ZEHNDER-RITTLING	BGHL5	3/4" x 4 1/4" x 4 1/4" x 32 FPF	3	24"	28"	140	120	754	ALL
FT-D	ZEHNDER-RITTLING	BGHL5	3/4" x 2 3/4" x 4 1/4" x 32 FPF	2	20"	24"	140	120	480.5	ALL

REMARKS:
1. WATER FLOW SHALL BE NO LESS THAN 0.5 GPM.
2. PERFORMANCE BASED ON 30% PROPYLENE GLYCOL.
3. COORDINATE ENCLOSURE LENGTH WITH WALL LENGTH PROVIDE CONTINUOUS ENCLOSURE ALONG EXPOSED WALLS UNLESS NOTED OTHERWISE. V.I.F.
4. ENCLOSURE MAY EXTEND BEYOND ELEMENT, PROVIDE FILLER SECTIONS FOR CONTINUOUS APPEARANCE.

CABINET UNIT HEATER SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	FAN FLOW (CFM)	MOTOR QTY	MOTOR POWER (hp)	MOTOR RPM	HEATING COIL CAPACITY (BTUH)	AIRSIDE EAT(db) (°F)	AIRSIDE LAT(db) (°F)	WATERSIDE FLOW (GPM)	WATERSIDE EWT (°F)	WATERSIDE LWT (°F)	WATERSIDE PD (PSI)	SOUND PRESS LEVEL (dBA)	ELECTRICAL DATA VOLT	ELECTRICAL DATA PH	REMARKS
CUH-1	ZEHNDER-RITTLING	RCWI-350-04	CEILING MOUNT	310	1	0.04	1550	6700	70.0	89.9	0.70	140.0	120.0	0.1	50	120 V	1	ALL
CUH-2	ZEHNDER-RITTLING	RCWI-350-04	RECESSED WALL MOUNT	420	1	0.04	1550	18300	70.0	110.2	1.90	140.0	120.0	1.3	55	120 V	1	ALL
CUH-3	ZEHNDER-RITTLING	RCWI-350-04	CEILING MOUNT	310	1	0.04	1550	6700	70.0	89.9	0.70	140.0	120.0	0.1	50	120 V	1	ALL
CUH-4	ZEHNDER-RITTLING	RCWI-350-04	CEILING MOUNT	310	1	0.04	1550	6700	70.0	89.9	0.70	140.0	120.0	0.1	50	120 V	1	ALL
CUH-5	ZEHNDER-RITTLING	RCWI-350-04	CEILING MOUNT	310	1	0.04	1550	6700	70.0	89.9	0.70	140.0	120.0	0.1	50	120 V	1	ALL

REMARKS:
1. HEATING COIL PERFORMANCE BASED ON 30% PROPYLENE GLYCOL.
2. PROVIDE WITH 3-SPEED EC MOTOR.
3. PROVIDED WITH FACTORY WIRED AND MOUNTED NON-FUSED DISCONNECT.
4. PROVIDE WITH 24 VAC FAN CONTROL RELAY WITH TRANSFORMER.
5. PROVIDE WITH 1" MERV 8 PANEL FILTER.
6. PROVIDE WITH PAINTED CABINET. CABINET COLOR TO BE SELECTED BY ARCHITECT FROM MANUFACTURER'S STANDARD COLOR CHART.

UNIT HEATER SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	FAN FLOW (CFM)	MOTOR QTY	MOTOR RPM	MOTOR HP	HEATING COIL CAPACITY (Btu/h)	AIRSIDE EAT(db) (°F)	AIRSIDE LAT(db) (°F)	WATERSIDE FLOW (GPM)	WATERSIDE EWT (°F)	WATERSIDE LWT (°F)	WATERSIDE PD (psi)	SOUND PRESS LEVEL	ELECTRICAL DATA VOLT	ELECTRICAL DATA PH	REMARKS
UH-1	ZEHNDER-RITTLING	RH-33	HORIZ. UNIT HEATER	490	1	1550	0.07	9100.0	70.0	87.2	0.90	140.0	120.0	0.10	50	120 V	1	ALL

REMARKS:
1. PERFORMANCE BASED ON 30% PROPYLENE GLYCOL SOLUTION AND HIGH FAN SPEED.
2. UNIT SHALL BE CONTROLLED BY WALL MOUNTED TEMPERATURE SENSOR.
3. PROVIDE WITH FACTORY WIRED AND MOUNTED NON-FUSED DISCONNECT SWITCH.
4. PROVIDE WITH CEILING MOUNTING BRACKET.

ELECTRIC UNIT HEATER SCHEDULE

TAG	MANUFACTURER	MODEL	HEATING ELEMENTS QTY	HEATING ELEMENTS POWER Btu/h	HEATING ELEMENTS POWER kW	FAN FLOW (CFM)	MOTOR QTY	MOTOR POWER (hp)	MOTOR RPM	SOUND PRESS LEVEL (dBA)	ELECTRICAL DATA FLA	ELECTRICAL DATA VOLT	ELECTRICAL DATA PH	REMARKS
EUH-1	REZNOR	EUHC-3	1	10.236	3	340	1	0.03	1550	58	14.4 A	208 V	1	ALL

REMARKS:
1. PROVIDE WITH UNIVERSAL WALL AND CEILING MOUNTING BRACKET.
2. PROVIDE WITH FACTORY WIRED AND MOUNTED NON-FUSED DISCONNECT SWITCH.
3. PROVIDE WITH 24 VAC POWER CONTACTOR AND CONTROL TRANSFORMER. UNIT SHALL BE CONTROLLED BY WALL MOUNTED TEMPERATURE SENSOR.

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RENOVATIONS TO:
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

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MECHANICAL SCHEDULES

M6.1

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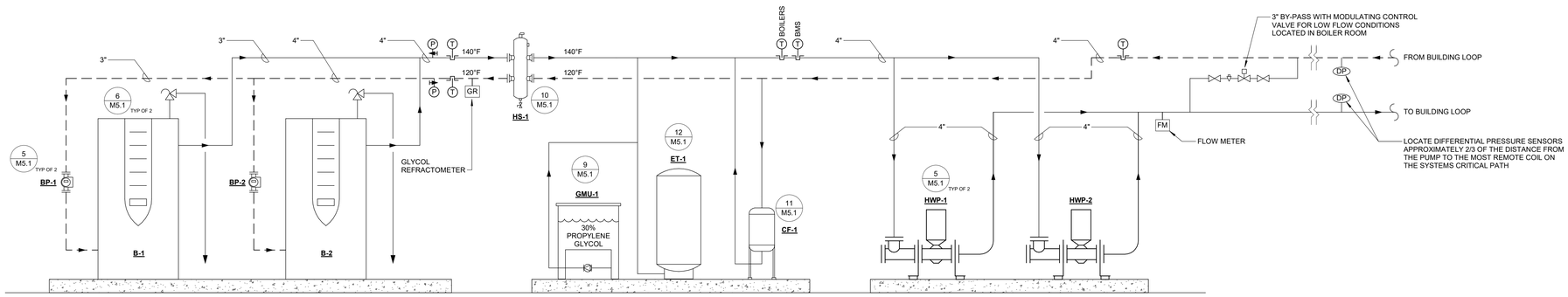

1 HOT WATER SYSTEM PIPING SCHEMATIC
NTS

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MECHANICAL PIPING DIAGRAMS

M7.0

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DIAGRAM SYMBOL LEGEND

DISPLAY	DESCRIPTION
——///	POWER WIRE
———	CONTROL WIRE
———	REF. PIPE

PIPING AND CONTROLS		
SYMBOL	BRANCH PIPE	MODEL NAME
J1		CMY-Y62-GA-E
J2		CMY-Y62-G-E
SYMBOL	LIQUID PIPE	GAS PIPE SIZE
P1	3/8	7/8
P2	3/8	5/8
P3	3/8	3/4
P4	1/4	1/2
P5	5/8	3/4
P6	3/4	1-1/8
SYMBOL	MODEL NUMBER	
CR	PAC-YTS30CRAU	

1 VRF AND SPLIT SYSTEM REFIGERANT PIPING AND CONTROL WIRING DIAGRAM
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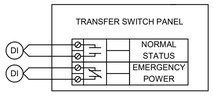
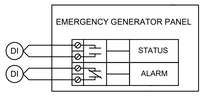


1 EMERGENCY GENERATOR TRANSFER MONITORING CONTROL DIAGRAM
NTS



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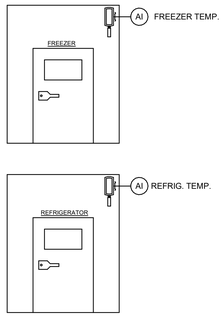

3 REFRIGERATOR/FREEZER TEMP MONITORING CONTROL DIAGRAM
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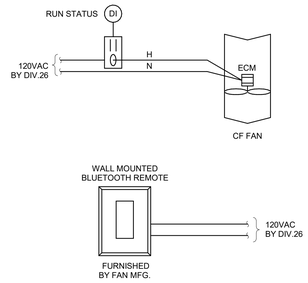
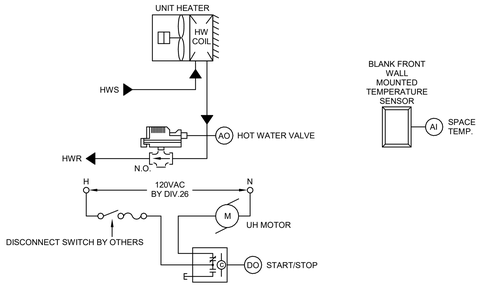
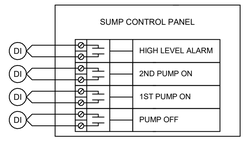


4 CEILING FAN CONTROL DIAGRAM
NTS



5 HOT WATER UNIT HEATER CONTROL DIAGRAM
NOT TO SCALE



6 EJECTOR PIT MONITORING CONTROL DIAGRAM
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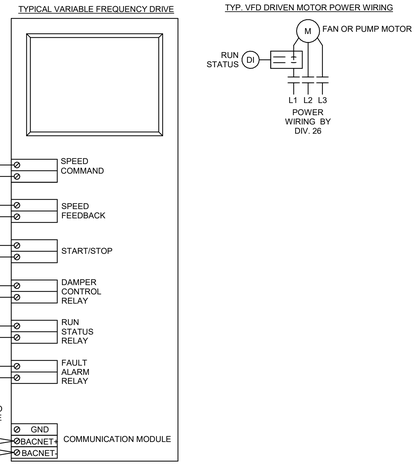

9 VARIABLE FREQUENCY DRIVE CONTROL DIAGRAM
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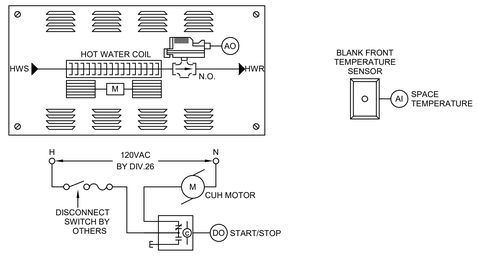
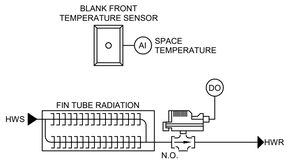


7 HOT WATER CABINET UNIT HEATER CONTROL DIAGRAM
NOT TO SCALE



8 HOT WATER FIN TUBE CONTROL DIAGRAM
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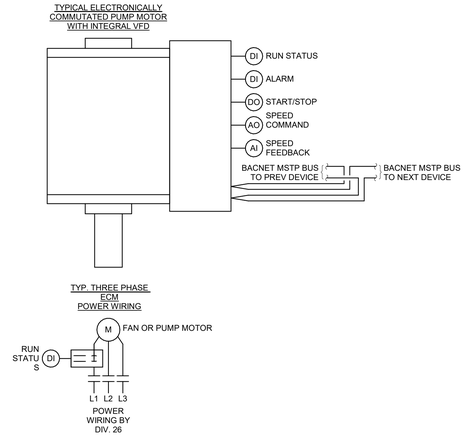

10 PUMP ECM CONTROL DIAGRAM.
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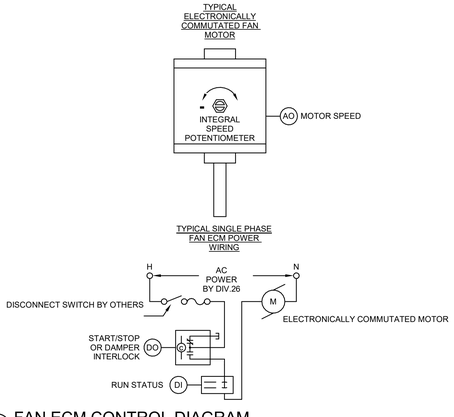

11 FAN ECM CONTROL DIAGRAM
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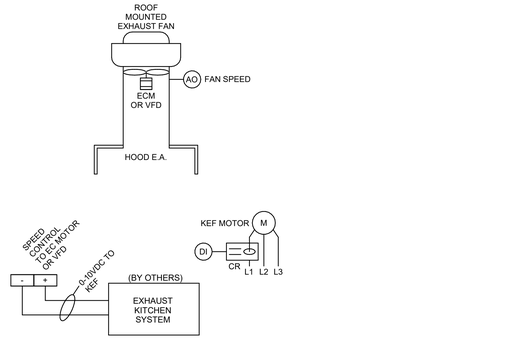

12 KITCHEN EXHAUST FAN CONTROL DIAGRAM
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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MECHANICAL CONTROL DIAGRAMS

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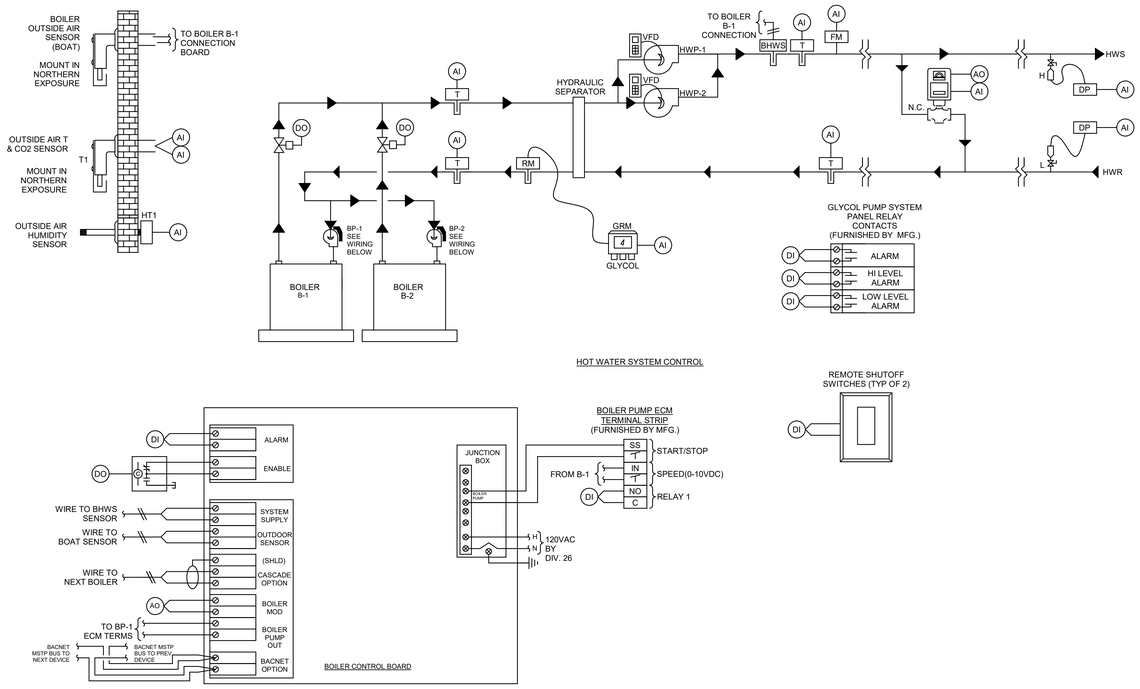
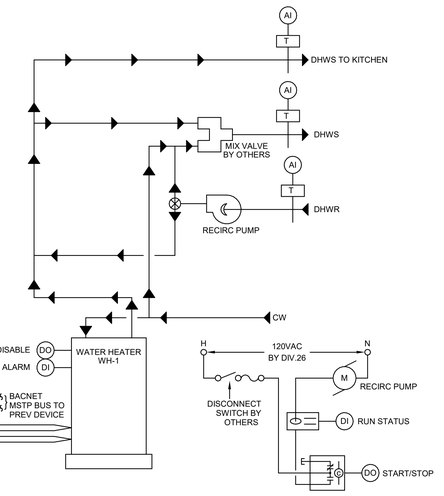
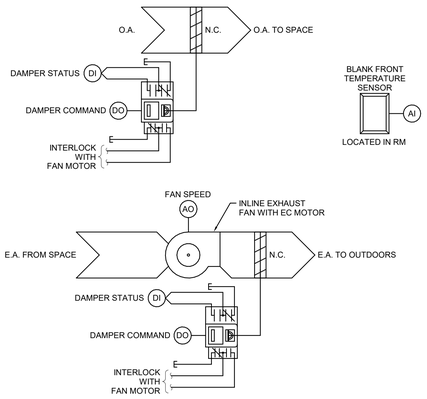


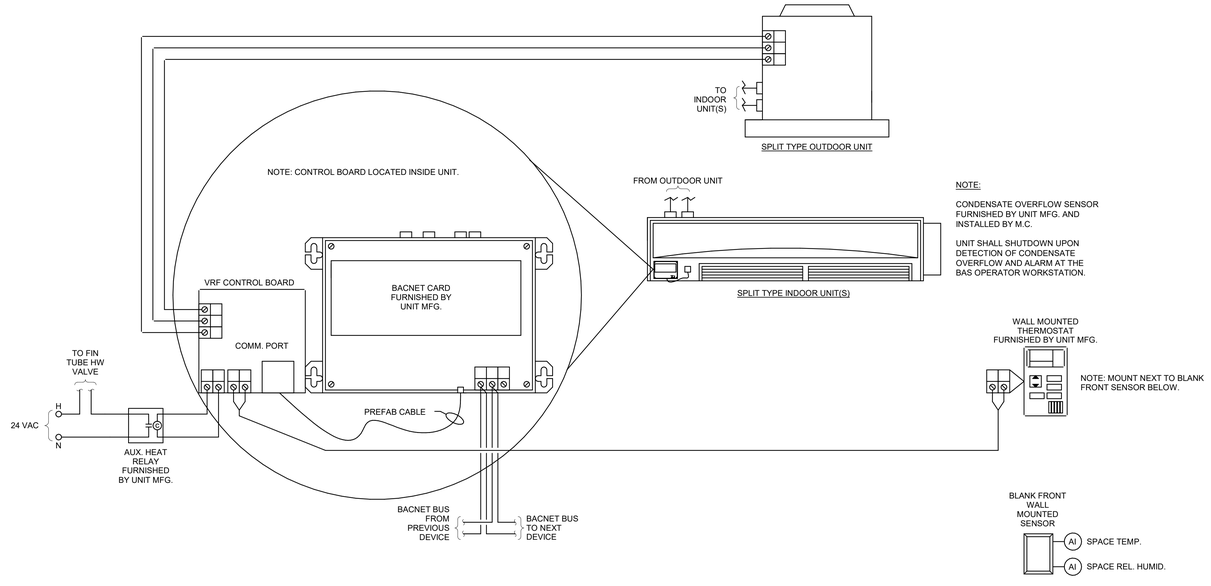
1 HOT WATER SYSTEM CONTROL DIAGRAM
NTS



2 DOMESTIC WATER HEATER AND RECIRC PUMP CONTROL DIAGRAM
NOT TO SCALE



3 BOILER ROOM EXHAUST FAN AND OUTDOOR AIR DAMPER CONTROL DIAGRAM
NOT TO SCALE



4 SPLIT SYSTEM HEAT PUMP CONTROL DIAGRAM
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MECHANICAL CONTROL DIAGRAMS

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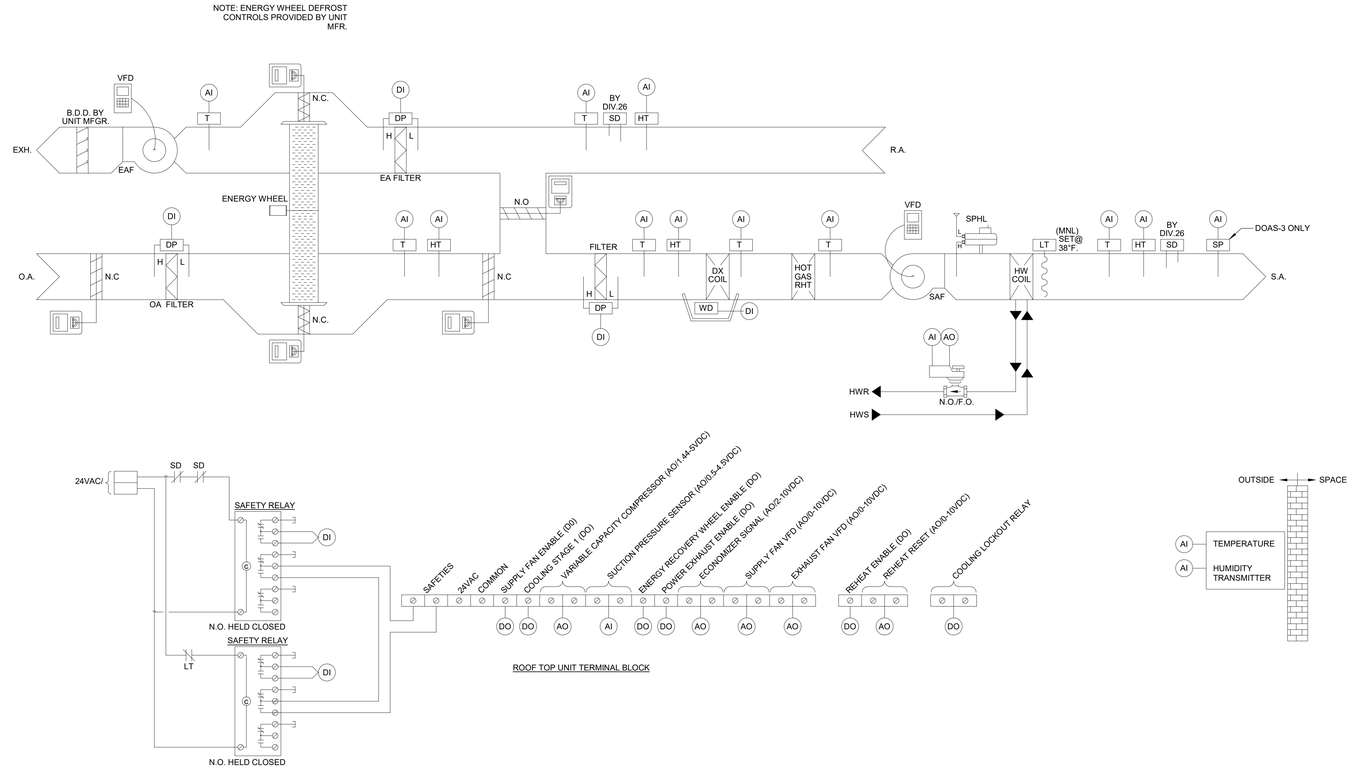
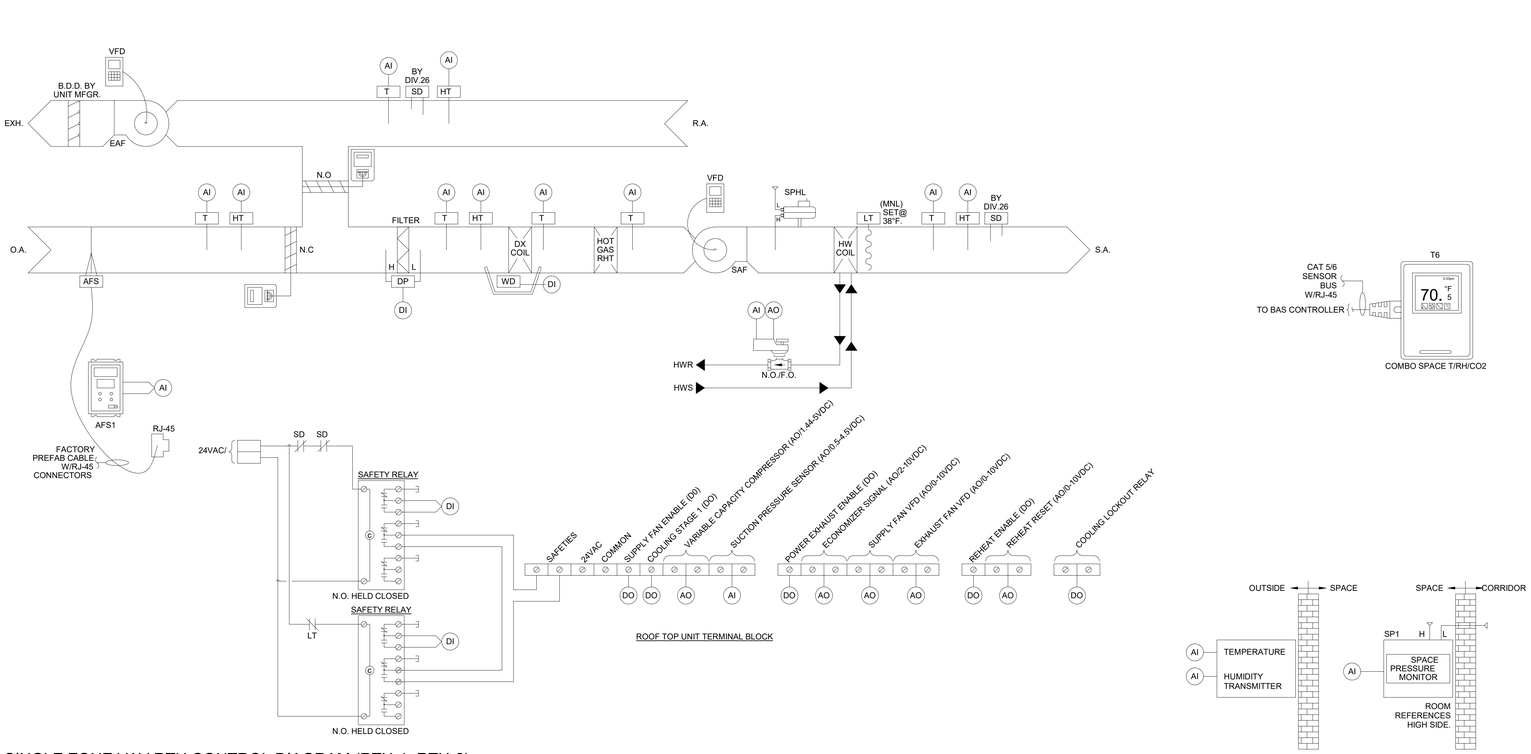


1 DEDICATED OUTDOOR AIR SYSTEM CONTROL DIAGRAM (TYP. OF ALL DOAS UNITS)
NOT TO SCALE



2 SINGLE ZONE VAV RTU CONTROL DIAGRAM (RTU-1, RTU-2)
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STATE OF CONNECTICUT REGISTERED No. 21720 LICENSED PROFESSIONAL ENGINEER

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MECHANICAL CONTROL DIAGRAMS

M8.2

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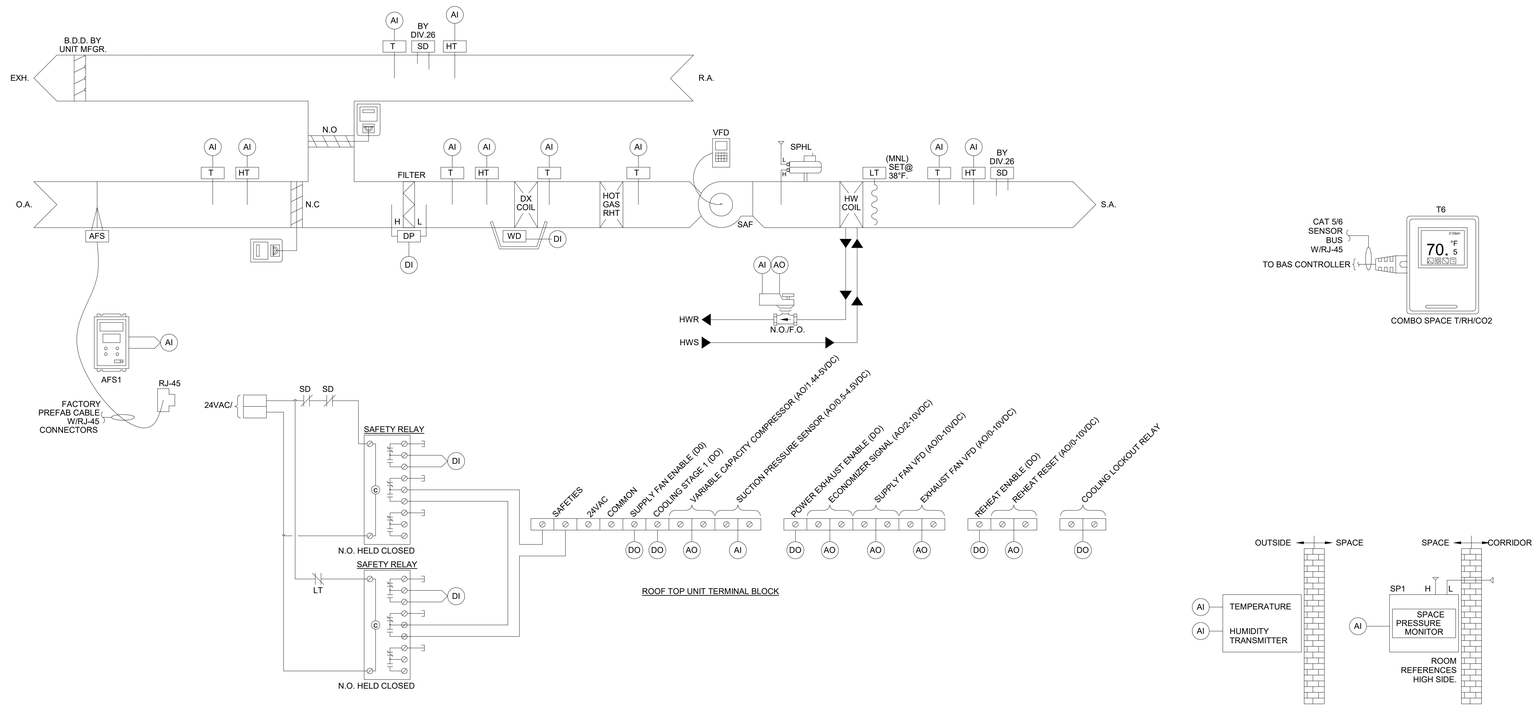

1 SINGLE ZONE VAV RTU CONTROL DIAGRAM (RTU-3)
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MECHANICAL CONTROL DIAGRAMS

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ABBREVIATIONS

A	GENERAL SERVICE COMPRESSED AIR
A/AMP	AMPERE
AC	AIR COMPRESSOR
ACU	AIR CONDITIONING UNIT(S)
AD	ACCESS DOORS
AD	AREA DRAIN
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AMB	AMBIENT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATE
AS	AIR SEPARATOR
AV	ACID VENT (CHEMICAL)
AVTR	ACID VENT THRU ROOF
AW	ACID WASTE
BFW	BOILER FEED WATER
BHP	BRAKE HORSEPOWER
BSMT	BASEMENT
BTU	BRITISH THERMAL UNITS
BTUH	BRITISH THERMAL UNITS/HOUR
C	CONNDESATE
C/B	CIRCUIT BREAKER
CER/CEG	CEILING EXHAUST REG./GRILLE
CFM	CUBIC FEET PER MINUTE
CFP	CHEMICAL FEED PUMPS
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CI	CAST IRON
CLG	CEILING
CLPS	CLEAN LOW PRESSURE STEAM
CMPS	CLEAN MEDIUM PRESSURE STEAM
CMV	CEILING MOUNTED VENTILATOR
CO	CLEANOUT
CO2	CARBON DIOXIDE
COMP	COMPRESSOR
CP	CONDENSATE PUMP
CRU	COMPUTER ROOM UNIT
CT	COOLING TOWER
CU FT	CUBIC FEET
CUH	CABINET UNIT HEATER
CV	COEFFICIENT, VALVE FLOW
CW	COLD WATER
D	DEPTH
dB	DECIBEL
DC	DIRECT CURRENT
DCV	DOUBLE CHECK VALVE
DE	DEIONIZED PROCESS WATER
DEG or °	DEGREE
DI	DISTILLED WATER
DIA	DIAMETER
DN	DOWN
DWBP	DOMESTIC WATER BOOSTER PUMP
DWG	DRAWING
EF	EXHAUST FAN
EFF	EFFICIENCY
EHC	ELECTRICAL HEATING CABLES
ELEC	ELECTRICAL
ELEV	ELEVATOR
ETP	ELECTRIC TRAP PRIMER
ETR	EXISTING TO REMAIN
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EXH	EXHAUST
EXP	EXPANSION
F	FAHRENHEIT
FA	FIRE ALARM
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FHC	FIRE HOSE CABINET
FM	FLOW METER
FP	FIRE PUMP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FS	FLOOR SINK
FT	FOOR OR FEET
FVC	FIRE VALVE CABINET
G	GAS
GA	GAUGE
GAL	GALLONS
GND	GROUND
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GRU	GREASE RECOVERY UNIT
GW	GREASE WASTE
H	HEIGHT
HD	HEAD
HP	HORSEPOWER
HPG	HIGH PRESSURE GAS
HPS	HIGH PRESSURE STEAM
HR	HOUR(S)
HT	HEAT
HTR	HEATER
HUM	HUMIDIFIER
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HW	HOT WATER

ABBREVIATIONS

HWR	HOT WATER RETURN
HWRP	HOT WATER RETURN PUMP
HWS	HOT WATER SUPPLY
HX	HEAT EXCHANGE
ID	INSIDE DIAMETER
IEF	IN-LINE EXHAUST FAN
IN	INCHES
IN WG	INCHES OF WATER, GAUGE (PRESSURE)
IW	INDIRECT WASTE
JP	JOCKEY PUMP
KEF	KITCHEN EXHAUST FAN
KVA	KILOVOLT AMPERE
KW	KILOWATT
KWH	KITCHEN WATER HEATER
L	LENGTH
LA	LABORATORY COMPRESSED AIR
LAV	LAVATORY
LBS/HR	POUNDS PER HOUR
LF	LINEAR FEET
LG	LABORATORY GAS
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
LV	LABORATORY VACUUM
MA	MEDICAL COMPRESSED AIR
MAGP	MASTER ALARM GAS PANEL
MAX	MAXIMUM
MBH	BTU PER HOUR (THOUSAND)
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MPS	MEDIUM PRESSURE STEAM
MUAU	MAKE UP AIR UNIT
MV	MEDICAL VACUUM
N2	NITROGEN
N2O	NITROUS OXIDE
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
O	OXYGEN
OA	OUTSIDE AIR
OD	OUTSIDE DIAMETER
ORD	OVERFLOW ROOF DRAIN
ORL	OVERFLOW RAIN LEADER
P	POLE
PH / Ø	PHASE
PRESS	PRESSURE
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
RD	ROOF DRAIN
REF	ROOF EXHAUST FAN
RL	RAIN LEADER
RM	ROOM
RO	REVERSE OSMOSIS WATER
RPD/RPZ	REDUCED PRESSURE DEVICE
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
RV	RADON VENT
S	SOIL
SAC	SHOP AIR COMPRESSOR
SCP	STEAM CONDENSATE PUMP
SEP	SEWAGE EJECTOR PUMP
SP	STATIC PRESSURE
SP	SUMP PUMP
SPEC	SPECIFICATION
SQ	SQUARE
SS	SOIL/STACK
ST	STORM
STD	STANDARD
SWH	STEAM WATER HEATER
TAG	IDENTIFICATION OF EQUIPMENT
TEMP	TEMPERATURE
TMV	THERMOSTATIC MIXING VALVE
TP	TRAP PRIMER
TW	TEMPERED WATER
TWR	TEMPERED WATER RETURN
TYP	TYPICAL
UH	UNIT HEATER
UR	URINAL
V	VENT
VAC	VACUUM
VEL	VELOCITY
VFC	VARIABLE FREQUENCY CONTROLLER
VIF	VERIFY IN FIELD
VOL	VOLUME
VTR	VENT THRU ROOF
W	WASTE
WC	WATER CLOSET
WG	WIREGUARD
WH	WALL HYDRANT (HOSE BIBB)
WHA	WATER HAMMER ARRESTER
WI	WIDTH
WP	WEATHERPROOF
WTG	WALL TRANSFER GRILLE
WV	WASTE AND VENT COMBINATION

PLUMBING SYMBOLS

———	COLD WATER
— — —	HOT WATER
———	HOT WATER RECIRCULATING
- - - - - -	VENT
——S——	SOIL OR WASTE
——RV——	RADON VENT
——WV——	COMBINATION WASTE & VENT
——GW——	GREASE WASTE
——GV——	GREASE VENT
——IW——	INDIRECT WASTE
——ORL——	OVERFLOW RAIN LEADER
——RL——	RAIN LEADER
——ST——	STORM DRAIN
——CD——	CONDENSATE DRAIN
——G——	GAS
——[HT]——	HEAT TRACED
Ⓜ	WATER METER ASSEMBLY
G	GAS METER ASSEMBLY
TP	TRAP PRIMER
ETP	ELECTRONIC TRAP PRIMER

MAXIMUM HOT WATER ROUGH IN LENGTH

NOMINAL PIPE SIZE	MAXIMUM PIPE LENGTH FROM END OF HEAT TRACE OR RECIRCULATED MAIN TO FIXTURE STOP (FEET)
PUBLIC LAVATORIES	
1/2"	2
3/4" AND LARGER	0.5
OTHER FIXTURES AND APPLIANCES	
1/2"	43
3/4"	21
1"	16
1-1/4"	8
1-1/2"	6
2" AND LARGER	4

IECC TABLE C404.5.1

FITTINGS AND VALVES

	BALL VALVE
	DIRECTION OF FLUID FLOW
	GATE VALVE
	BUTTERFLY VALVE
	CALIBRATED BALANCING VALVE
	CIRCUIT SETTER
	GAS COCK
	CHECK VALVE
	PRESSURE REDUCING VALVE
	THERMOSTATIC MIXING VALVE
	SOLENOID VALVE
	DRAIN VALVE WITH HOSE END, CAP & CHAIN OR HOSE BIBB
	WALL HYDRANT
	TAKEOFF FROM TOP OF MAIN PIPE
	TAKEOFF FROM BOTTOM OF MAIN PIPE
	UNION
	PIPE ELBOW UP OR PIPE TEE UP
	PIPE ELBOW DOWN
	PIPE TEE DOWN
	WALL CLEANOUT OR BLIND FLANGE
	FLOOR CLEANOUT
	"P" TRAP
	ROUND FLOOR DRAIN
	FLOOR SINK
	STRAINER OR STRAINER WITH BLOW-DOWN VALVE HOSE END, CAP AND CHAIN
	BACKFLOW PREVENTER (2 1/2" AND LARGER)
	PUMP
	WATER HAMMER ARRESTOR
	PIPE CAP OR CAPPED END OF PIPE
	AIR VENT
	PRESSURE RELIEF SAFETY VALVE
A	AQUASTAT
T	TEMPERATURE SENSOR WITH SEPARABLE SOCKET IN IMMERSIBLE WELL
	THERMOMETER WITH SEPARABLE SOCKET IN IMMERSIBLE WELL
	PRESSURE GAUGE

MIN. SLOPE OF HORIZONTAL DRAINAGE PIPE

SIZE (IN)	MIN. SLOPE (IN PER FOOT)
LESS THAN 3"	1/4
3" TO 6"	1/8

PLUMBING GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN COMPLIANCE WITH CURRENT APPLICABLE CODES, ORDINANCES, THE REGULATORY AGENCIES HAVING JURISDICTION AND THE SPECIFICATIONS. THE SPECIFICATIONS MAY EXCEED THE REQUIREMENTS OF THE CODE, IN WHICH CASE, THE SPECIFICATION MUST BE FOLLOWED.
2. THE INTENT OF THESE DOCUMENTS IS FOR THE MEP TRADES TO FURNISH AND INSTALL COMPLETE MECHANICAL AND ELECTRICAL SYSTEMS. THE SPECIFIED PLUMBING SYSTEM SHALL BE COMPLETE IN ALL RESPECTS; OPERATIONAL, TESTED, ADJUSTED, APPROVED BY THE AUTHORITIES HAVING JURISDICTION AND READY FOR BENEFICIAL USE BY THE OWNER.
3. THE TRADES SHALL OBTAIN AND REVIEW ALL CONTRACT DOCUMENTS BEFORE SUBMITTING A BID. INFORMATION IS PROVIDED ON THE VARIOUS DRAWINGS, SCHEDULES, SPECIFICATIONS AND ALL OF THE VARIOUS DOCUMENTS IN THE BIDDING PACKAGE. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY AND FORM A TOTAL PROJECT DESIGN AND INFORMATION SOURCE FOR CONSTRUCTION PURPOSES.
4. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT. COORDINATE LOCATIONS OF EQUIPMENT WITH OTHER TRADES BEFORE AND DURING CONSTRUCTION. ANY MODIFICATION TO THE EQUIPMENT LAYOUT, REQUIRED FOR INSTALLATION, IS TO BE PERFORMED UNDER THE CONTRACT AGREEMENT, AT NO ADDITIONAL COST. REFER TOP DETAILS, SCHEDULES AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
5. THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH THE PROJECT DOCUMENTS OF ALL TRADES. THE DRAWINGS ARE DIAGRAMMATIC AND SHOW THE GENERAL ARRANGEMENT OF EQUIPMENT AND PIPING. THE CONTRACTOR SHALL COORDINATE THE EXACT LOCATION OF EQUIPMENT AND PIPING INSTALLATION WITH ALL THE TRADES BEFORE COMMENCING WORK.
6. EQUIPMENT SHALL BE INSTALLED IN ACCESSIBLE LOCATIONS. WHEN EQUIPMENT MUST BE LOCATED ABOVE AN INACCESSIBLE CEILING (GYP BOARD OR EQUIVALENT), OR BEHIND A WALL, AN APPROPRIATE ACCESS DOOR SHALL BE PROVIDED. IF AN ACCESS DOOR IS REQUIRED, IT SHALL BE OF A RATING APPROPRIATE FOR THE WALL/CEILING IN WHICH IT IS TO BE INSTALLED. THE CONTRACTOR SHALL COORDINATE LOCATIONS OF ACCESS PANELS FOR ALL VALVES AND DEVICES, REQUIRING ACCESS, WITH THE ARCHITECT, PRIOR TO INSTALLATION OF SUCH DEVICES OR OTHER APPURTENANCES.
7. WHERE A CONFLICT OCCURS BETWEEN THE DOCUMENTS, IT SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT. CARRY AS PART OF THE BID THE LARGER QUANTITY AND/OR MORE EXPENSIVE ITEM(S).
8. THIS CONTRACT SHALL INCLUDE ALL THE NECESSARY PIPING, FITTINGS, TRANSITIONS, OFFSETS, ETC. AS REQUIRED TO INSTALL PIPING, EQUIPMENT, MAINTAINING PROPER CLEARANCES AND TO AVOID ANY CONFLICTS WITH OTHER TRADES, AND THE BUILDING STRUCTURE. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY ASSUMPTIONS, OMISSIONS OR ERRORS HE MAKES AS A RESULT OF HIS FAILURE TO COORDINATE WITH OTHER TRADES OR BECOME FULLY FAMILIAR WITH THE PROJECT DOCUMENTS OF ALL TRADES.
9. DO NOT INSTALL ANY PIPING OVER ELECTRICAL PANELS, TRANSFORMERS, SPECIAL EQUIPMENT, OR THROUGH ELECTRICAL ROOMS, DATA ROOMS, ELEVATOR MACHINE ROOM, STAIRWELL OR STAIRWELL WALLS THAT ARE NOT ASSOCIATED WITH OR SERVE THE RESPECTIVE ROOMS. COORDINATE THE LOCATION OF ELECTRICAL EQUIPMENT IN THE FIELD AND ADJUST AS NECESSARY.
10. IT IS NOT THE INTENT OF THE DRAWINGS TO SHOW INDIVIDUAL BRANCH PIPING TO EACH PLUMBING FIXTURE; ONLY THE BRANCH PIPING TO GROUPS OF FIXTURES IS INDICATED. EACH AND EVERY FIXTURE SHALL BE PROPERLY PIPED TO WATER, WASTE, AND VENT PIPING SYSTEMS. REFER TO THE PLUMBING SCHEDULES FOR INDIVIDUAL PIPE SIZES TO EACH FIXTURE.
11. PROVIDE PROPER PIPING SYSTEM IDENTIFICATION LABELS, SLOPES FOR DRAIN PIPING, CLEANOUTS, HANGERS, ETC. IN ACCORDANCE WITH THE PLUMBING CODE.
12. REFER TO THE ARCHITECTURAL DRAWINGS FOR THE EXACT LOCATION AND MOUNTING HEIGHTS OF PLUMBING FIXTURES OR EQUIPMENT. ALL SUCH EQUIPMENT AND EQUIPMENT COLORS AND FINISHES SHALL BE COORDINATED WITH THE ARCHITECT. MOUNTING HEIGHTS SHALL BE APPROVED BY THE ARCHITECT.
13. INSTALL WATER HAMMER ARRESTORS (WHA) AT ALL QUICK CLOSING VALVES (FLUSH VALVES, SOLENOID VALVES, ETC.); SIZE SHALL BE BASED ON FIXTURE UNITS PER PDI STANDARDS AND INSTALLED PER MANUFACTURER'S RECOMMENDATION.
14. ALL PIPING, DRAINS, STRAINERS, FAUCETS, FAUCET AERATORS, FILTERS, ETC. SHALL BE THOROUGHLY CLEANED AND FLUSHED IMMEDIATELY BEFORE PROJECT COMPLETION. PROVIDE CERTIFICATION ON CONTRACTOR'S LETTER HEAD THAT THIS WORK HAS BEEN COMPLETED.
15. DOMESTIC WATER DROPS AND RISERS INSTALLED IN EXTERIOR WALLS SHALL BE INSTALLED ON THE WARM SIDE OF INSULATION AND THE LOCATION SHALL BE MADE INFILTRATION FREE.
16. BEFORE INSTALLATION, COORDINATE THE WORK WITH OWNER-FURNISHED EQUIPMENT, INCLUDING REQUIRED SERVICE CONNECTIONS, FACTORY START UPS AND INSTALLATION OF FIELD DEVICES.
17. PIPE ALL CONDENSATE DRAINS FROM MECHANICAL EQUIPMENT COOLING COILS, BY GRAVITY (INTERIOR AIR HANDLING UNITS, FAN COIL UNITS, AC UNITS, ETC.) TO FLOOR DRAINS, JANITOR'S SINKS OR OTHER APPROVED LOCATION THROUGH AN AIR GAP. EACH CONDENSATE DRAIN SHALL BE TRAPPED AT THE EQUIPMENT DRAIN OUTLET, REFER TO TRAP DETAILS ON DRAWINGS. COORDINATE EXACT LOCATION OF EQUIPMENT WITH THE HVAC CONTRACTOR AND ADJUST AS NECESSARY.
18. INSULATE ALL WASTE ABOVE SLAB RECEIVING CONDENSATE FROM EQUIPMENT INCLUDING "P" TRAPS AND BRANCH WASTE PIPING
19. ALL INDIRECT WASTE DRAINS SHALL BE PIPED TO FLOOR DRAINS, FUNNELS OR FIXED AIR GAP FITTINGS, THROUGH AIR GAP OR TO A SINK DRAIN TAILPIECE.
20. INSTALL TRAP PRIMERS OR TRAP GUARD SEALER FOR FLOOR DRAINS, HUB DRAINS AND FIXED AIR GAP FITTINGS, WHERE TRAP IS SUBJECT TO LOSS OF SEAL BY EVAPORATION, CONNECT TRAP PRIMER TO COLD WATER LINE. PROVIDE ISOLATION VALVES AND EXTEND SLOPED PRIMING LINE TO DRAIN TRAPS.
21. COORDINATE ALL PLUMBING EQUIPMENT REQUIRING POWER, FOR EXACT LOCATION AND POWER REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR.
22. ALL EXTERIOR EXPOSED GAS PIPING SHALL BE PRIMED AND PAINTED.
23. FLOOR MOUNTED PLUMBING EQUIPMENT SHALL BE INSTALLED ON A 6" CONCRETE HOUSE-KEEPING PAD. COORDINATE SIZE AND FINAL LOCATION OF ALL CONCRETE PADS WITH THE STRUCTURAL ENGINEER. PADS SHALL BE MINIMUM 6" LARGER THAN THE EQUIPMENT IN BOTH HORIZONTAL DIRECTIONS.
24. COORDINATE EXACT LOCATION OF PLUMBING SERVICES ENTERING THE BUILDING WITH THE SITE CONTRACTOR AND UTILITY DRAWINGS PRIOR TO INSTALLATION. COORDINATE ALL FOUNDATION WALL PENETRATIONS AND INVERT ELEVATIONS WITH THE GENERAL CONTRACTOR AND/OR CONSTRUCTION MANAGER BEFORE COMMENCING WORK.
25. SEISMICALLY SUPPORT THE EQUIPMENT AS REQUIRED BY CODE, THE AUTHORITY HAVING JURISDICTION, AND/OR AS SPECIFIED. SUBMIT ENGINEERED INSTALLATION DETAILS PER THE SPECIFICATIONS. THE CONTRACTOR'S SEISMIC ENGINEER SHALL REVIEW THE INSTALLATION AND PROVIDE A DETAILED REPORT FOR THE RECORD.
26. PROVIDE PIPE EXPANSION COMPENSATION FOR THE VARIOUS PIPING SYSTEMS. SUBMIT ENGINEERED DETAILS FOR APPROVAL AND VERIFY INSTALLATION IS IN ACCORDANCE WITH THE CODE. THE CONTRACTOR'S CONSULTING ENGINEER SHALL REVIEW THE INSTALLATION AND PROVIDE A REPORT OF THE FINDINGS.

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RENOVATIONS TO:
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345 MIX STREET
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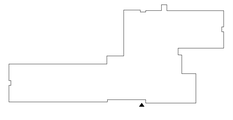
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING GENERAL INFORMATION

P0.1

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UNDERSLAB GENERAL NOTES

1. VERIFY ALL DIMENSIONS AND ELEVATIONS IN FIELD PRIOR TO INSTALLATION.
2. ALL WORK SHOWN SHALL BE PERFORMED BY PLUMBING CONTRACTOR UNLESS OTHERWISE NOTED.
3. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING INVERTS, UTILITY CONNECTIONS, AND SLAB ELEVATIONS PRIOR TO INSTALLATION. REPORT ANY CONFLICTS TO ENGINEER BEFORE PROCEEDING.
4. RUN ALL PIPING WITHIN EXISTING UTILITY TUNNEL WHERE POSSIBLE.
5. ALL UNDER-SLAB PIPING SHALL BE INSTALLED ON COMPACTED SUBGRADE WITH 4" MIN SAND OR FINE GRAVEL BEDDING. BACKFILL AND COMPACT PER STRUCTURAL REQUIREMENTS.
6. COORDINATE ALL PIPE ROUTES AND PENETRATIONS THROUGH GRADE BEAMS WITH STRUCTURAL PRIOR TO CONCRETE PLACEMENT.
7. PROVIDE PVC OR STEEL SLEEVES THROUGH GRADE BEAMS WITH 1" MIN ANNULAR CLEARANCE AROUND PIPE. SEAL WITH NON-SHRINK GROUT OR FLEXIBLE FIRESTOP SEALANT. FIELD CORING OF REINFORCED GRADE BEAMS IS NOT PERMITTED WITHOUT STRUCTURAL APPROVAL.
8. PIPING LAYOUTS ARE DIAGRAMMATIC. COORDINATE ROUTING TO AVOID CONFLICTS WITH FOUNDATIONS, REINFORCING, AND OTHER UTILITIES.
9. ALL BELOW-GRADE MATERIALS SHALL BE SUITABLE FOR UNDER-SLAB USE AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
10. TEST ALL UNDER-SLAB SANITARY AND STORM PIPING FOR LEAKS PRIOR TO COVER OR CONCRETE POUR.
11. PROVIDE CLEANOUTS AT CHANGES OF DIRECTION >45°, AT BASE OF STACKS, AND AT INTERVALS PER CODE. CLEANOUTS SHALL BE ACCESSIBLE AFTER SLAB POUR.
12. COORDINATE ALL CLEANOUT LOCATIONS WITH ARCHITECT.
13. MAINTAIN REQUIRED COVER UNDER STRUCTURAL SLABS AND COORDINATE ALL TRENCHES AND RECESSES WITH STRUCTURAL.
14. PROVIDE WATERPROOF SLEEVES AND SEALANTS AT ALL EXTERIOR WALL AND FOUNDATION PENETRATIONS. ALL JOINTS BELOW SLAB SHALL BE WATERTIGHT.
15. PLUMBING CONTRACTOR TO PROVIDE SEALING AND FIRESTOPPING OF ALL PENETRATIONS THROUGH FIRE-RATED FLOOR/WALL ASSEMBLIES.
16. GREASE INTERCEPTOR SIZING, SELECTION, AND LOCATION SHALL BE DETERMINED BY CIVIL ENGINEER IN ACCORDANCE WITH LOCAL CODE AND AHJ REQUIREMENTS. COORDINATE FINAL MODEL, CAPACITY, AND INSTALLATION WITH ARCH., PLUMBING, AND SITE DRAWINGS PRIOR TO CONSTRUCTION.
17. RADON MITIGATION SYSTEM SHALL BE PER STRUCTURAL DRAWINGS. COORDINATE PIPE ROUTING, SLEEVES, FOUNDATION PENETRATIONS, AND ROOF TERMINATIONS WITH MECH. EQUIPMENT.

PLUMBING KEYNOTES

P01 NEW SAN. DISCHARGE TO SITE. REFER TO CIVIL FOR CONT. & CONNECTION. COORD. INVERTS & ROUTING W/ CIVIL & FIELD CONDITIONS.

P21 UP TO FCO

P22 3" ST RISER UP

P24 4" ST RISER UP

P25 2" UP TO HS-1

P26 4" UP TO WC-2A

P27 2" V UP

P28 2" UP TO LAV-2A

P29 2" UP TO FD-1

P35 6" RADON VENT PIPING. INSTALL UNDERGROUND RADON COLLECTION PIPING AS SHOWN AND CONNECT TO RISER(S) FOR VENTING THROUGH ROOF. TERMINATE IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS AND LOCATE A MINIMUM OF 25'-0" FROM ALL OUTSIDE AIR INTAKES, OPERABLE WINDOWS, DOORS, AND OTHER BUILDING OPENINGS. COORDINATE INSTALLATION WITH STRUCTURAL, SITE, AND FOUNDATION REQUIREMENTS.

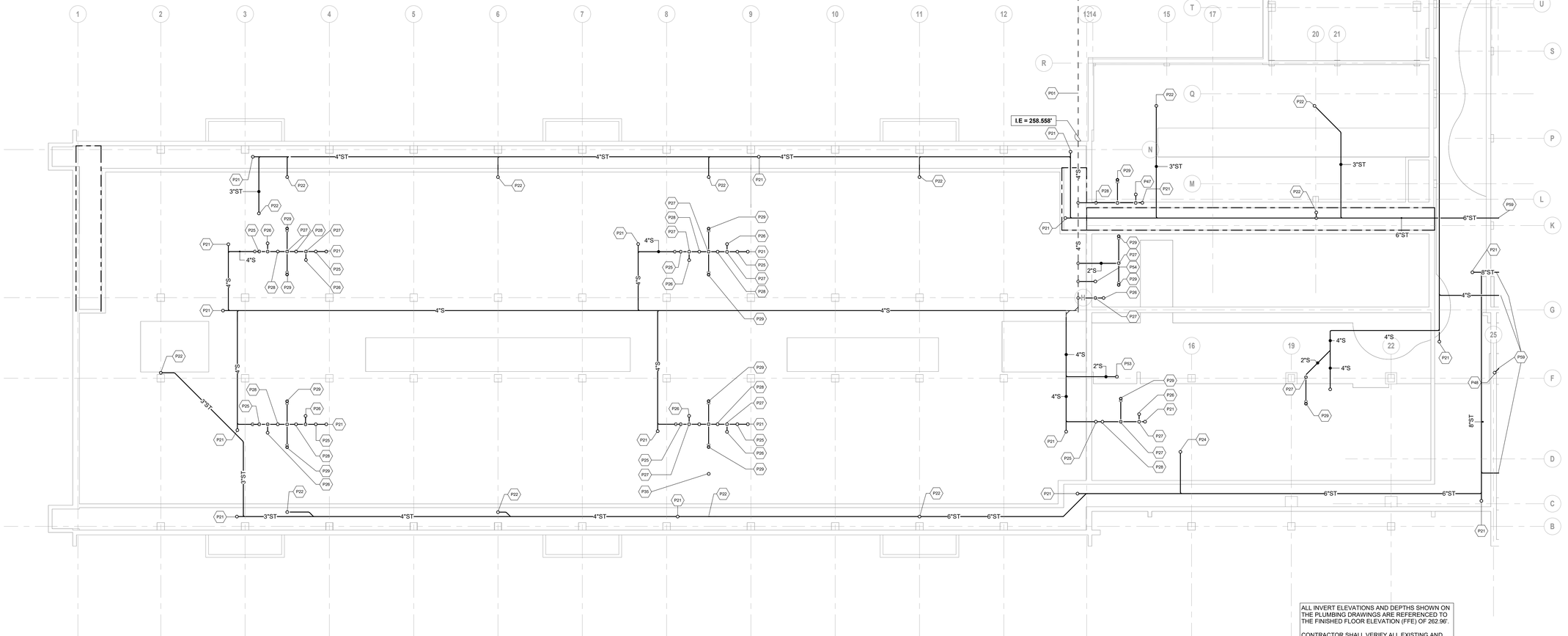
P47 4"W UP TO WC-1A

P48 2" S UP TO LAV-1A

P53 2"W UP TO EWC

P54 4" GV UP TO VTR

P59 REFER TO P1.0B FOR CONT.



ALL INVERT ELEVATIONS AND DEPTHS SHOWN ON THE PLUMBING DRAWINGS ARE REFERENCED TO THE FINISHED FLOOR ELEVATION (FFE) OF 262.96'.

CONTRACTOR SHALL VERIFY ALL EXISTING AND PROPOSED ELEVATIONS IN THE FIELD AND COORDINATE WITH CIVIL DRAWINGS PRIOR TO CONSTRUCTION.

1 BASEMENT DRAINAGE PLAN - AREA A
1/8" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT DRAINAGE PLAN - AREA A

P1.0A

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UNDERSLAB GENERAL NOTES

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3. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING INVERTS, UTILITY CONNECTIONS, AND SLAB ELEVATIONS PRIOR TO INSTALLATION. REPORT ANY CONFLICTS TO ENGINEER BEFORE PROCEEDING.
4. RUN ALL PIPING WITHIN EXISTING UTILITY TUNNEL WHERE POSSIBLE.
5. ALL UNDER-SLAB PIPING SHALL BE INSTALLED ON COMPACTED SUBGRADE WITH 4" MIN SAND OR FINE GRAVEL BEDDING. BACKFILL AND COMPACT PER STRUCTURAL REQUIREMENTS.
6. COORDINATE ALL PIPE ROUTES AND PENETRATIONS THROUGH GRADE BEAMS WITH STRUCTURAL PRIOR TO CONCRETE PLACEMENT.
7. PROVIDE PVC OR STEEL SLEEVES THROUGH GRADE BEAMS WITH 1" MIN ANNULAR CLEARANCE AROUND PIPE. SEAL WITH NON-SHRINK GROUT OR FLEXIBLE FIRESTOP SEALANT. FIELD CORING OF REINFORCED GRADE BEAMS IS NOT PERMITTED WITHOUT STRUCTURAL APPROVAL.
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12. COORDINATE ALL CLEANOUT LOCATIONS WITH ARCHITECT.
13. MAINTAIN REQUIRED COVER UNDER STRUCTURAL SLABS AND COORDINATE ALL TRENCHES AND RECESSES WITH STRUCTURAL.
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PLUMBING KEYNOTES

P21 UP TO FCO

P22 3" ST RISER UP

P24 4" ST RISER UP

P25 2" UP TO HS-1

P26 4" UP TO WC-2A

P27 2" V UP

P28 2" UP TO LAV-2A

P29 2" UP TO FD-1

P30 NEW 8" STORM TO EXISTING SITE STORM DRAIN REFER TO CIVIL FOR CONT. & CONNECTION. COORD. INVERTS & ROUTING W/ CIVIL & FIELD CONDITIONS. INVERT ELEVATION AT BUILDING EXIT : CONTRACTOR SHALL VERIFY ELEVATION IN FIELD AND MAINTAIN REQUIRED SLOPE TO POINT OF CONNECTION

P31 NEW CONCRETE PIT FOR DUPLEX SEWAGE EJECTOR SYSTEM (SP-1 & SP-2). PROVIDE (2) 2" DISCHARGE RISERS & 2" VENT. INSTALL CHECK VALVE AND ISOLATION VALVE ON EACH DISCHARGE LINE. COORDINATE POWER AND CONTROLS WITH ELECTRICAL. REFER TO SCHEDULE AND DETAIL SHEETS FOR ADDITIONAL REQUIREMENTS. PIT CONSTRUCTION BY STRUCTURAL.

P32 3" PD TO TIE INTO GRAVITY SANITARY LINE. PROVIDE WYE FITTING IN DIRECTION OF FLOW COORDINATE EXACT CONNECTION LOCATION AND INVERT WITH FIELD CONDITIONS.

P33 4" UP TO FD-2

P35 6" RADON VENT PIPING. INSTALL UNDERGROUND RADON COLLECTION PIPING AS SHOWN AND CONNECT TO RISER(S) FOR VENTING THROUGH ROOF. TERMINATE IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS AND LOCATE A MINIMUM OF 25'-0" FROM ALL OUTSIDE AIR INTAKES, OPERABLE WINDOWS, DOORS, AND OTHER BUILDING OPENINGS. COORDINATE INSTALLATION WITH STRUCTURAL, SITE, AND FOUNDATION REQUIREMENTS.

P39 4" W UP TO FS-1

P40 4" W UP TO FD-1

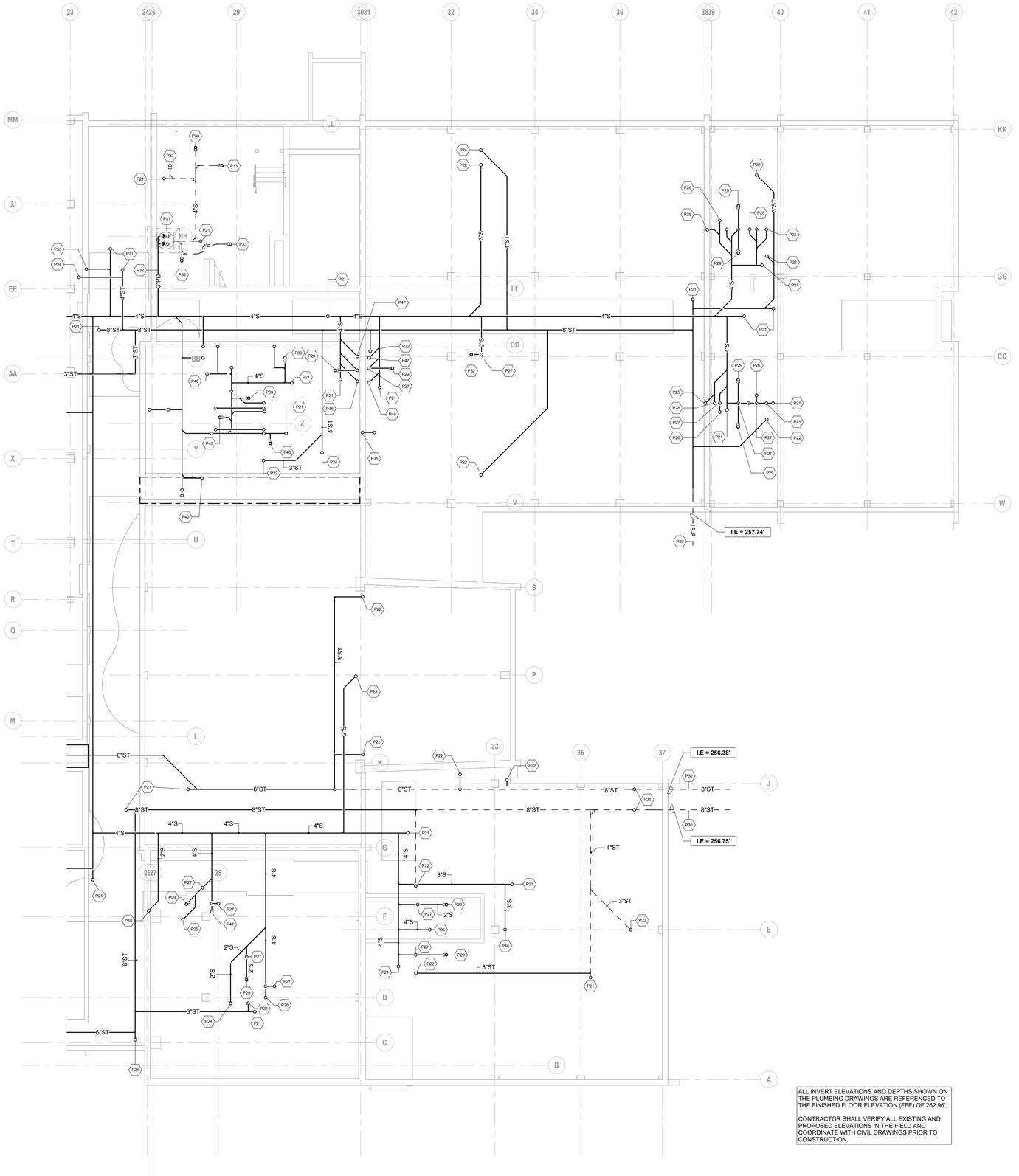
P46 3" W UP TO HS-1

P47 4"W UP TO WC-1A

P48 2" S UP TO LAV-1A

P52 2"S UP TO JS-1

P53 2"W UP TO EWC



1 BASEMENT DRAINAGE PLAN - AREA B
1/8" = 1'-0"

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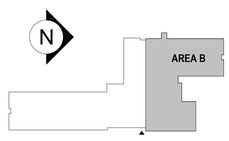

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

BASEMENT DRAINAGE PLAN - AREA B

P1.0B

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5. PROVIDE WATERPROOF SLEEVES AND SEALANTS AT ALL EXTERIOR WALL AND FOUNDATION PENETRATIONS.
6. PLUMBING CONTRACTOR TO PROVIDE SEALING AND FIRESTOPPING OF ALL PENETRATIONS THROUGH FIRE RATED FLOOR/WALL ASSEMBLIES.
7. COORDINATE ALL CLEANOUT LOCATIONS (FLOOR AND WALL PLATE CLEANOUT) WITH ARCHITECTURAL LAYOUT.
8. REFER TO PDI "MINIMUM SPACE REQUIREMENT FOR ENCLOSED PLUMBING FIXTURE SUPPORTS" FOR ALL WALL HUNG FIXTURES. COORDINATE EXACT REQUIREMENTS WITH ARCHITECT.
9. FINAL SELECTION AND FINISH OF ALL PLUMBING FIXTURES SHALL BE COORDINATED WITH ARCHITECT/OWNER.
10. REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIXTURE MOUNTING HEIGHTS.
11. PROVIDE TRAP SEALS FOR ALL FLOOR DRAINS INDICATED.

PLUMBING KEYNOTES

P18 3" ST UP TO RD-1

P19 4" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

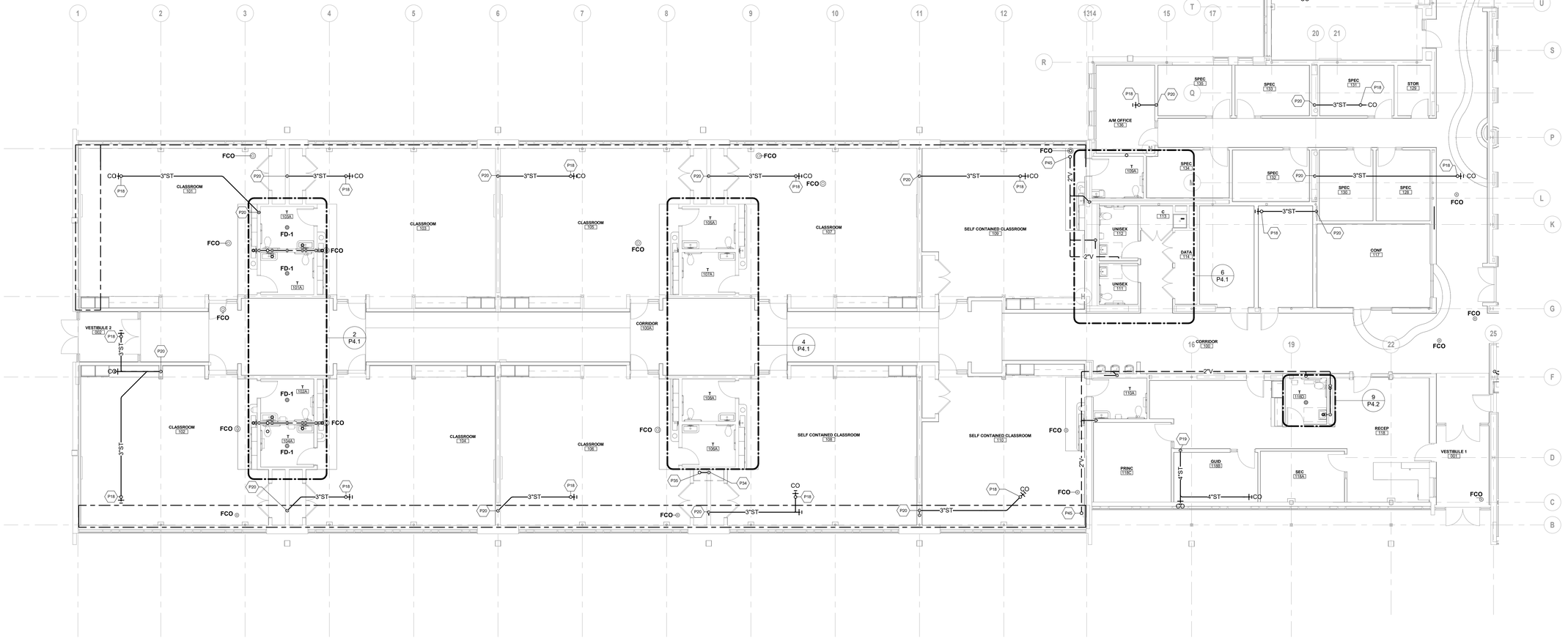
P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P34 APPROXIMATE LOCATION OF RADON COLLECTION PIT. PROVIDE 6" RADON VENT PIPING FROM RADON PIT AND EXTEND THROUGH BUILDING AS SHOWN. RADON PIT BY OTHERS. COORDINATE EXACT PIT LOCATION, SLEEVES, AND FOUNDATION PENETRATIONS WITH STRUCTURAL DRAWINGS.

P35 6" RADON VENT PIPING. INSTALL UNDERGROUND RADON COLLECTION PIPING AS SHOWN AND CONNECT TO RISER(S) FOR VENTING THROUGH ROOF. TERMINATE IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS AND LOCATE A MINIMUM OF 25'-0" FROM ALL OUTSIDE AIR INTAKES, OPERABLE WINDOWS, DOORS, AND OTHER BUILDING OPENINGS. COORDINATE INSTALLATION WITH STRUCTURAL, SITE, AND FOUNDATION REQUIREMENTS.

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

P51 4"ST DN



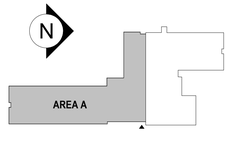
1 FIRST FLOOR DRAINAGE PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
QuinebaugArcamMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR DRAINAGE PLAN - AREA A

P1.1A

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GENERAL NOTES

1. VERIFY ALL DIMENSIONS AND ELEVATIONS IN FIELD PRIOR TO INSTALLATION.
2. ALL WORK SHOWN SHALL BE PERFORMED BY PLUMBING CONTRACTOR UNLESS OTHERWISE NOTED.
3. PIPING LAYOUTS ARE DIAGRAMMATIC. COORDINATE ROUTING TO AVOID CONFLICTS WITH FOUNDATIONS, REINFORCING, AND OTHER UTILITIES.
4. PROVIDE CLEANOUTS AT CHANGES OF DIRECTION >45°, AT BASE OF STACKS, AND AT INTERVALS PER CODE. CLEANOUTS SHALL BE ACCESSIBLE AFTER SLAB POUR.
5. PROVIDE WATERPROOF SLEEVES AND SEALANTS AT ALL EXTERIOR WALL AND FOUNDATION PENETRATIONS.
6. PLUMBING CONTRACTOR TO PROVIDE SEALING AND FIRESTOPPING OF ALL PENETRATIONS THROUGH FIRE RATED FLOOR/WALL ASSEMBLIES.
7. COORDINATE ALL CLEANOUT LOCATIONS (FLOOR AND WALL PLATE CLEANOUT) WITH ARCHITECTURAL LAYOUT.
8. REFER TO PDI "MINIMUM SPACE REQUIREMENT FOR ENCLOSED PLUMBING FIXTURE SUPPORTS" FOR ALL WALL HUNG FIXTURES. COORDINATE EXACT REQUIREMENTS WITH ARCHITECT.
9. FINAL SELECTION AND FINISH OF ALL PLUMBING FIXTURES SHALL BE COORDINATED WITH ARCHITECT/OWNER.
10. REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIXTURE MOUNTING HEIGHTS.
11. PROVIDE TRAP SEALS FOR ALL FLOOR DRAINS INDICATED.

PLUMBING KEYNOTES

P18 3" ST UP TO RD-1

P19 4" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P34 APPROXIMATE LOCATION OF RADON COLLECTION PIT. PROVIDE 6" RADON VENT PIPING FROM RADON PIT AND EXTEND THROUGH BUILDING AS SHOWN. RADON PIT BY OTHERS. COORDINATE EXACT PIT LOCATION, SLEEVES, AND FOUNDATION PENETRATIONS WITH STRUCTURAL DRAWINGS.

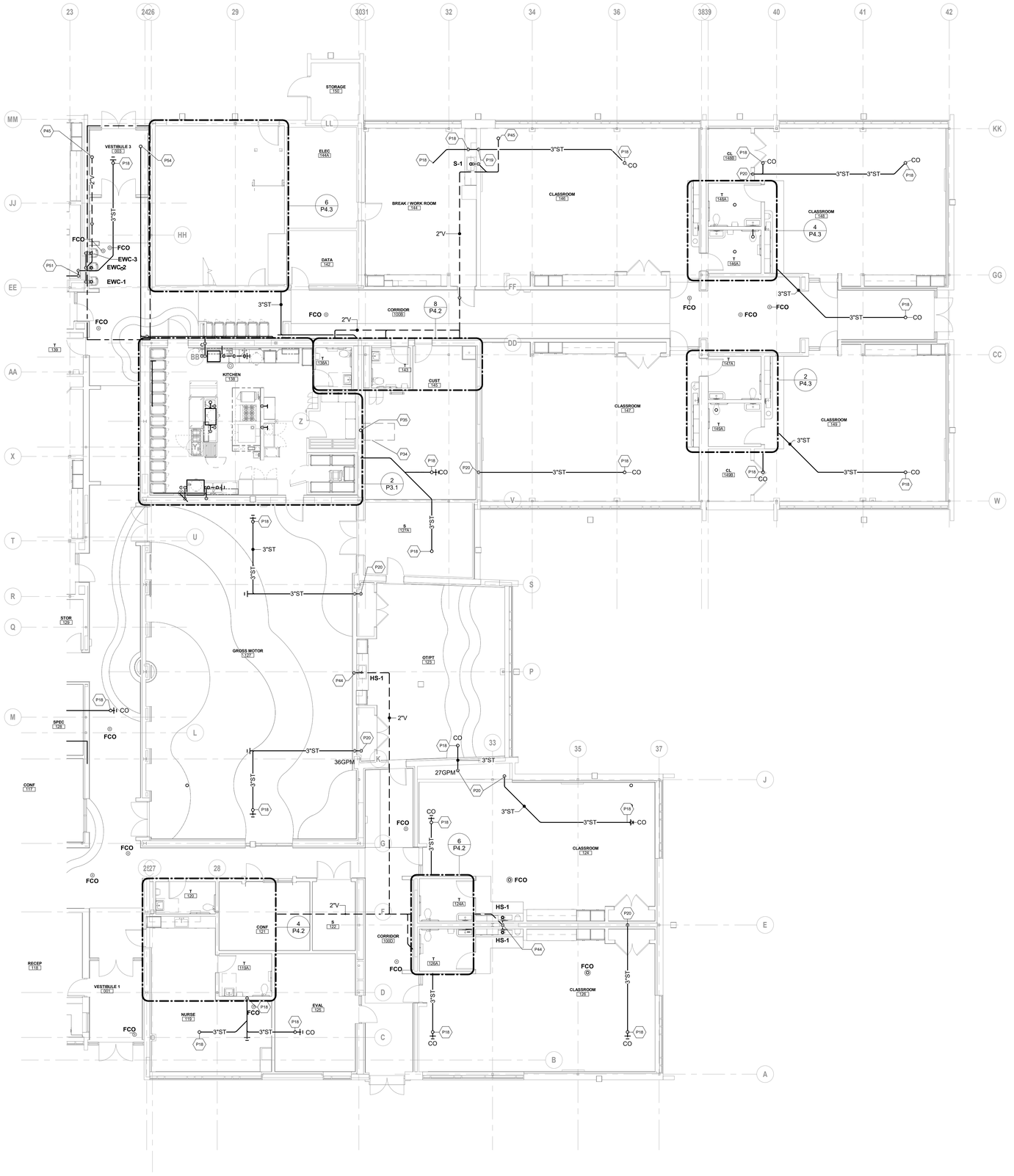
P35 6" RADON VENT PIPING. INSTALL UNDERGROUND RADON COLLECTION PIPING AS SHOWN AND CONNECT TO RISER(S) FOR VENTING THROUGH ROOF. TERMINATE IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS AND LOCATE A MINIMUM OF 25'-0" FROM ALL OUTSIDE AIR INTAKES, OPERABLE WINDOWS, DOORS, AND OTHER BUILDING OPENINGS. COORDINATE INSTALLATION WITH STRUCTURAL, SITE, AND FOUNDATION REQUIREMENTS.

P44 2" W DN & 2" V RISE

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

P51 4"ST DN

P54 4" GV UP TO VTR



1 FIRST FLOOR DRAINAGE PLAN - AREA B
1/8" = 1'-0"

QA+M architecture
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195 Scott Swamp Road
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qamarch.com

GM2

STATE OF CONNECTICUT * KEVIN M. SMITH * 24-31720 * REGISTERED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA B

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR DRAINAGE PLAN - AREA B

P1.1B

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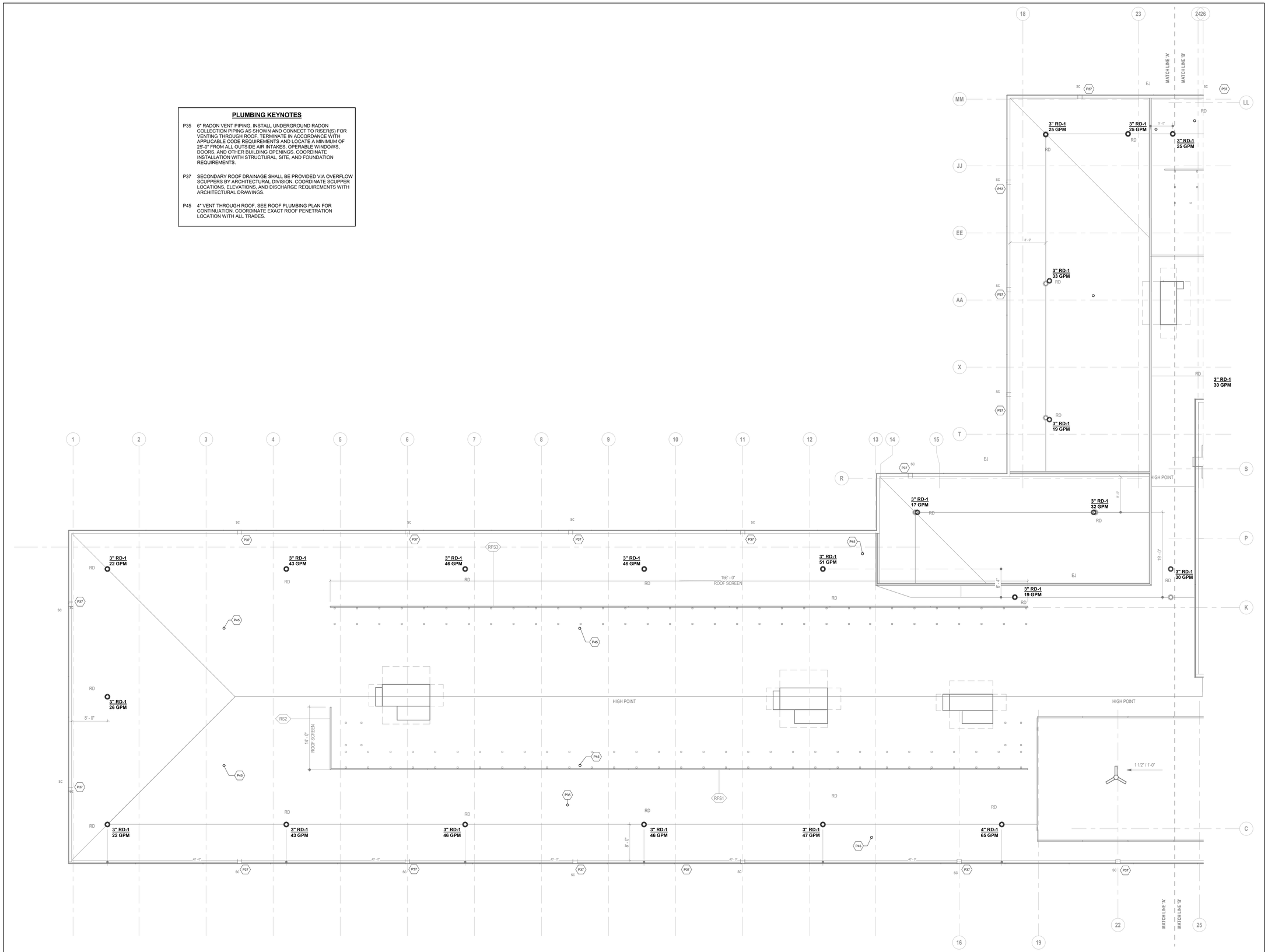
PLUMBING KEYNOTES

P35 6" RADON VENT PIPING. INSTALL UNDERGROUND RADON COLLECTION PIPING AS SHOWN AND CONNECT TO RISER(S) FOR VENTING THROUGH ROOF. TERMINATE IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS AND LOCATE A MINIMUM OF 25'-0" FROM ALL OUTSIDE AIR INTAKES, OPERABLE WINDOWS, DOORS, AND OTHER BUILDING OPENINGS. COORDINATE INSTALLATION WITH STRUCTURAL, SITE, AND FOUNDATION REQUIREMENTS.

P37 SECONDARY ROOF DRAINAGE SHALL BE PROVIDED VIA OVERFLOW SCUPPERS BY ARCHITECTURAL DIVISION. COORDINATE SCUPPER LOCATIONS, ELEVATIONS, AND DISCHARGE REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.



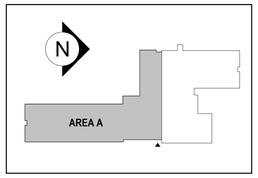
1 PLUMBING ROOF PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
Quisenberry Arcan Malik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
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PLUMBING ROOF PLAN - AREA A

P1.2A

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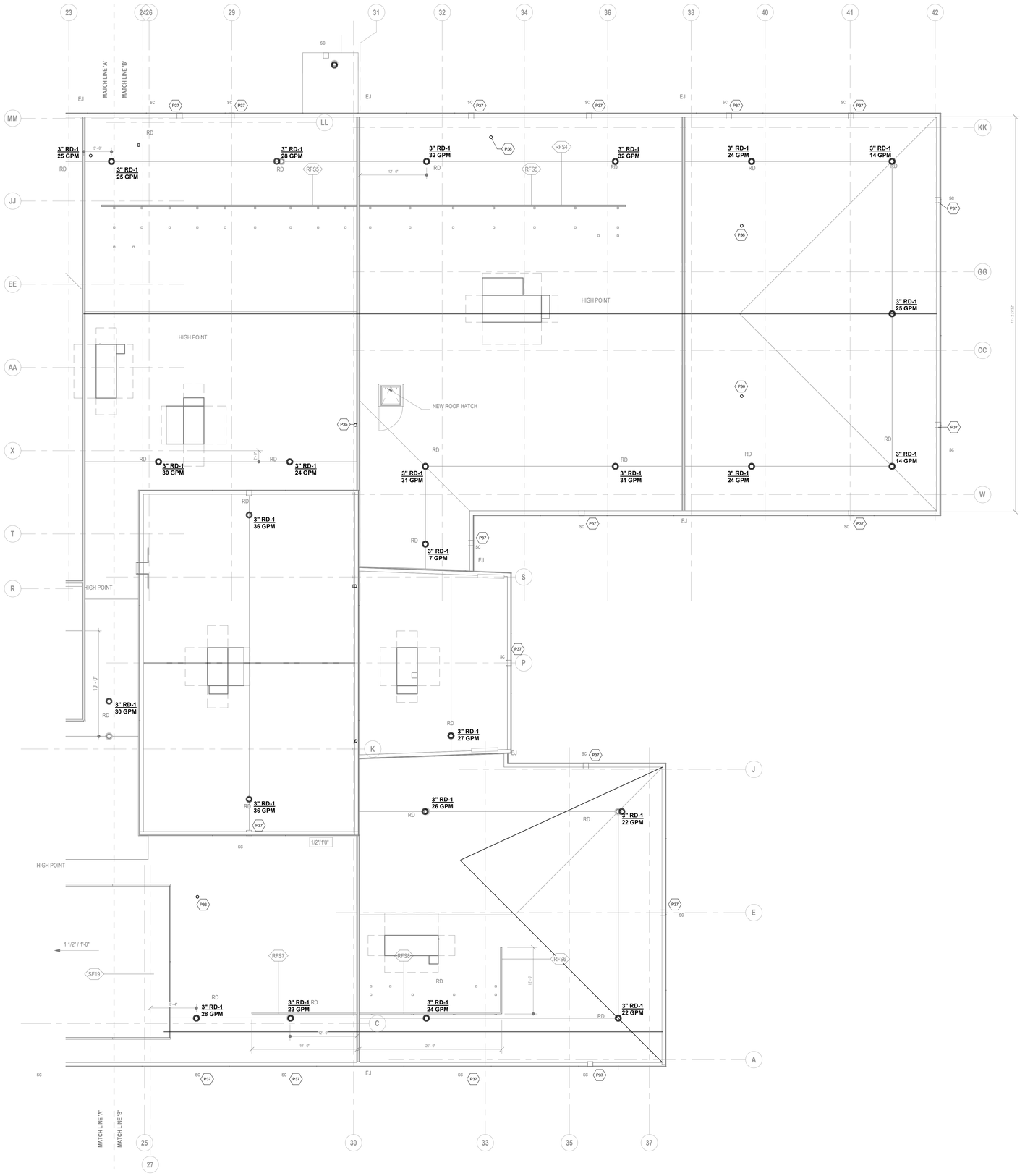
PLUMBING KEYNOTES

P35 6" RADON VENT PIPING. INSTALL UNDERGROUND RADON COLLECTION PIPING AS SHOWN AND CONNECT TO RISER(S) FOR VENTING THROUGH ROOF. TERMINATE IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS AND LOCATE A MINIMUM OF 25'-0" FROM ALL OUTSIDE AIR INTAKES, OPERABLE WINDOWS, DOORS, AND OTHER BUILDING OPENINGS. COORDINATE INSTALLATION WITH STRUCTURAL, SITE, AND FOUNDATION REQUIREMENTS.

P36 NEW 4" VTR.TERMINATE A MINIMUM OF 24" ABOVE ROOF SURFACE OR AS REQUIRED BY CODE. PROVIDE WEATHERPROOF ROOF FLASHING AND COORDINATE FINAL PENETRATION LOCATION WITH STRUCTURAL, ARCHITECTURAL, AND MECHANICAL DRAWINGS.

P37 SECONDARY ROOF DRAINAGE SHALL BE PROVIDED VIA OVERFLOW SCUPPERS BY ARCHITECTURAL DIVISION. COORDINATE SCUPPER LOCATIONS, ELEVATIONS, AND DISCHARGE REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.



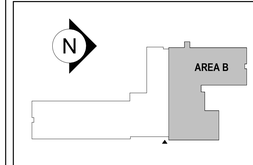
1 PLUMBING ROOF PLAN - AREA B
1/8" = 1'-0"

QA+M architecture
QuisenberryArcanMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING ROOF PLAN - AREA B

P1.2B

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GENERAL NOTES

ALL PLUMBING FIXTURES / APPLIANCES SHALL HAVE THEIR OWN INDEPENDENT SHUT-OFF VALVES, INSTALLED IN AN EASILY ACCESSIBLE AND CONVENIENT LOCATION.

ALL DOMESTIC WATER BRANCH LINES SHALL HAVE THEIR OWN RESPECTIVE SHUT-OFF VALVES.

ANY PRODUCT DESIGNED FOR DISPENSING POTABLE WATER MUST BE LEAD FREE AND MEET BOTH NSF 61 AND NSF 372 TEST STANDARDS VIA THIRD-PARTY TESTING AND CERTIFICATION. LEAD FREE REFERS TO THE WETTED SURFACE OF PIPE, FITTINGS, AND FIXTURES IN POTABLE WATER SYSTEMS THAT HAVE A WEIGHTED AVERAGE LEAD CONTENT ≤ 0.25% PER THE SAFE DRINKING WATER ACT (SEC. 1417), AMENDED 1-4-2011, AND OTHER EQUIVALENT STATE REGULATIONS.

INSTALL 1" INSULATION ON ALL 1-1/4" AND SMALLER PIPE REQUIRING INSULATION AND 1-1/2" INSULATION ON ALL 1-1/2" AND LARGER PIPE REQUIRING INSULATION.

PROVIDE ACCESS DOORS IN CEILINGS AND WALLS AS REQUIRED TO MAKE VALVES, TRAP PRIMERS, ETC. READILY ACCESSIBLE. COORDINATE LOCATIONS WITH INSTALLATIONS OF VALVES, WATER HAMMER ARRESTERS, AND TRAP PRIMERS IN FIELD DURING CONSTRUCTION.

PLUMBING CONTRACTOR TO INSTALL WATER HAMMER ARRESTORS ON ALL WATER SUPPLIES SERVING QUICK CLOSING FIXTURES PER PDI-WH 201.

REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIXTURE MOUNTING HEIGHTS.

PLUMBING CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS TO ALL PLUMBING FIXTURES AND EQUIPMENT, INCLUDING EQUIPMENT SUPPLIED BY OTHERS.

ALL GAS PIPING SHALL BE IDENTIFIED IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF IFGC 2022. ALL GAS PIPING EXPOSED TO ELEMENTS SHALL BE PAINTED WITH TWO COATS OF OSHA YELLOW ENAMEL PAINT SUITABLE FOR EXTERIOR USE.

ALL GAS-FIRED EQUIPMENT SHALL BE CONNECTED TO GAS PIPING IN ACCORDANCE WITH IFGC 2022. EACH PIECE OF EQUIPMENT SHALL HAVE A DIRT LEG, UNION, GAS COCK, AND REGULATOR WHERE REQUIRED.

PLUMBING CONTRACTOR TO PROVIDE SEALING AND FIRESTOPPING OF ALL PENETRATIONS THROUGH FIRE-RATED FLOOR/WALL ASSEMBLIES.

PROVIDE AN ASSE 1070 APPROVED TEMPERATURE LIMITING DEVICE ON HAND WASH AND LAVATORY SINKS.

FINAL SELECTION AND FINISH OF ALL PLUMBING FIXTURES SHALL BE COORDINATED WITH ARCHITECT/OWNER.

REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIXTURE MOUNTING HEIGHTS.

PROVIDE TRAP PRIMER FOR ALL FLOOR DRAINS INDICATED.

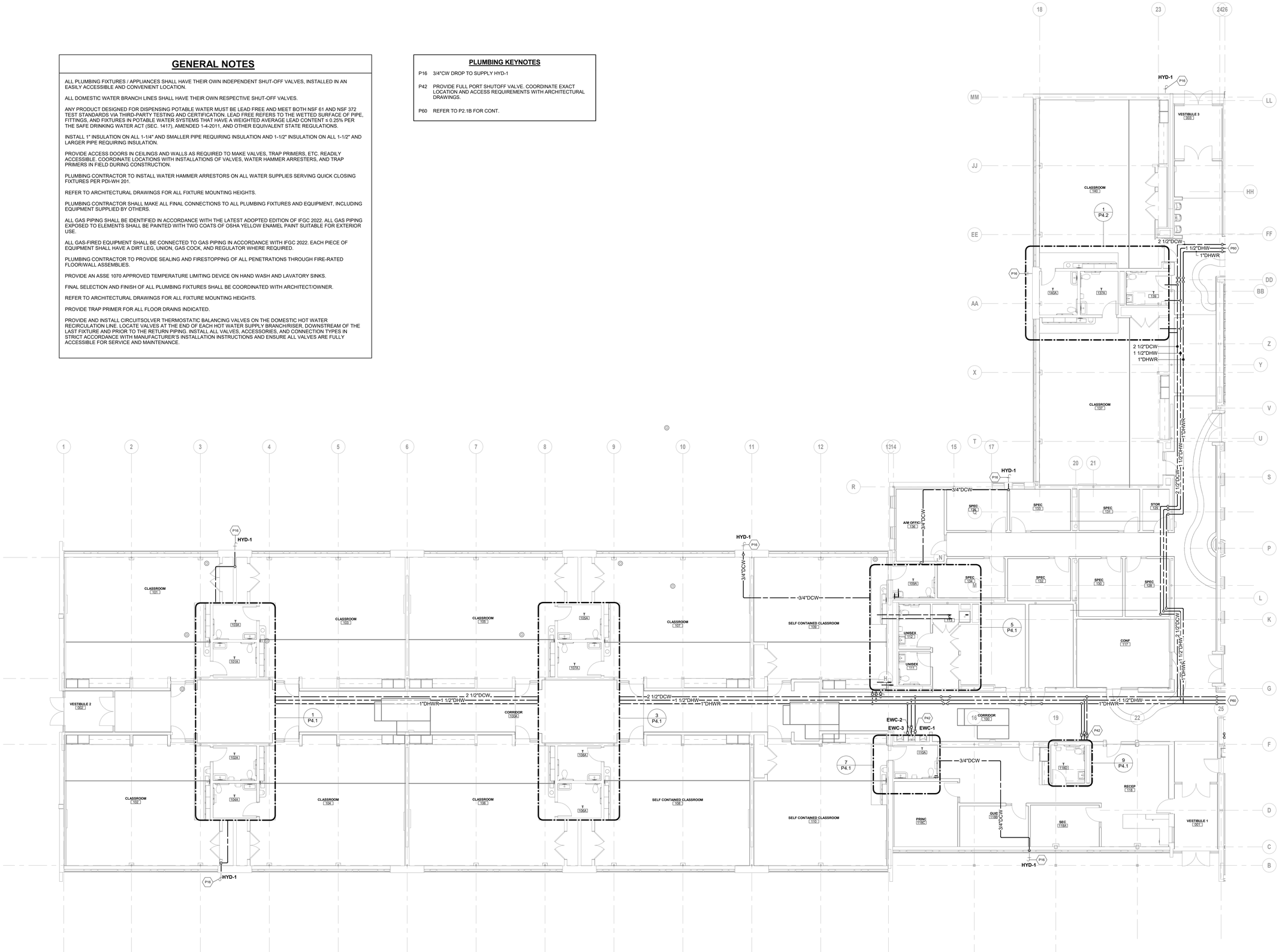
PROVIDE AND INSTALL CIRCUITSOLVER THERMOSTATIC BALANCING VALVES ON THE DOMESTIC HOT WATER RECIRCULATION LINE. LOCATE VALVES AT THE END OF EACH HOT WATER SUPPLY BRANCH/RISER, DOWNSTREAM OF THE LAST FIXTURE AND PRIOR TO THE RETURN PIPING. INSTALL ALL VALVES, ACCESSORIES, AND CONNECTION TYPES IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS AND ENSURE ALL VALVES ARE FULLY ACCESSIBLE FOR SERVICE AND MAINTENANCE.

PLUMBING KEYNOTES

P16 3/4"CW DROP TO SUPPLY HYD-1

P42 PROVIDE FULL PORT SHUTOFF VALVE. COORDINATE EXACT LOCATION AND ACCESS REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.

P60 REFER TO P2.1B FOR CONT.



1 FIRST FLOOR PLUMBING SUPPLY PLAN - AREA A
1/8" = 1'-0"

QA+M architecture
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Farmington, CT 06032
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GM2

STATE OF CONNECTICUT
JOSEPH A. MALIK
No. 21720
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR PLUMBING SUPPLY PLAN - AREA A

P2.1A

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GENERAL NOTES

ALL PLUMBING FIXTURES / APPLIANCES SHALL HAVE THEIR OWN INDEPENDENT SHUT-OFF VALVES, INSTALLED IN AN EASILY ACCESSIBLE AND CONVENIENT LOCATION.

ALL DOMESTIC WATER BRANCH LINES SHALL HAVE THEIR OWN RESPECTIVE SHUT-OFF VALVES.

ANY PRODUCT DESIGNED FOR DISPENSING POTABLE WATER MUST BE LEAD FREE AND MEET BOTH NSF 61 AND NSF 372 TEST STANDARDS VIA THIRD-PARTY TESTING AND CERTIFICATION. LEAD FREE REFERS TO THE WETTED SURFACE OF PIPE, FITTINGS, AND FIXTURES IN POTABLE WATER SYSTEMS THAT HAVE A WEIGHTED AVERAGE LEAD CONTENT ≤ 0.25% PER THE SAFE DRINKING WATER ACT (SEC. 1417), AMENDED 1-4-2011, AND OTHER EQUIVALENT STATE REGULATIONS.

INSTALL 1" INSULATION ON ALL 1-1/4" AND SMALLER PIPE REQUIRING INSULATION AND 1-1/2" INSULATION ON ALL 1-1/2" AND LARGER PIPE REQUIRING INSULATION.

PROVIDE ACCESS DOORS IN CEILINGS AND WALLS AS REQUIRED TO MAKE VALVES, TRAP PRIMERS, ETC. READILY ACCESSIBLE. COORDINATE LOCATIONS WITH INSTALLATIONS OF VALVES, WATER HAMMER ARRESTERS, AND TRAP PRIMERS IN FIELD DURING CONSTRUCTION.

PLUMBING CONTRACTOR TO INSTALL WATER HAMMER ARRESTORS ON ALL WATER SUPPLIES SERVING QUICK CLOSING FIXTURES PER PDI-WH 201.

REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIXTURE MOUNTING HEIGHTS.

PLUMBING CONTRACTOR SHALL MAKE ALL FINAL CONNECTIONS TO ALL PLUMBING FIXTURES AND EQUIPMENT, INCLUDING EQUIPMENT SUPPLIED BY OTHERS.

ALL GAS PIPING SHALL BE IDENTIFIED IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF IFGC 2022. ALL GAS PIPING EXPOSED TO ELEMENTS SHALL BE PAINTED WITH TWO COATS OF OSHA YELLOW ENAMEL PAINT SUITABLE FOR EXTERIOR USE.

ALL GAS-FIRED EQUIPMENT SHALL BE CONNECTED TO GAS PIPING IN ACCORDANCE WITH IFGC 2022. EACH PIECE OF EQUIPMENT SHALL HAVE A DIRT LEG, UNION, GAS COCK, AND REGULATOR WHERE REQUIRED.

PLUMBING CONTRACTOR TO PROVIDE SEALING AND FIRESTOPPING OF ALL PENETRATIONS THROUGH FIRE-RATED FLOOR/WALL ASSEMBLIES.

PROVIDE AN ASSE 1070 APPROVED TEMPERATURE LIMITING DEVICE ON HAND WASH AND LAVATORY SINKS.

FINAL SELECTION AND FINISH OF ALL PLUMBING FIXTURES SHALL BE COORDINATED WITH ARCHITECT/OWNER.

REFER TO ARCHITECTURAL DRAWINGS FOR ALL FIXTURE MOUNTING HEIGHTS.

PROVIDE TRAP PRIMER FOR ALL FLOOR DRAINS INDICATED.

PROVIDE AND INSTALL CIRCUITSOLVER THERMOSTATIC BALANCING VALVES ON THE DOMESTIC HOT WATER RECIRCULATION LINE. LOCATE VALVES AT THE END OF EACH HOT WATER SUPPLY BRANCH/RISER, DOWNSTREAM OF THE LAST FIXTURE AND PRIOR TO THE RETURN PIPING. INSTALL ALL VALVES, ACCESSORIES, AND CONNECTION TYPES IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS AND ENSURE ALL VALVES ARE FULLY ACCESSIBLE FOR SERVICE AND MAINTENANCE.

PLUMBING KEYNOTES

P04 NEW 4" DOMESTIC WATER SERVICE FROM SITE. REFER TO CIVIL DRAWINGS FOR SIZE, ROUTING, AND CONNECTION LOCATION. PROVIDE OS&Y SHUTOFF VALVE UPON ENTRY INTO BUILDING.

P05 NEW 6" FIRE SPRINKLER SERVICE FROM SITE. REFER TO CIVIL DRAWINGS FOR SIZE, ROUTING, AND CONNECTION LOCATION. PROVIDE OS&Y SHUTOFF VALVE UPON ENTRY INTO BUILDING.

P06 PROVIDE NEW 3" DOUBLE CHECK VALVE BACKFLOW PREVENTER ASSEMBLY. INSTALL IN ACCORDANCE WITH THE STATE OF CONNECTICUT CROSS CONNECTION CONTROL MANUAL, DEPARTMENT OF PUBLIC HEALTH – DRINKING WATER DIVISION.

P07 PROVIDE PRESSURE REDUCING VALVE (PRV). OUTLET PRESSURE TO BE SET AT 60 PSI. CONTRACTOR SHALL ADJUST FINAL SETTING IN FIELD AFTER TESTING TO ENSURE PROPER OPERATION OF ALL FLUSH VALVE FIXTURES AND TO MAINTAIN ADEQUATE RESIDUAL PRESSURE UNDER PEAK DEMAND CONDITIONS. PROVIDE PRESSURE GAUGES UPSTREAM AND DOWNSTREAM OF PRV.

P08 (WH-1) PROVIDE NEW 100 GALLON GAS-FIRED WATER HEATER. INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ALL APPLICABLE CODES.

P09 (ET-1) NEW EXPANDION TANK. (SEE SCHEDULE SHEET)

P10 (TMV-1) THERMOSTATIC MIXING VALVE (SEE SCHEDULE SHEET)

P11 NEW 2" GAS SERVICE EXTENDED BACK TO MAIN. REFER TO UTILITY AND CIVIL DRAWINGS FOR CONNECTION LOCATION AND COORDINATE WITH UTILITY COMPANY.

P12 1 1/4" GAS DROP TO SERVE (2) BOILERS. SPLIT INTO (2) 1" BRANCH CONNECTIONS TO EACH UNIT. PROVIDE SHUTOFF VALVE AND GAS PRESSURE REGULATOR AT EACH CONNECTION AS REQUIRED.

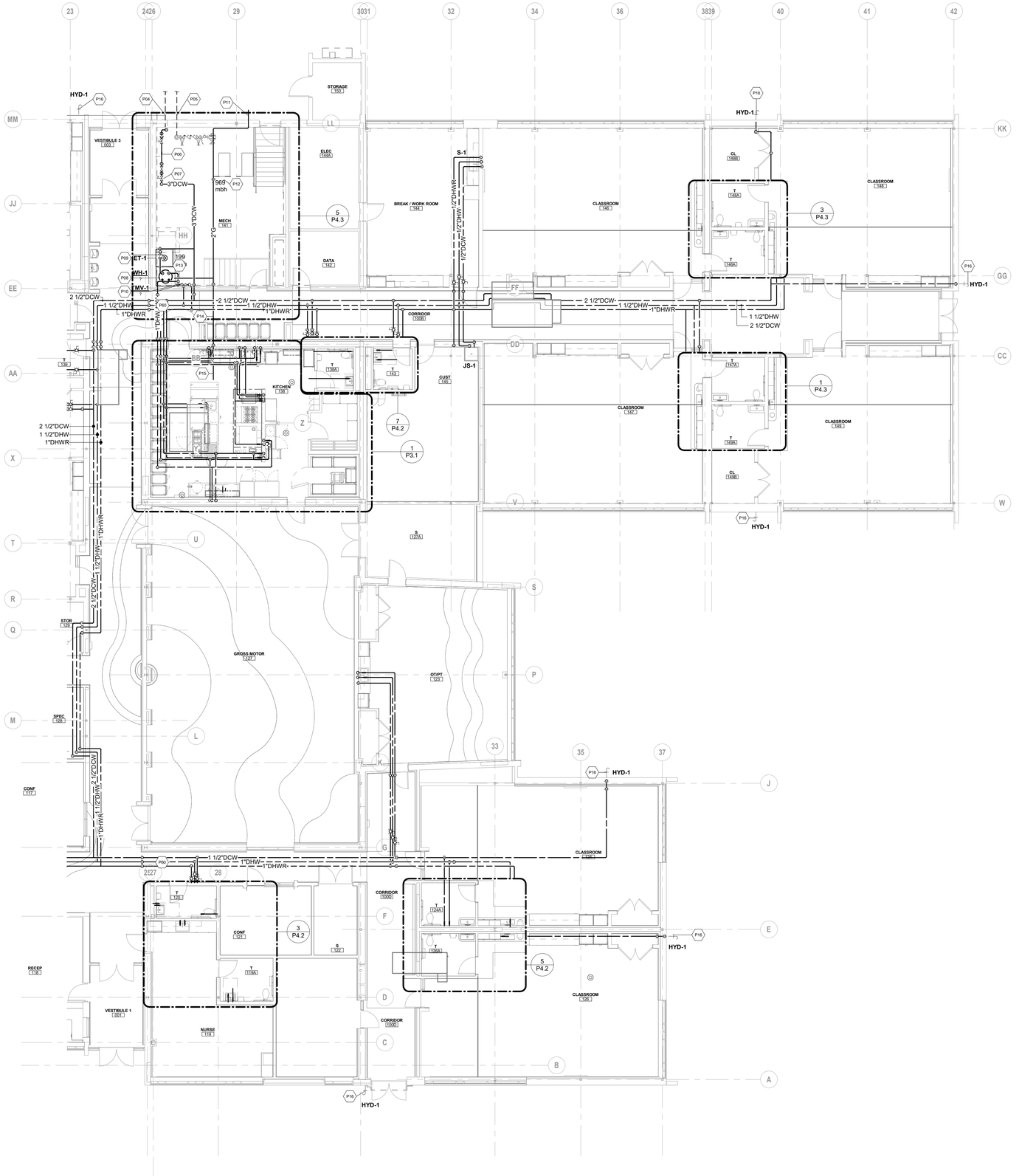
P13 3/4" GAS DROP TO SUPPLY DWH-1. PROVIDE SHUTOFF VALVE, AND LINE PRESSURE REGULATOR AS REQUIRED. COORDINATE FINAL CONNECTION TO WATER HEATER IN FIELD.

P14 MAINTAIN FIRE RATING AT EGRESS CORRIDOR. COORDINATE WITH ARCH.

P15 1"GAS TO SUPPLY KITCHEN

P16 3/4"CW DROP TO SUPPLY HYD-1

P60 REFER TO P2.1B FOR CONT.


HYD-1
P16
P04
P05
P11
P06
P07
3"DCW
P12
969 mbh
MECH 141
3"DCW
2"DCW
P09
ET-1
199
P13
WH-1
P08
TMV-1
P10
2 1/2"DCW
1 1/2"DHW
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P60
P14
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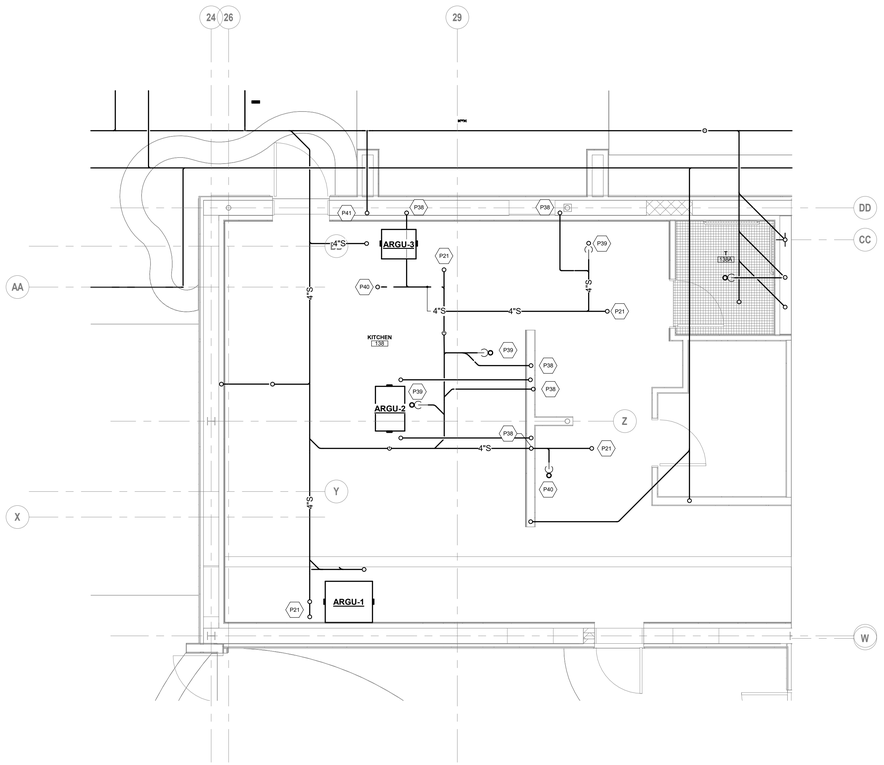


5 PLUMBING UNDERSLAB PART PLAN - AREA A KITCHEN 138
1/4" = 1'-0"

PLUMBING KEYNOTES

P18 3" ST UP TO RD-1

P19 4" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P21 UP TO FCO

P38 2" GV UP

P39 4" W UP TO FS-1

P40 4" W UP TO FD-1

P41 2" W UP TO ITEM #16

P43 2" GV DN

P44 2" W DN & 2" V RISE

P61 AGRU-1: PROVIDE 30 GPM POINT-OF-USE AGRU. REFER TO PLUMBING FIXTURE SCHEDULE.

P62 AGRU-2: PROVIDE 5 GPM POINT-OF-USE AGRU. REFER TO PLUMBING FIXTURE SCHEDULE.

P63 AGRU-3: PROVIDE 40 GPM POINT-OF-USE AGRU. REFER TO PLUMBING FIXTURE SCHEDULE.

SCHEDULE OF FOODSERVICE EQUIPMENT & CONNECTIONS

ITEM	QTY	DESCRIPTION	PLUMBING	EQUIPMENT REMARKS
1	1	MOP SINK CABINET	1/2" H&CW, DRAIN IN FLOOR	REQUIRES WALL BLOCKING BY GC (SEE SPECIAL CONDITIONS PLANS)
7	1	COOLER EVAPORATOR COIL	3/4" IW TO FD	REMOTE REFRIGERATION FROM ITEM 8 BY KEC
16	2	HAND SINK CABINET	1/2" H&CW; 1-1/2" W	REQUIRES WALL BLOCKING BY GC (SEE SPECIAL CONDITIONS PLANS)
19	1	PREP TABLE WITH SINKS	1/2" H&CW; 2" IW TO FS	
26	1	COUNTERTOP SIX PAN STEAMER	1/2" G @ 32MBTU (2) 3/4" CW; 1-1/2 IW TO FS	
27	1	WATER FILTER ASSEMBLY	3/4" CW	REQUIRES WALL BLOCKING BY GC (SEE SPECIAL CONDITIONS PLANS)
28	1	EXISTING SIX-BURNER RANGE	3/4" G @ 230 MBTU; QD	
29	1	DOUBLE CONVECTION OVEN	3/4" G @ 230 MBTU; QD	
37	1	COOK'S TABLE WITH SINK	1/2" H&CW, 2" IWTO FS	
39	1	WATER FILTER ASSEMBLY, WAREWASHER	3/4" HW	REQUIRES WALL BLOCKING BY GC (SEE SPECIAL CONDITIONS PLANS)
44	1	THREE COMPARTMENT SINK	(2) 3/4" 120°F H&CW (3) 2" W MANIFOLD THRU GI BY PC	
46	1	PRE-RINSE ASSEMBLY WITH ADD-ON FAUCET	3/4" H&CW	REQUIRES WALL BLOCKING BY GC (SEE SPECIAL CONDITIONS PLANS)
47	1	VENTLESS WAREWASHER	1/2" H&CW; 3/4" IW TO FS	6,800 BTU/HR LATENT HEAT; 5,000 BTU/HR SENSIBLE HEAT

NOTES:

1) UTILITIES SHOWN IN THESE SCHEDULES ARE SPECIFIC TO THE PRIME MANUFACTURER LISTED IN THE WRITTEN SPECIFICATION SECTION 114000. IF EQUIPMENT FROM AN ALTERNATE MANUFACTURER IS PROVIDED, IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO COORDINATE AND SUBMIT TO THE PROJECT DESIGN TEAM FOR REVIEW.

2) UTILITIES LISTED ON THIS SCHEDULE FOR OWNER FURNISHED OR VENDOR SUPPLIED EQUIPMENT ARE ESTIMATES ASSUMED FOR ENGINEERING PURPOSES ONLY. IT IS THE RESPONSIBILITY OF THE OWNER TO PROVIDE EQUIPMENT CUT SHEETS OF THIS EQUIPMENT TO CRABTREE-MCGRATH ASSOCIATES PRIOR TO CONSTRUCTION.

3) INSTALLING SUB-CONTRACTORS MUST NOTIFY CRABTREE-MCGRATH ASSOCIATES IF A UTILITY REQUIREMENT LISTED ON THIS EQUIPMENT SCHEDULE IS NOT AVAILABLE.

4) REFER TO THE ABBREVIATIONS NOTES PROVIDED ON THIS SHEET FOR CLARIFICATION OF ABBREVIATIONS USED WITHIN THIS EQUIPMENT SCHEDULE.

Point-of-Use AGRU Sizing Calculation

Assumptions		
Fill Factor	0.75	
Drain Time	2	min
Retention Factor	2	

Fixture	Compartments	Length (in)	Width (in)	Depth (in)	Total Volume (gal)	Working Volume (gal)	Required Flow (GPM)	AGRU Size
#19 PREP TABLE WITH SINKS	2	18	18	12	33.66	25.25	25.25	30 GPM minimum
# 37 COOK'S TABLE WITH SINK	1	12	12	8	4.99	3.74	3.74	5 GPM minimum
#44 THREE COMPARTMENT SINK	3	18	18	12	50.49	37.87	37.87	40 GPM minimum

PLAN NOTES

1) IT IS THE RESPONSIBILITY OF THE KITCHEN EQUIPMENT CONTRACTOR TO FIELD VERIFY THE DELIVERY PATH OF ALL EQUIPMENT WITHIN THEIR SCOPE WITH BUILDING CONDITIONS PRIOR TO ORDERING TO CONFIRM ALL EQUIPMENT FITS WITHIN THE DESIGNATED SPACE AS LOCATED ON PLANS.

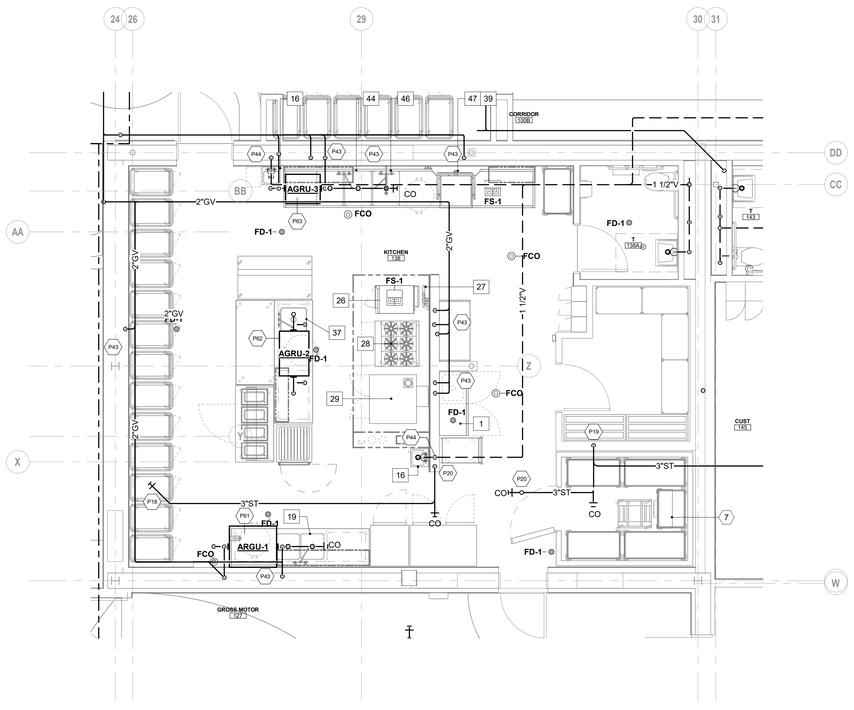
2) KITCHEN EQUIPMENT CONTRACTOR SHALL COORDINATE WITH THE GENERAL CONTRACTOR AS NECESSARY FOR OPENINGS IN BUILDING, WALL LEAVE OUTS, DOOR WIDTHS AND HEADER HEIGHTS REQUIRED FOR DELIVERY AND INSTALLATION MEANS.

3) FINISHES TO ALL WALLS, FLOORS AND CEILINGS ARE TO BE PROVIDED BY THE GENERAL CONTRACTOR AS SPECIFIED BY THE PROJECT ARCHITECT TO MEET THE REQUIREMENTS OF THE LOCAL HEALTH DEPARTMENT.

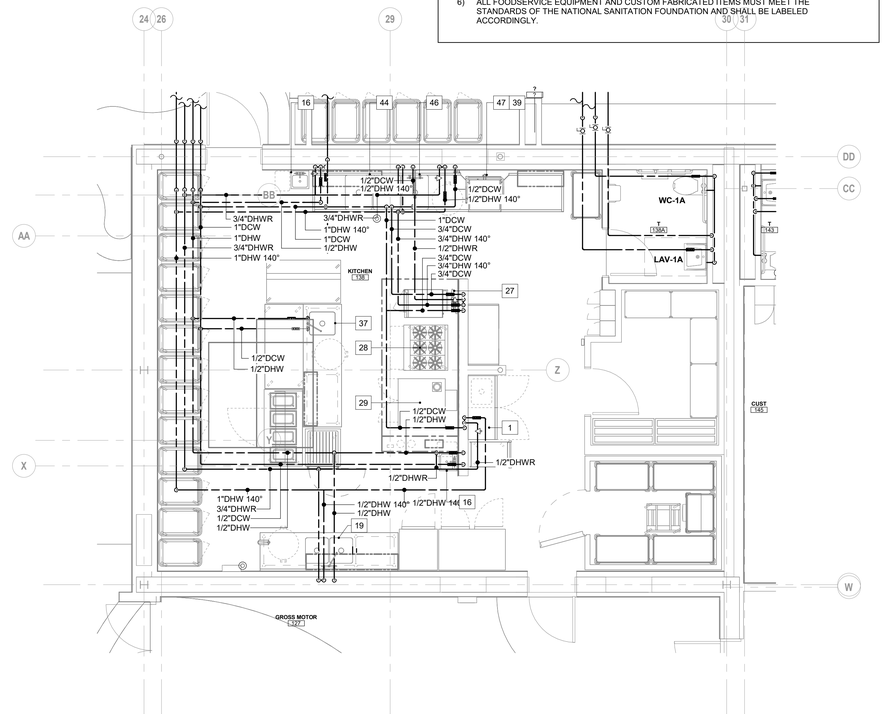
4) REVISIONS TO THESE PLANS DUE TO FIELD CONDITIONS MUST BE SUBMITTED TO THE PROJECT DESIGN TEAM FOR REVIEW AND APPROVAL PRIOR TO PROCEEDING WITH CONSTRUCTION.

5) FLOORING MATERIAL SPECIFIED BY THE ARCHITECT MUST BE PROVIDED WITH A COVED BASE AT ALL WALLS TO INCLUDE THE INTERIOR AND EXTERIOR OF WALK-IN REFRIGERATED ROOMS.

6) ALL FOODSERVICE EQUIPMENT AND CUSTOM FABRICATED ITEMS MUST MEET THE STANDARDS OF THE NATIONAL SANITATION FOUNDATION AND SHALL BE LABELED ACCORDINGLY.



2 FIRST FLOOR DRAINAGE PART PLAN - AREA B KITCHEN 138
1/4" = 1'-0"



1 FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA B KITCHEN 138
1/4" = 1'-0"

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STATE OF CONNECTICUT
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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING KITCHEN PART PLANS

P3.1

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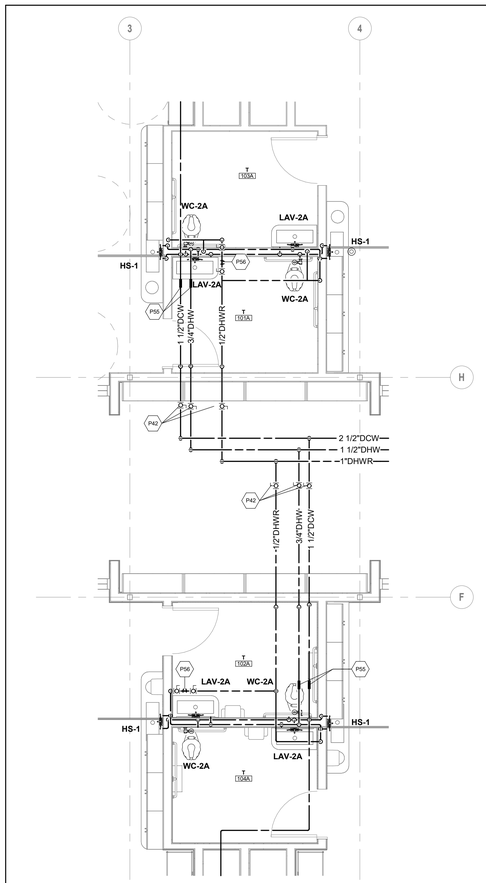
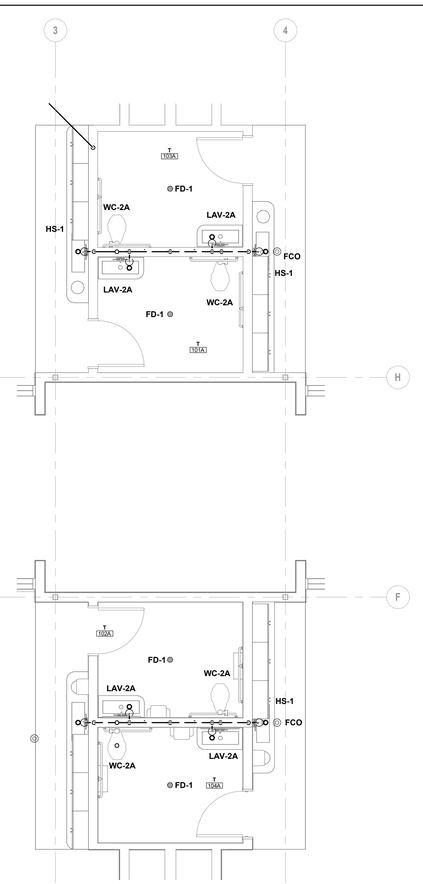


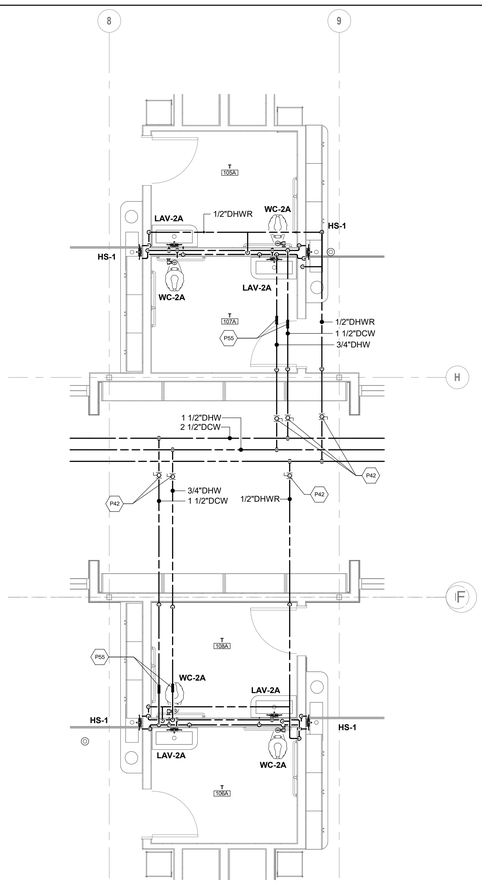
FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA A T 102A, T 104A

1/4" = 1'-0"



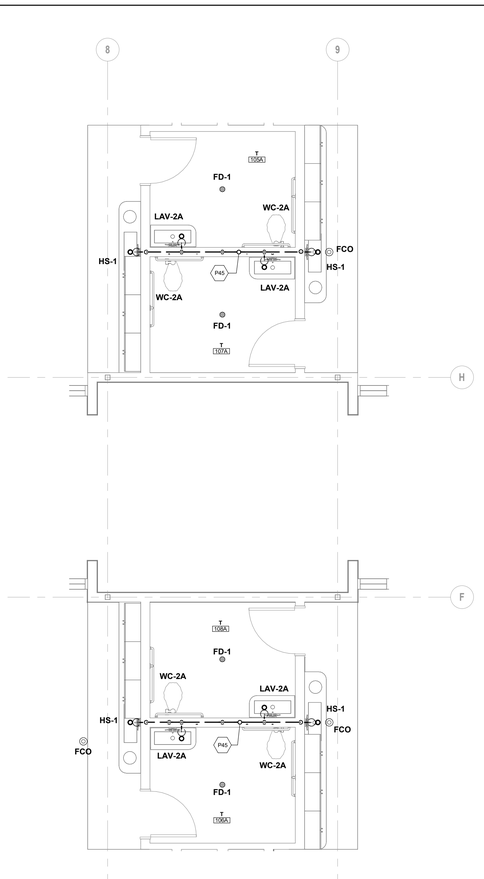
FIRST FLOOR DRAINAGE PRT PLAN - AREA A T 102A, T 104A

1/4" = 1'-0"



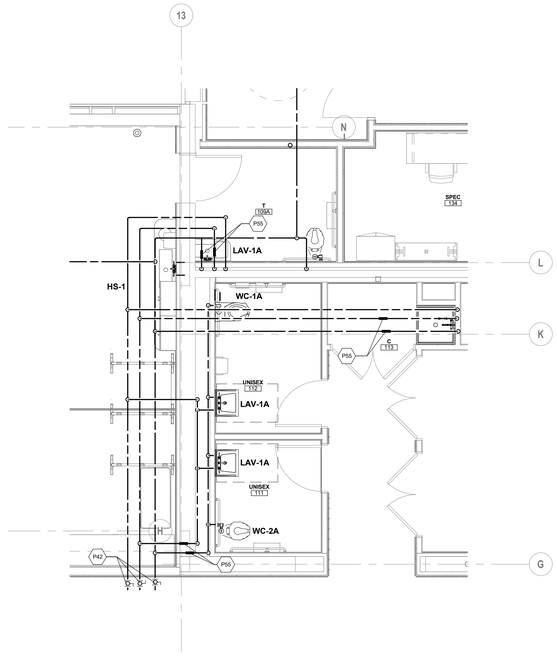
FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA A T 105A, T 107A, T 108A, T 106 A

1/4" = 1'-0"



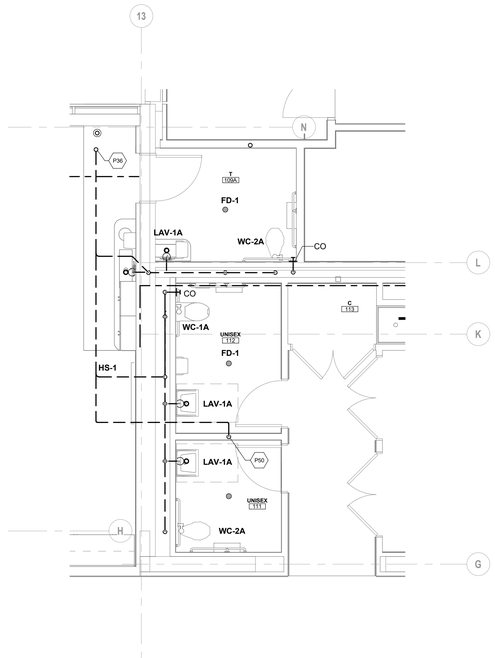
FIRST FLOOR DRAINAGE PART PLAN - AREA A T 105A, T 107A, T 108A, T 106 A

1/4" = 1'-0"



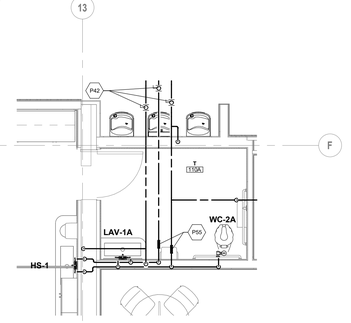
FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA A T 109A, T 110A, UNISEX 111,112, C 113 (3/P4.1)

1/4" = 1'-0"



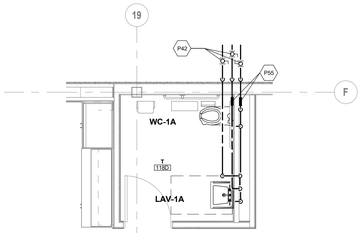
FIRST FLOOR DRAINAGE PART PLAN - AREA A T 109A, UNISEX 111,112, C 113

1/4" = 1'-0"



FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA A T 110A

1/4" = 1'-0"



FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA A T 117D

1/4" = 1'-0"

PLUMBING KEYNOTES

P36 NEW 4" VTR TERMINATE A MINIMUM OF 24" ABOVE ROOF SURFACE OR AS REQUIRED BY CODE. PROVIDE WEATHERPROOF ROOF FLASHING AND COORDINATE FINAL PENETRATION LOCATION WITH STRUCTURAL, ARCHITECTURAL, AND MECHANICAL DRAWINGS.

P42 PROVIDE FULL PORT SHUTOFF VALVE. COORDINATE EXACT LOCATION AND ACCESS REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

P50 2"V DN

P55 PROVIDE WATER HAMMER ARRESTORS PER PDI WH-201. INSTALL ABOVE ACCESSIBLE CEILINGS AS CLOSE AS PRACTICAL TO FIXTURES SERVED. SIZE PER PDI WH-201. PROVIDE ACCESS PANELS AS REQUIRED FOR MAINTENANCE AND REPLACEMENT.

P56 PROVIDE CIRCUITSOLVER THERMOSTATIC BALANCING VALVE AT END OF EACH DHW BRANCH. INSTALL PER MANUFACTURER'S REQUIREMENTS WITH ISOLATION VALVES, UNION, AND ACCESS FOR MAINTENANCE. INSTALL IN CORRECT FLOW DIRECTION AND COORDINATE LOCATION WITH OTHER TRADES.

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STATE OF CONNECTICUT
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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

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PLUMBING ENLARGED PLANS

P4.1

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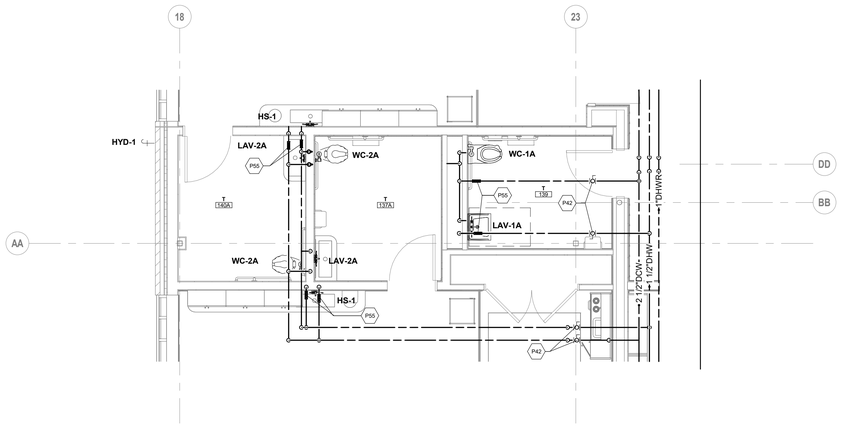
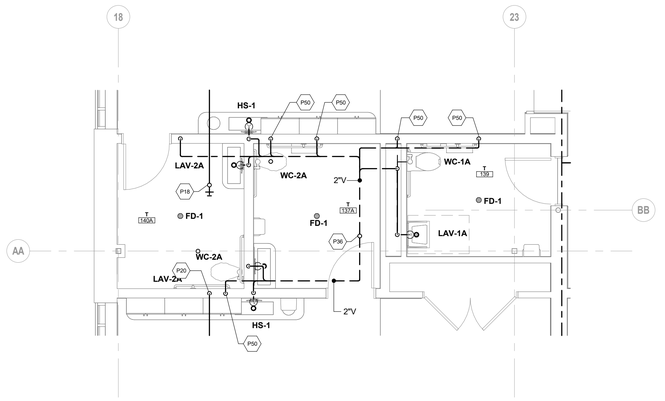


1 FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA A T 139, T 137A, T 140A
1/4" = 1'-0"



2 FIRST FLOOR DRAINAGE PART PLAN - AREA A T 139, T 137A, T 140A
1/4" = 1'-0"

PLUMBING KEYNOTES

P04 NEW 4" DOMESTIC WATER SERVICE FROM SITE. REFER TO CIVIL DRAWINGS FOR SIZE, ROUTING, AND CONNECTION LOCATION. PROVIDE OS&Y SHUTOFF VALVE UPON ENTRY INTO BUILDING.

P18 3" ST UP TO RD-1

P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P36 NEW 4" VTR.TERMINATE A MINIMUM OF 24" ABOVE ROOF SURFACE OR AS REQUIRED BY CODE. PROVIDE WEATHERPROOF ROOF FLASHING AND COORDINATE FINAL PENETRATION LOCATION WITH STRUCTURAL, ARCHITECTURAL, AND MECHANICAL DRAWINGS.

P42 PROVIDE FULL PORT SHUTOFF VALVE. COORDINATE EXACT LOCATION AND ACCESS REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.

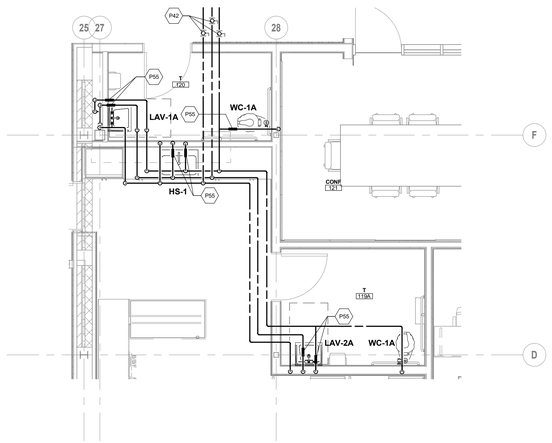
P44 2" W DN & 2" V RISE

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

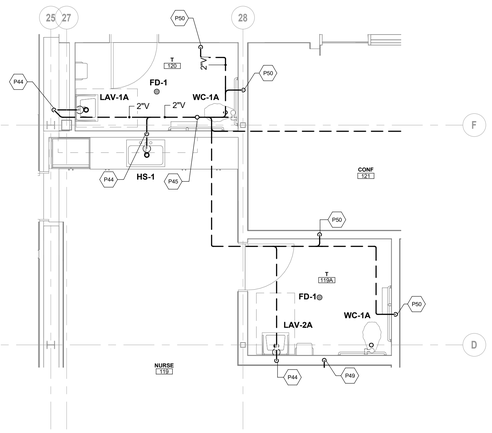
P49 3" ST DN

P50 2"V DN

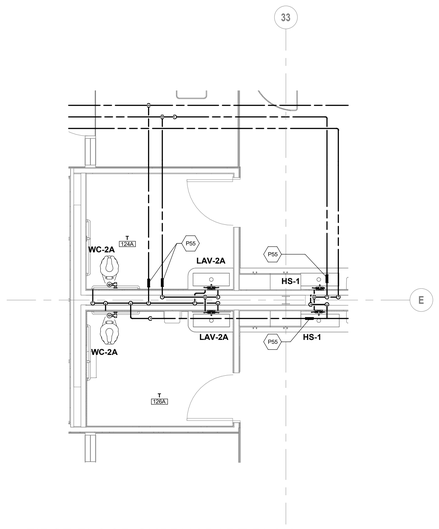
P55 PROVIDE WATER HAMMER ARRESTORS PER PDI WH-201. INSTALL ABOVE ACCESSIBLE CEILINGS AS CLOSE AS PRACTICAL TO FIXTURES SERVED. SIZE PER PDI WH-201. PROVIDE ACCESS PANELS AS REQUIRED FOR MAINTENANCE AND REPLACEMENT.



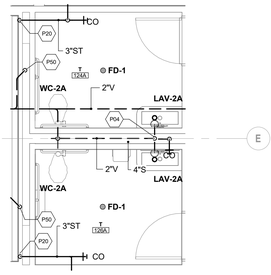
3 FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA B T 118A, T 119
1/4" = 1'-0"



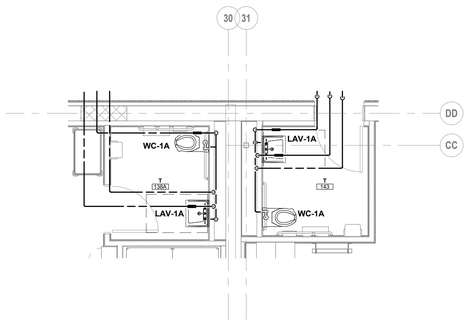
4 FIRST FLOOR DRAINAGE PART PLAN - AREA B T 118A, T 119
1/4" = 1'-0"



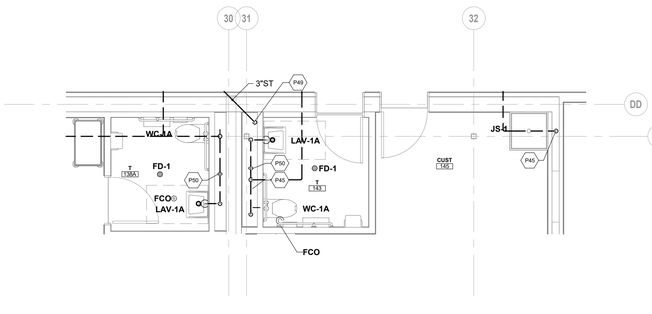
5 FIRST FLOOR SUPPLY PART PLAN - AREA B T 118A, T 123A, T 125A
1/4" = 1'-0"



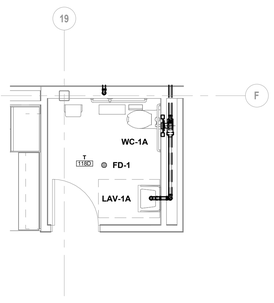
6 FIRST FLOOR DRAINAGE PART PLAN - AREA B T 118A, T 123A, T 125A
1/4" = 1'-0"



7 FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA B T 138A, T 143
1/4" = 1'-0"



8 FIRST FLOOR DRAINAGE PART PLAN - AREA B T 138A, T 143, CUST 145
1/4" = 1'-0"



9 FIRST FLOOR DRAINAGE PART PLAN - AREA A T118 D
1/4" = 1'-0"

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING
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P4.2

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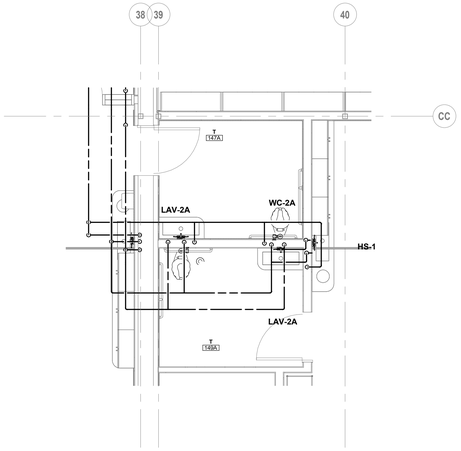
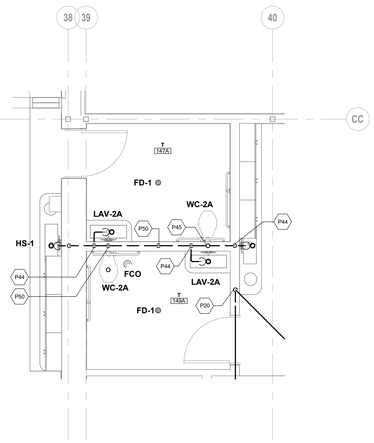
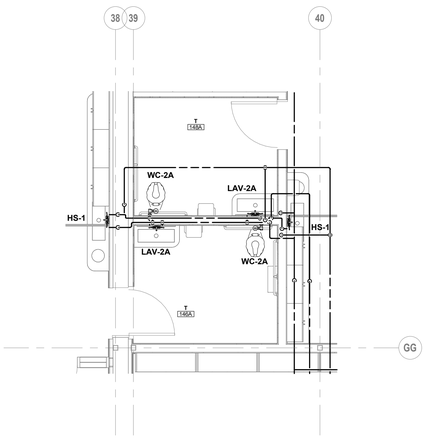


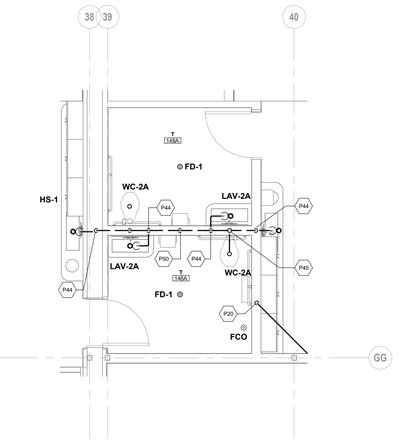
FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA B T 147A, T 149A
1/4" = 1'-0"



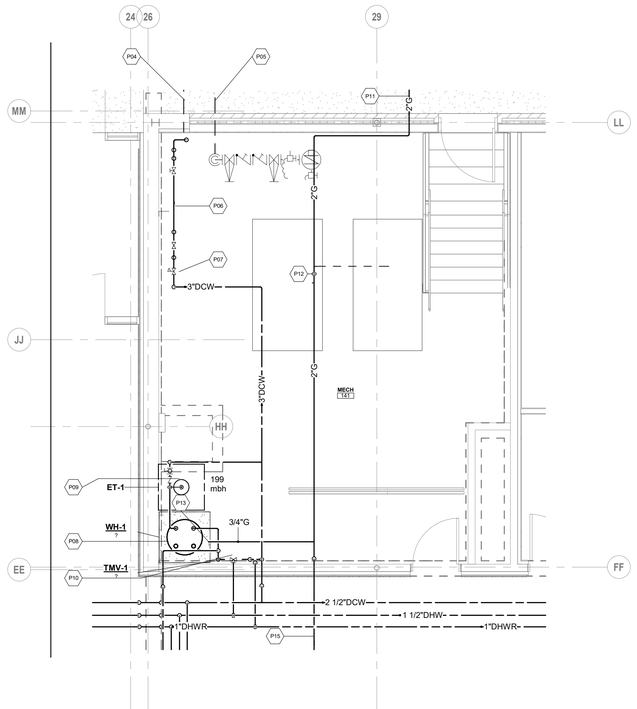
FIRST FLOOR DRAINAGE PART PLAN - AREA B T 147A, T 149A
1/4" = 1'-0"



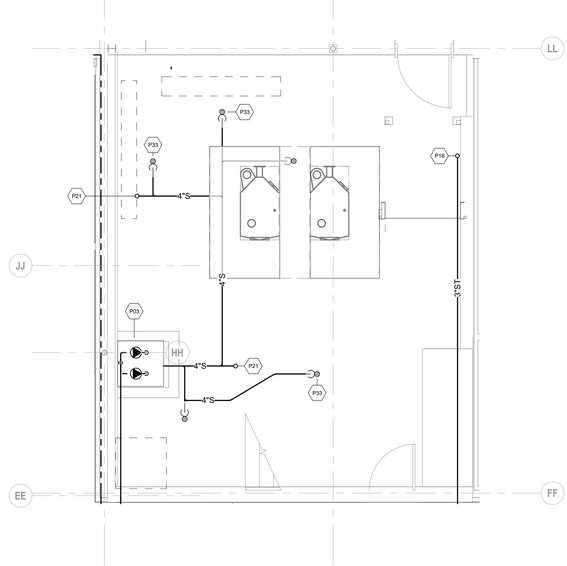
FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA B T 148A, T 146A
1/4" = 1'-0"



FIRST FLOOR DRAINAGE PART PLAN - AREA B T 148A, T 147A
1/4" = 1'-0"



FIRST FLOOR PLUMBING SUPPLY PART PLAN - AREA B BOILER ROOM
1/4" = 1'-0"



FIRST FLOOR DRAINAGE PART PLAN - BOILER ROOM
1/4" = 1'-0"

PLUMBING KEYNOTES

P03 NEW CONCRETE PIT FOR DUPLEX SEWAGE EJECTOR SYSTEM (SP-1 & SP-2). PROVIDE (2) 2" DISCHARGE RISERS & 2" VENT. INSTALL CHECK VALVE AND ISOLATION VALVE ON EACH DISCHARGE LINE. COORDINATE POWER AND CONTROLS WITH ELECTRICAL. REFER TO SCHEDULE AND DETAIL SHEETS FOR ADDITIONAL REQUIREMENTS. PIT CONSTRUCTION BY STRUCTURAL.

P04 NEW 4" DOMESTIC WATER SERVICE FROM SITE. REFER TO CIVIL DRAWINGS FOR SIZE, ROUTING, AND CONNECTION LOCATION. PROVIDE OS&Y SHUTOFF VALVE UPON ENTRY INTO BUILDING.

P05 NEW 6" FIRE SPRINKLER SERVICE FROM SITE. REFER TO CIVIL DRAWINGS FOR SIZE, ROUTING, AND CONNECTION LOCATION. PROVIDE OS&Y SHUTOFF VALVE UPON ENTRY INTO BUILDING.

P06 PROVIDE NEW 3" DOUBLE CHECK VALVE BACKFLOW PREVENTER ASSEMBLY. INSTALL IN ACCORDANCE WITH THE STATE OF CONNECTICUT CROSS CONNECTION CONTROL MANUAL, DEPARTMENT OF PUBLIC HEALTH – DRINKING WATER DIVISION.

P07 PROVIDE PRESSURE REDUCING VALVE (PRV). OUTLET PRESSURE TO BE SET AT 60 PSI. CONTRACTOR SHALL ADJUST FINAL SETTING IN FIELD AFTER TESTING TO ENSURE PROPER OPERATION OF ALL FLUSH VALVE FIXTURES AND TO MAINTAIN ADEQUATE RESIDUAL PRESSURE UNDER PEAK DEMAND CONDITIONS. PROVIDE PRESSURE GAUGES UPSTREAM AND DOWNSTREAM OF PRV.

P08 (WH-1) PROVIDE NEW 100 GALLON GAS-FIRED WATER HEATER. INSTALL IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ALL APPLICABLE CODES.

P09 (ET-1) NEW EXPANDION TANK. (SEE SCHEDULE SHEET)

P10 (TMV-1) THERMOSTATIC MIXING VALVE (SEE SCHEDULE SHEET)

P11 NEW 2" GAS SERVICE EXTENDED BACK TO MAIN. REFER TO UTILITY AND CIVIL DRAWINGS FOR CONNECTION LOCATION AND COORDINATE WITH UTILITY COMPANY.

P12 1 1/4" GAS DROP TO SERVE (2) BOILERS. SPLIT INTO (2) 1" BRANCH CONNECTIONS TO EACH UNIT. PROVIDE SHUTOFF VALVE AND GAS PRESSURE REGULATOR AT EACH CONNECTION AS REQUIRED.

P13 3/4" GAS DROP TO SUPPLY DWH-1. PROVIDE SHUTOFF VALVE, AND LINE PRESSURE REGULATOR AS REQUIRED. COORDINATE FINAL CONNECTION TO WATER HEATER IN FIELD.

P15 1"GAS TO SUPPLY KITCHEN

P18 3" ST UP TO RD-1

P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P21 UP TO FCO

P33 4" UP TO FD-2

P44 2" W DN & 2" V RISE

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

P50 2"V DN

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STATE OF CONNECTICUT
THOMAS J. MALIK
No. 21720
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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Revisions

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P4.3

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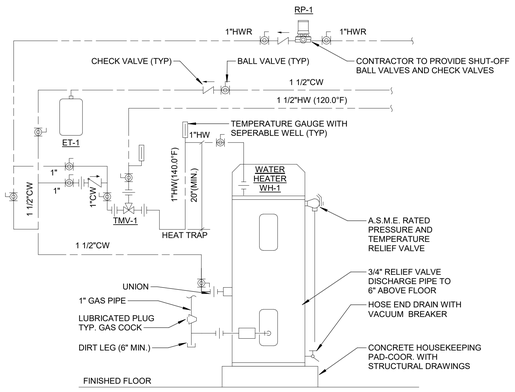
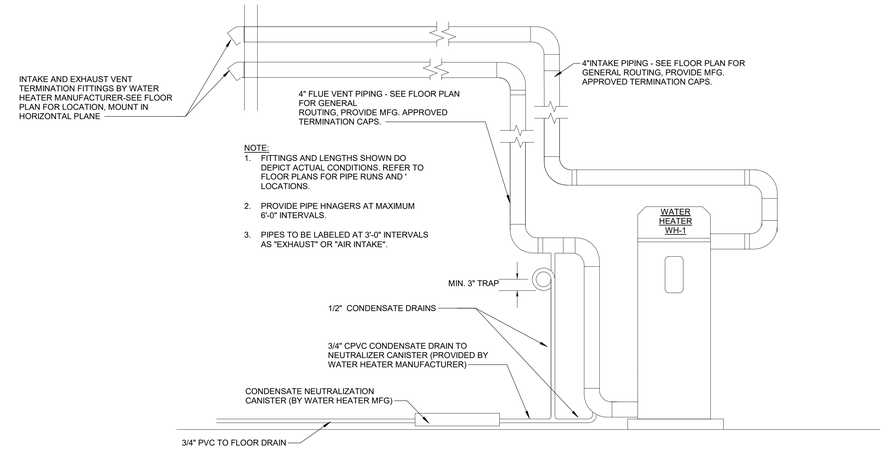
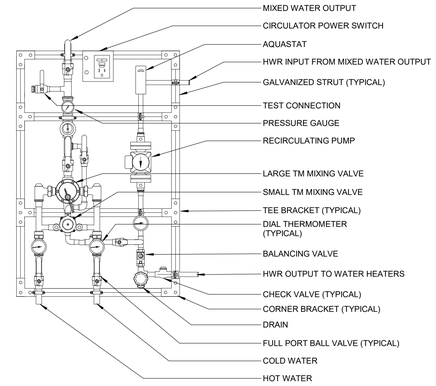


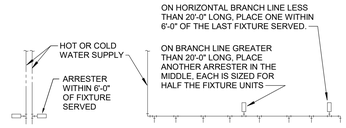
6 GAS WATER HEATER PIPING DETAIL - WH-1
NOT TO SCALE



3 GAS WATER HEATER VENTING DETAIL - TYPICAL WH-1
NOT TO SCALE



2 PACKAGED THERMOSTATIC MIXING STATION
NOT TO SCALE

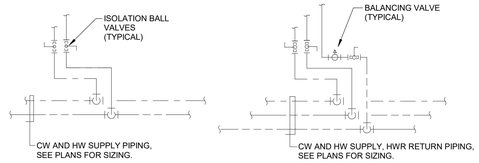


PDI SIZE	FIXTURE UNIT LOAD
AA	1-3
A	4-11
B	12-32
C	33-60
D	61-113
E	114-154
F	155-330

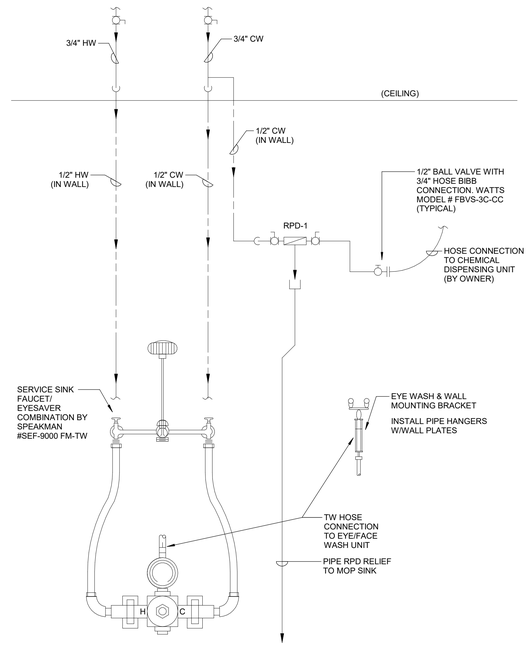
FIXTURE UNIT TABULATION		
FIXTURE	COLD	HOT
VALVE WATER CLOSET	10	-
TANK WATER CLOSET	5	-
URINAL	5	-
LAVATORY	1.5	1.5
SINK	2	2
MOP BASIN	3	3
SHOWER/BATHTUB	2	3
DRINKING FOUNTAIN	0.5	-

PROVIDE WATER HAMMER ARRESTERS BY SIOUX CHIEF, PRECISION PLUMBING PRODUCTS, WATTS OR APPROVED EQUIVALENT WITH PISTON AND 0-RING CONSTRUCTION, HAVING PDI #WH-201, ASSE #1010 OR ANSI #A112.26.1M CERTIFICATION. SIZE AND INSTALL PER PDI #WH-201 STANDARD OR MANUFACTURER'S INSTRUCTION. TABLES ABOVE ARE BASED ON SIOUX CHIEF PRODUCT LINE. IF PRESSURE IS IN EXCESS OF 65 PSIG THEN UPSIZE ARRESTER BY ONE (EXAMPLE: AN 'A' ARRESTER WOULD BECOME A 'B' ARRESTER.)

5 WATER HAMMER ARRESTORS
NOT TO SCALE



4 TYPICAL BRANCH PIPING DETAIL
NOT TO SCALE



1 JANITOR CLOSET-TYPICAL PIPING DETAIL
NOT TO SCALE

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qamarch.com

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

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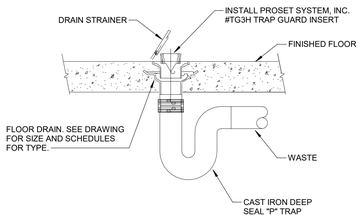
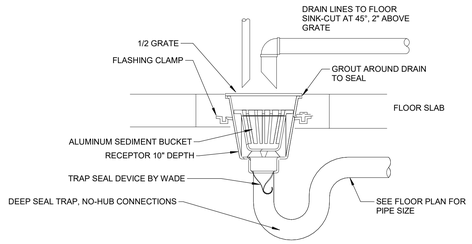
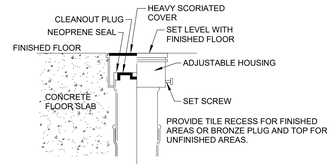


1 TYPICAL FLOOR DRAIN WITH TRAP GUARD INSERT DETAIL
NOT TO SCALE



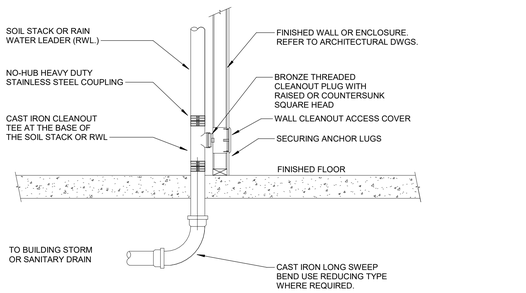
2 FLOOR SINK (FS-1) HALF GRATE DETAIL
NOT TO SCALE



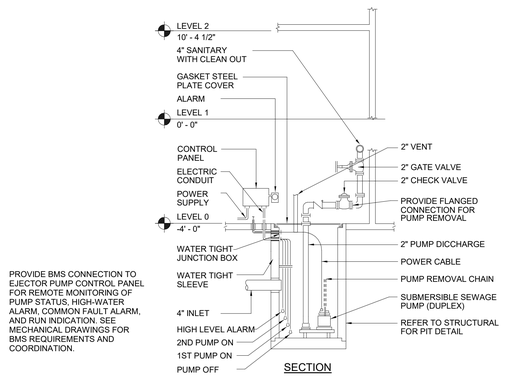
3 INTERIOR FLOOR CLEANOUT DETAIL
NOT TO SCALE

GREASE WASTE HEAT TRACE SCHEDULE

MANUFACTURER	MODEL #	LOCATION	WATTS PER FOOT	OPERATING TEMP.	CIRCUIT BREAKER (A)	MAX. CT. LENGTH	NOTES
RAYCHEM XL-TRACE	12XLE2-CT 208-277V	**********	12	110 F	30	340	CONTROLLER LOCATED IN *********

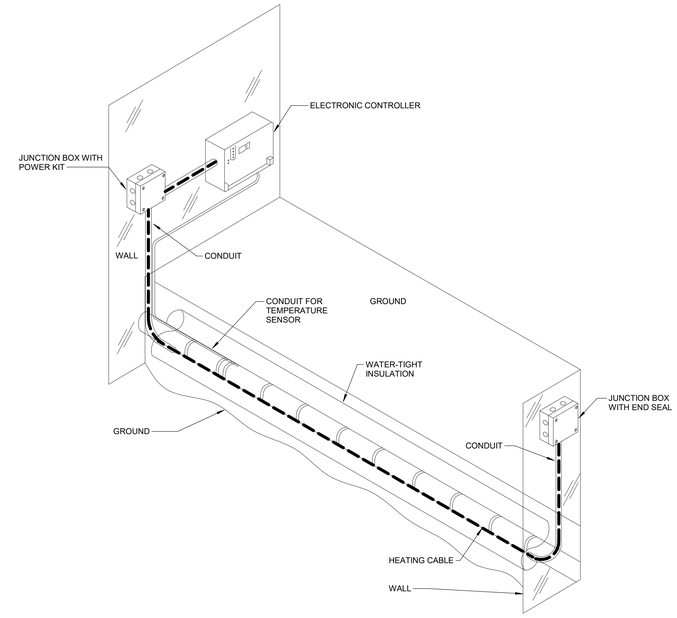


4 TYPICAL CLEAN OUT DETAIL AT BASE OF SOIL STACK OR RWL
NOT TO SCALE

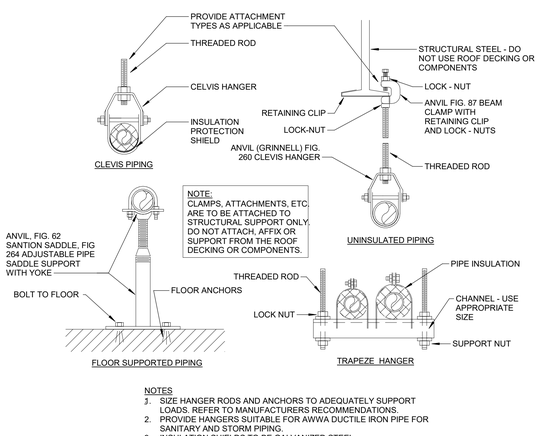


SECTION

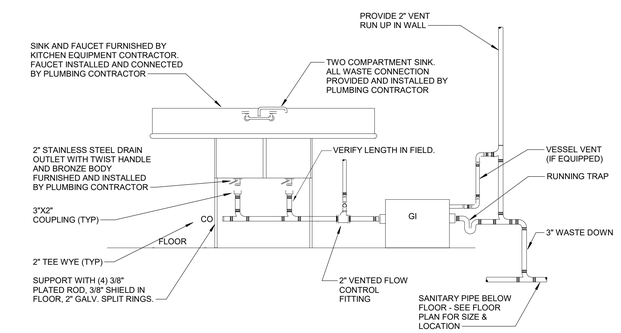
5 DUPLEX SEWAGE PUMP
NOT TO SCALE



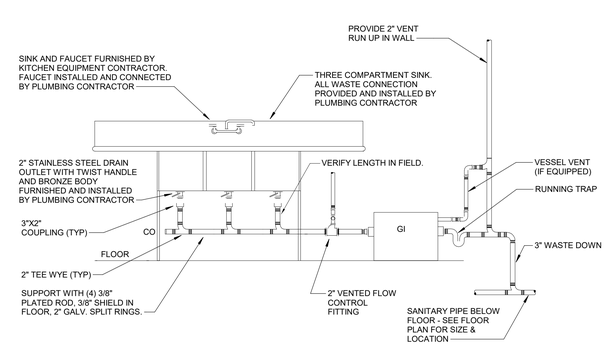
7 GREASE WASTE HEAT CABLE DETAIL - BELOW SLAB
NOT TO SCALE



8 TYPICAL PIPE HANGER AND SUPPORT DETAIL
NOT TO SCALE



6 2 BAY SINK AND GREASE TRAP DETAIL
NTS



9 3 BAY SINK AND GREASE TRAP DETAIL
NTS

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STATE OF CONNECTICUT
KA-21720
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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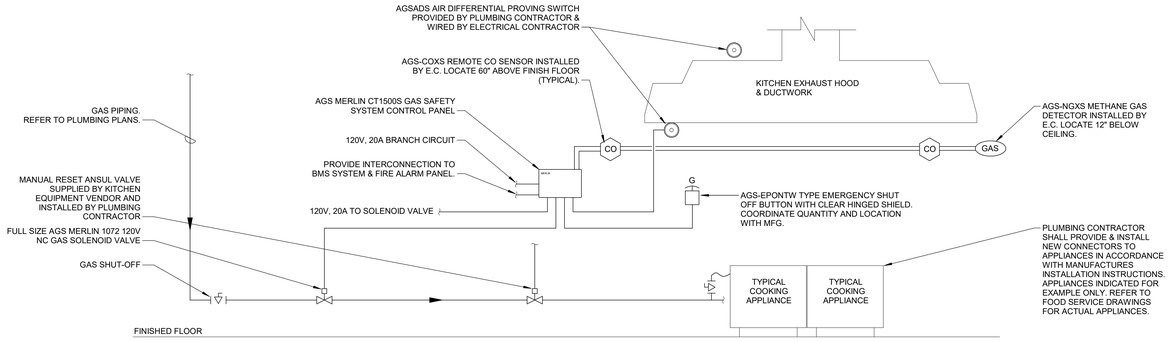


SEQUENCE OF OPERATION:

THE SYSTEM'S GAS SOLENOID VALVE SHALL CLOSE UPON ANY OF THE FOLLOWING:

A. WHEN CARBON MONOXIDE IS DETECTED.
B. SHUT DOWN OF HOOD (LOSS OF DRAFT).
C. ALARM SIGNAL FROM PANIC BUTTON
D. ALARM SIGNAL FROM FIRE ALARM PANEL.

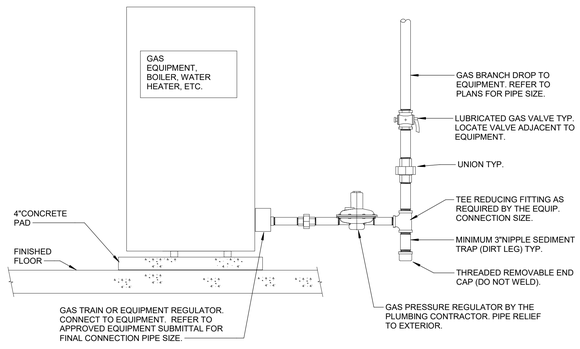
1. UNDER NORMAL OPERATION CONDITION, KITCHEN EXHAUST FAN IS ON HIGH SPEED, GAS CONTROL PANEL IS POWERED, GAS SOLENOID CAN BE MANUALLY OPENED VIA AUTHORITY KEY SWITCH.
2. UPON DETECTION OF CARBON MONOXIDE OR COMBUSTIBLE GAS, GAS CONTROL PANEL SHALL GO INTO ALARM, CLOSING GAS SOLENOID VALVE AND GENERATING A TROUBLE SIGNAL FOR BMS / BAS, FIRE ALARM PANEL
3. UPON LOSS OF POWER TO HOOD OR GAS CONTROL PANEL, GAS SOLENOID SHALL CLOSE, MANUAL RESET OF SYSTEM IS REQUIRED TO OPEN GAS SOLENOID VALVE.
4. UPON SENSOR FAILURE OR FAULT, SYSTEM SHALL GO INTO ALARM AND CLOSE GAS SOLENOID VALVE.
5. INCIDENT ON COOKING LINE SHALL ACTIVATE HOOD ANSUL SYSTEM AND CLOSE THERMALLY-ACTIVATED GAS VALVE.

NOTES:

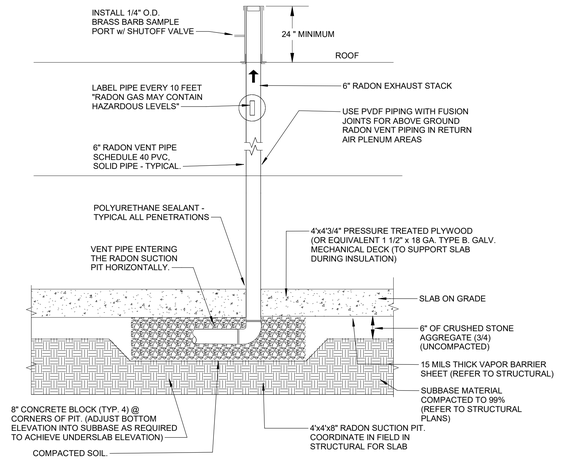
1. INSTALLATION OF SYSTEM MUST CONFORM TO NATIONAL AND LOCAL APPLICABLE CODES AND REQUIREMENTS.
2. BASIS OF DESIGN IS AMERICAN GAS SAFETY (AGS) MERLIN CT1500S GAS VENTILATION INTERLOCK AND SHUTOFF SYSTEM INCORPORATING, CO DETECTOR, AIR DIFFERENTIAL SWITCHES, GAS DETECTOR, AND OTHER ITEMS LISTED IN SCHEMATIC ABOVE. CONTACT LOCAL REPRESENTATIVE: EMERSON SWAN 781-986-2000
3. SYSTEM SHALL BE THE ULTIMATE RESPONSIBILITY OF THE PLUMBING CONTRACTOR. GAS SOLENOID, MERLIN CONTROL PANEL, DETECTORS, DIFFERENTIAL SWITCHES, EMERGENCY STOP BUTTONS AND ALL ACCESSORIES SHALL BE FURNISHED BY THE PLUMBING CONTRACTOR. LIAISE WITH PLUMBING CONTRACTOR, ARCHITECT, AND KITCHEN CONTRACTOR FOR LOCATION AND POSITION OF EQUIPMENT. ELECTRICAL CONTRACTOR TO INSTALL ALL WIRING AND CONDUIT.
4. ELECTRICAL CONTRACTOR SHALL PROVIDE 120VAC LINE VOLTAGE TO MERLIN PANEL AND GAS SOLENOID. PROVIDE 12VDC FROM MERLIN PANEL TO DETECTORS / SENSORS. PROVIDE SIGNAL WIRE FROM DETECTORS AND DIFFERENTIAL SWITCHES TO MERLIN PANEL. VOLT FREE CIRCUIT TO REMOTE EMERGENCY STOP BUTTON.
5. COORDINATE PLACEMENT AND FINAL LOCATION OF DETECTORS WITH MANUFACTURER.

1 GAS CONTROLLER DETAIL
NOT TO SCALE

NOTES:
1. ALL NEW GAS PIPING SHALL BE PAINTED WITH PRIMER AND (2) COATS OF YELLOW RUST INHIBITIVE PAINT.
2. COORDINATE LOCATION OF GAS CONNECTION WITH EQUIPMENT LOCATION AND MECHANICAL CONTRACTOR.
3. GAS PRESSURE REGULATORS TO BE AS MANUFACTURED BY MAXITROL, FISHER OR SENSUS. CONTRACTOR TO SURVEY GAS UTILIZATION EQUIPMENT FOR SELECTION AND SIZING OF PROPER GAS REGULATORS.



2 EQUIPMENT GAS CONNECTION DETAIL
NOT TO SCALE



CRUSHED STONE GRADING REQUIREMENTS

1. USE ASTM SIZE #5 MEETING THE FOLLOWING GRADATIONS (SQUARE OPENING AMOUNT FINER THAN EACH LAB SIEVE WEIGHT %): 100% PASSING 1 1/2"; 90 - 100% PASSING 1"; 20 - 55% PASSING 3/4";0 - 10% PASSING 1/2"; 0 - 5% PASSING 3/8". CONTRACTOR AT THEIR OPTION, MAY SUBMIT ALTERNATELY CRUSHED STONE MEETING CTDOT SPECIFICATIONS FOR #6 (SEE SPECIFICATION EARTHWORK SECTION).
2. CONTRACTOR TO SUBMIT SAMPLES & ANALYSIS BASED ON EARTHWORK SECTION DIVISION 2 REQUIREMENTS FOR CRUSHED STONE ASTM #5.
3. CONTRACTOR TO INSTALL MATERIAL IN CONFORMANCE W/CTDOT FORM 816.

GENERAL NOTES RADON SYSTEM :

1. RADON SUCTION PIPE SHALL BE CENTRALLY LOCATED AS SHOWN.
2. DO NOT LOCATE SUCTION PIT NEAR SUBSLAB BARRIERS OR NEAR UNSEALED OPENINGS THROUGH THE SLAB.
3. VENT PIPE SHALL ENTER THE RADON SUCTION PUT HORIZONTALLY.
4. RUN VENT PIPE UNDER THE SLAB AND EXIT THE SUBSLAB IN THE GENERAL LOCATION INDICATED IN THE PLANS.
5. PROVIDE PRESSURE MONITOR/WARNING SIGNAL AT RISER. WHERE LOCATED IN A CHASE, PROVIDE ACCESS DOOR.
6. HORIZONTAL PIPE RUNS IN CEILING MUST PITCH A MINIMUM OF 1/8"/FT. BACK TO THE RADON SUCTION PIT
7. CONTRACTOR TO CONFIRM PROPER OPERATION OF SYSTEM AFTER INSTALLATION BY DRILLING 10 (1/2") HOLES THROUGH SLAB @ EVENLY SPACED LOCATIONS REPRESENTING THE AREA COVERED BY EACH SUCTION PIT. PRESSURES SHALL BE MEASURED @ EACH HOLE BY USING MICROMANOMETER OR SIMILAR DEVICE. A MINIMUM -0.002 in. WATER COLUMN (WC) IS REQUIRED @ ALL TEST HOLES.
8. CONTRACTOR SHALL FILL HOLES AFTER COMPLETION OF TEST W/APPROVED NON-SHRINK "QUICKRETE" CONCRETE GROUT OR EQUAL.
9. ALL PVC PIPING SECTIONS TO BE CONNECTED USING PVC CEMENT (LOW VOC's).
10 ALL PVC PIPING SECTIONS TO BE CONNECTED USING PVC CEMENT (LOW VOC's).
11. REFER TO STRUCTURAL DWGS FOR MORE INFORMATION AND CRUSHED STONE REQUIREMENTS.
12. CONTRACTOR TO RETAIN LICENSED CERTIFIED (CTDPH) RADON TEST PROFESSIONAL TO PREPARE A WRITTEN PLAN APPROVAL AND CONDUCT ON-SITE TESTING TO DETERMINE RADON LEVELS.
13. CONTRACTOR SHALL UTILIZE A LICENSED CERTIFIED RADON TESTING COMPANY TO COLLECT SAMPLES FROM THE SAMPLE PORT ON THE ROOF TO DETERMINE EFFECTIVENESS OF THE SYSTEM. THE LICENSED CERTIFIED RADON TESTING COMPANY SHALL BE A PROFESSIONAL WHO IS ON THE APPROVED LIST OF QUALIFIED SCHOOL RADON MEASUREMENTS PROFESSIONALS WITH CT DEPT. OF PUBLIC HEALTH.
14. LOCATE EXHAUST STACK ON ROOF A MINIMUM 25' FROM ANY BUILDING AIR INTAKES.
15. COORDINATE INSTALLATION OF NEW RADON/GAS VENT PIPING WITH LOCATION OF STRUCTURAL FOOTINGS, GRADE BEAMS. ADJUST PIPING LOCATION (< 5' EITHER DIRECTION) AS NECESSARY TO AVOID CONFLICTS.
16. RADON SYSTEM SUBSLAB DETAIL APPLIES UNDER ENTIRE BUILDING SLAB AREA.
17. NO PVC PIPING WILL BE ALLOWED IN RETURN AIR PLENUM AREAS. USE PVDF PIPING WITH FUSION JOINTS FOR ABOVE GROUND RADON VENT PIPING IN RETURN AIR PLENUM AREAS.

3 RADON MITIGATION SYSTEM DETAILS
NOT TO SCALE

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qamarch.com

GM2

STATE OF CONNECTICUT
JOSEPH R. MALIK
No. 21720
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

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PLUMBING FIXTURE SCHEDULE

GENERAL NOTES:

PIPE SIZES SHOWN ARE FOR SUPPLY AND DRAINAGE ONLY. PROVIDE SUPPLIES WITH SCREWDRIVER STOPS, WALL ESCUTCHEON, 17-GAUAGE SEMICAST "P" TRAPS WITH CLEANOUT PLUGS, PLUMBING FIXTURE SUPPORTS AND NECESSARY FITTINGS TO MAKE FINAL CONNECTION. REFER TO SPECIFICATIONS FOR EQUIVALENTS. REFER TO ARCHITECTURAL DRAWINGS FOR MOUNTING ELEVATION OF PLUMBING FIXTURES, CLEARANCE BELOW SINKS AND LAVATORIES AND OFFSET DRAIN LOCATIONS. OFFSET DRAINS SHALL BE OFFSET LEFT REAR OR OFFSET RIGHT REAR. COORDINATE MOUNTING HEIGHTS FOR CHILDREN AND ADULT FIXTURES WITH ARCHITECTURAL DRAWINGS.

TAG	ADA	MANUFACTURER	MODEL	COLD	HOT	SAN	VENT	DESCRIPTION
EWC-1	Yes	ELKAY	EZS8L	1/2"		2"	1 1/2"	ADA REGULAR HEIGHT SINGLE-LEVEL WATER COOLER WITH INTEGRAL CHILLER. MANUAL PUSH BAR ACTIVATION, SINGLE BUBBLER. APPROX. 0.5 GPM FLOW.
EWC-2	Yes	ELKAY	EZS8WSLK	1/2"		2"	1 1/2"	ADA REGULAR HEIGHT SINGLE-LEVEL WATER COOLER WITH INTEGRAL BOTTLE FILLER. MANUAL PUSH BAR FOR COOLER AND SENSOR ACTIVATED BOTTLE FILLER. BOTTLE FILLER MAX 1.1 GPM, COOLER APPROX. 0.5 GPM.
EWC-3	Yes	ELKAY	EZS8L (LOW HEIGHT / PRE-K MOUNT)	1/2"		2"	1 1/2"	ADA PRE-K HEIGHT SINGLE-LEVEL WATER COOLER WITH INTEGRAL CHILLER. MANUAL PUSH BAR ACTIVATION, LOW HEIGHT SINGLE BUBBLER. APPROX. 0.5 GPM FLOW.
HS-1	Yes	WHITEHAUS / NEWPORT BRASS	WINEHAUS (UNDERMOUNT SINK) / 3-3121 (FAUCET TRIM)	1/2"	1/2"	2"	1 1/2"	UNDERMOUNT FIRECLAY CLASSROOM SINK (APPROX. 22" x 12") WITH WALL-MOUNTED MANUAL FAUCET, LEVER HANDLES (NEWPORT BRASS 3-3121 OR EQUAL). FAUCET TO BE PROVIDED WITH REQUIRED ROUGH VALVE. MAX FLOW RATE 1.2 GPM @ 60 PSI (WATERSENSE COMPLIANT). COORDINATE WITH ARCHITECTURAL CABINET AND BACKSPLASH.
JS-1	No	FIAT	MSB-2424	3/4"	3/4"	3"	2"	FIAT #MSB-2424, MOLDED STONE BASIN, 24"x24"x10", SST INTEGRAL DRAIN BODY. SPEAKMAN SEF-9000-TW, EYESAVER COMBINATION SERVICE SINK FAUCET AND EMERGENCY EYEWASH UNIT WITH DRENCH HOSE. WALL MOUNTED, 8" BODY FAUCET, 3/4" THREADED MALE HOSE OUTLET, PAIL HOOK, WALL BRACE AND VACUUM BREAKER SPOUT. PROVIDE DRENCH HOSE ADJACENT TO SINK.
LAV-1A	Yes	ELKAY	ADA WALL HUNG LAV	1/2"	1/2"	1 1/2"	1 1/2"	ADA WALL HUNG LAVATORY WITH MANUAL GOOSENECK FAUCET, LEVER HANDLE, MAX FLOW RATE 0.5 GPM @ 60 PSI.
LAV-2A	Yes	WHITEHAUS / NEWPORT BRASS	WINEHAUS (UNDERMOUNT SINK) / 3-3121 (FAUCET TRIM)	1/2"	1/2"	1 1/2"	1 1/2"	UNDERMOUNT FIRECLAY LAVATORY (APPROX. 22" x 12") WITH WALL-MOUNTED MANUAL FAUCET, LEVER HANDLES (NEWPORT BRASS 3-3121 OR EQUAL). FAUCET TO BE PROVIDED WITH REQUIRED ROUGH VALVE. MAX FLOW RATE 1.2 GPM @ 60 PSI (WATERSENSE COMPLIANT). COORDINATE WITH ARCHITECTURAL CABINET AND BACKSPLASH.
S-1	Yes	ELKAY	ELUH3021	1/2"	1/2"	2"	2"	30" x 21" UNDERMOUNT STAINLESS STEEL SINK. PROVIDE DECK OR COUNTER MOUNTED MANUAL FAUCET, IKEA TAKSJON PULL DOWN LEVER HANDLE, MAX FLOW RATE 2.2 GPM @ 60 PSI. PROVIDE STRAINER AND P-TRAP. COORDINATE WITH ARCH.
WC-1A	Yes	KOHLER	K-4369	1"		4"	2"	ADA WALL MOUNT TOILET WITH MANUAL FLUSH VALVE (LEVER TYPE), 1.28 GPF.
WC-2A	Yes	KOHLER	<varies>	1"		4"	2"	<varies>

PLUMBING SPECIALTY SCHEDULE

TAG	SPECIALTY ITEM	MANUFACTURER	MODEL	DESCRIPTION	REMARKS
HYD-1		NIBCO	763-LS SERIES	EXTERIOR WALL HYDRANT	FINISHED AREAS, CHROME PLATED BRONZE SILL COCK WITH "LOCK SHIELD KEY", REMOVABLE HAND WHEEL, AND VACUUM BREAKER

GAS-FIRED WATER HEATER SCHEDULE

TAG	MANUFACTURER	MODEL NO.	GAS BURNER		WATER SIDE				THERMAL EFFICIENCY	ELECTRICAL DATA			REMARKS
			INPUT (BTU/H)	FUEL TYPE	STORAGE RECOVERY @ 100°F (GPH)	STORAGE VOL (gal)	PIPE DIAMETER INLET	PIPE DIAMETER OUTLET		FLA	VOLT	PH	
WH-1	A.O. SMITH	BTH-199	199,900	NATURAL	235	100	1 1/2"	1 1/2"	97	5 A	120 V	1	POWER VENT, HIGH EFFICIENCY CONDENSING GAS WATER HEATER. PROVIDE T&P RELIEF VALVE, THERMAL EXPANSION TANK, DRAIN PAN, AND CONDENSATE NEUTRALIZER. PROVIDE CONCENTRIC VENT KIT PER MANUFACTURER REQUIREMENTS.

GENERAL NOTES:

1. THE WATER HEATER SHALL BE FACTORY ASSEMBLED, AND SHALL INCLUDE HOOKUPS FOR ELECTRICAL, GAS, VENTING AND PLUMBING. THE BURNER SHALL BE A HIGH EFFICIENCY TYPE. IGNITION SHALL BE BY AN ELECTRONIC PILOT SYSTEM WITH AUTOMATIC SAFETY CONTROLS FOR HIGH LIMIT, GAS PRESSURE REGULATOR. VENTING SHALL BE U.L. RATED FOR USE WITH CPVC. THE WATER HEATER SHALL BE CONSTRUCTED TO ASME CODE, CERTIFIED BY CSA, AND APPROVED BY NSF FOR DOMESTIC HOT WATER USE.
2. PROVIDE ASME PRESSURE/TEMPERATURE RELIEF VALVE FOR THE WATER HEATER.
3. THE WATER HEATER SHALL COMPLY WITH THE ENERGY EFFICIENCY REQUIREMENTS FOR STANDBY LOSS AND THERMAL EFFICIENCY AS SPECIFIED IN THE LATEST EDITION OF ASHRAE 90.1 STANDARD.

PLUMBING DRAINAGE SCHEDULE

TAG	SPECIALTY ITEM	MANUFACTURER	MODEL	DESCRIPTION	REMARKS
FCO	FLOOR CLEANOUT	JR SMITH	4020 SERIES	AREAS INCORPORATING FLOOR FINISHES, ADJUSTABLE ROUND SCORIATED HEAVY DUTY NICKEL BRONZE SECURED TOP, CAST IRON BODY, FLASHING FLANGE AND CLAMP, TAPERED BRONZE PLUG.	
FD-1	FLOOR DRAIN	JR SMITH	2010(A)-NB-P050	CAST IRON BODY, BOTTOM OUTLET, 6" DIAMETER ADJUSTABLE NICKEL BRONZE STRAINER TOP, COMBINATION SEEPAGE PAN/MEMBRANE FLASHING CLAMP AND TRAP PRIMER CONNECTION.	
FD-2	FLOOR DRAIN	JR SMITH	2110-P050-B	CAST IRON BODY, BOTTOM OUTLET, 9" DIAMETER CAST IRON TOP, SEDIMENT BUCKET, COMBINATION SEEPAGE PAN/MEMBRANE FLASHING CLAMP AND TRAP PRIMER CONNECTION.	
FS-1	FLOOR SINK	JR SMITH	3101-C	ACID RESISTANT COATED(ARC) INTERIOR, 6" DEEP CAST IRON BODY, BOTTOM OUTLET, 8" SQUARE NICKEL BRONZE TOP, ALUMINUM SEDIMENT BUCKET AND COMBINATION SEEPAGE PAN/MEMBRANE FLASHING CLAMP. PROVIDE DRAINS RECEIVING INDIRECT WASTE WITH 1/2 GRATE.	
RD-1	ROOF DRAIN	JR SMITH	1010-E-R-C	DIAMETER CAST IRON BODY, BOTTOM OUTLET, 12" DIAMETER CAST IRON DOME, SUMP RECEIVER, UNDER-DECK CLAMP, FIXED EXTENSION COLLAR, AND COMBINATION MEMBRANE FLASHING CLAMP/GRAVEL GUARD.	

PLUMBING EXPANSION TANK SCHEDULE

TAG	SPECIALTY ITEM	MANUFACTURER	MODEL	DESCRIPTION	REMARKS
ET-1	DOMESTIC WATER EXPANSION TANK	AMTROL	ST-25V-C		10.3 GALLON THERMAL EXPANSION TANK FOR DOMESTIC WATER HEATER SYSTEM. PROVIDE 6.9 GALLON ACCEPTANCE VOLUME. SET TANK PRE-CHARGE TO MATCH INCOMING STATIC WATER PRESSURE. INSTALL ON COLD WATER SUPPLY TO WATER HEATER PER MANUFACTURER REQUIREMENTS.

MIXING VALVE SCHEDULE

TAG	MANUFACTURER	MODEL	TYPE	GPM	MAX. PRESSURE	MIN GPM WITH ACCURATE TEMP.	OUTLET SET TEMP. (°F)	SIZE (INLET, OUTLET)	UNIT COMPLIANCE	REMARKS
TMV-1	ACORN	MV17-3	PACKAGED MIXING STATION	90	125 PSI	2	120	2"	ASSE 1017	COMMAND STATION. INCLUDED WILL BE COMBINATION TEMPERATURE/PRESSURE GAUGES ON THE INLETS AND OUTLET, FULL PORT LOCKABLE BALL VALVES FOR SERVICE STOPS, CARTRIDGE-STYLE INLET CHECKS W/STRAINERS, A HOSE CONNECTION FOR CREATING DEMAND LOCALLY. ATTACHED TO A WELDED UNISTRUT FRAME FOR SUPPORT. ASSEMBLY SHALL BE LEAD-FREE.

DUPLEX EFFLUENT PUMP SCHEDULE

TAG	MANUFACTURER	MODEL	SERVICE	TYPE	FLOW	HEAD	ELECTRICAL VOLTS	ELECTRICAL PH	ELECTRICAL HZ	REMARKS
SP-1 / SP-2	ZOELLER	6155	FLOOR DRAIN WASTE	DUPLEX SUBMERSIBLE EFFLUENT PUMP	77 GPM MAX	44' MAX	208	3	60	PROVIDE DUPLEX EFFLUENT PUMP SYSTEM FOR FLOOR DRAIN WASTE ONLY. PROVIDE (2) MODEL 6155 PUMPS, EACH RATED FOR 30 GPM. CONCRETE PIT BY STRUCTURAL DIVISION. REFER TO STRUCTURAL DRAWINGS FOR PIT SIZE AND REINFORCEMENT REQUIREMENTS. PROVIDE AIR-TIGHT COVER WITH PORTS FOR PUMPS, PIPING, AND CONTROLS. PROVIDE DUPLEX PIVOT PRO DUPLEX CONTROLLER WITH 3-FLOAT TREE FOR ON/OFF AND HIGH-WATER ALARM. TIE HIGH-WATER ALARM AND COMMON FAULT SIGNAL INTO BUILDING MANAGEMENT SYSTEM. PROVIDE Z-RAIL SYSTEM FOR EASY PUMP REMOVAL WITHOUT DISCONNECTING PIPING.

GREASE INTERCEPTOR SCHEDULE

TAG	MANUFACTURER	MODEL	FLOW RATE (GPM)	REMARKS

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING SCHEDULES

P6.1

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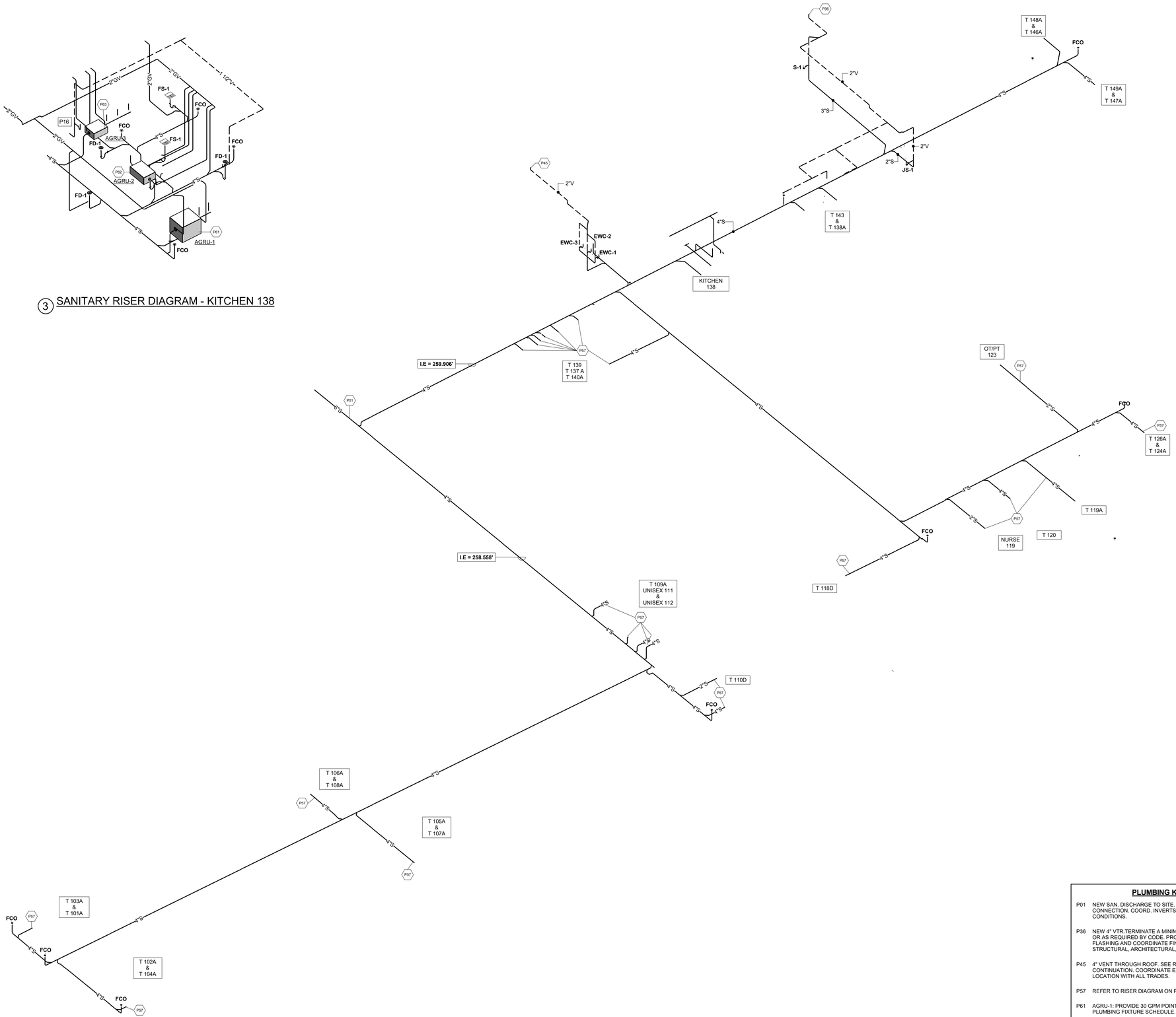
3 SANITARY RISER DIAGRAM - KITCHEN 138



1 SANITARY RISER DIAGRAM 1

PLUMBING KEYNOTES

P01 NEW SAN. DISCHARGE TO SITE. REFER TO CIVIL FOR CONT. & CONNECTION. COORD. INVERTS & ROUTING W/ CIVIL & FIELD CONDITIONS.

P36 NEW 4" VTR.TERMINATE A MINIMUM OF 24" ABOVE ROOF SURFACE OR AS REQUIRED BY CODE. PROVIDE WEATHERPROOF ROOF FLASHING AND COORDINATE FINAL PENETRATION LOCATION WITH STRUCTURAL, ARCHITECTURAL, AND MECHANICAL DRAWINGS.

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

P57 REFER TO RISER DIAGRAM ON P7.2

P61 AGRU-1: PROVIDE 30 GPM POINT-OF-USE AGRU. REFER TO PLUMBING FIXTURE SCHEDULE.

P62 AGRU-2: PROVIDE 5 GPM POINT-OF-USE AGRU. REFER TO PLUMBING FIXTURE SCHEDULE.

P63 AGRU-3: PROVIDE 40 GPM POINT-OF-USE AGRU. REFER TO PLUMBING FIXTURE SCHEDULE.

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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
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Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING RISERS - DRAINAGE

P7.1

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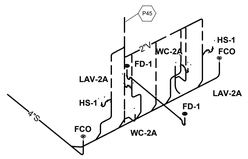
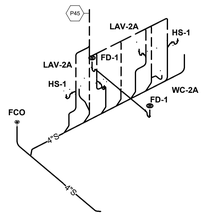
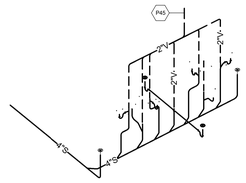


1 SANITARY RISER DIAGRAM T 102A & T 104A



2 SANITARY RISER DIAGRAM T 103A & T 101A



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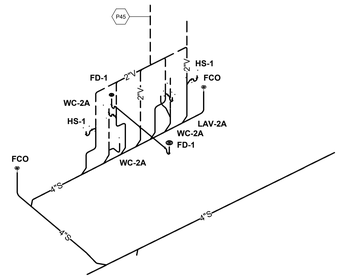
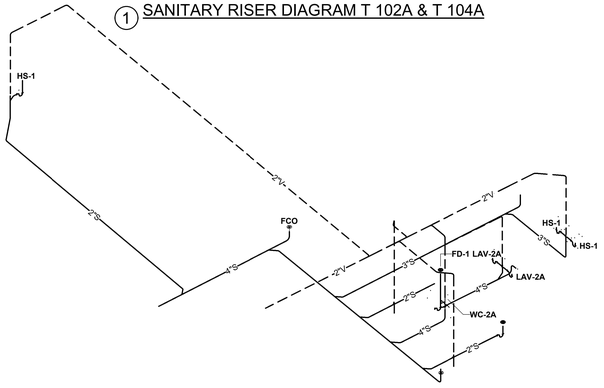
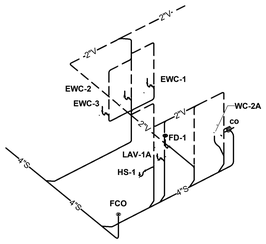


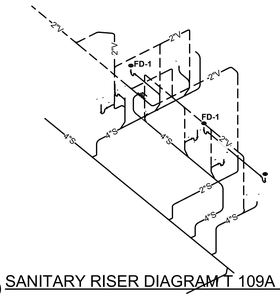
4 SANITARY RISER DIAGRAM T 106A & T 108A



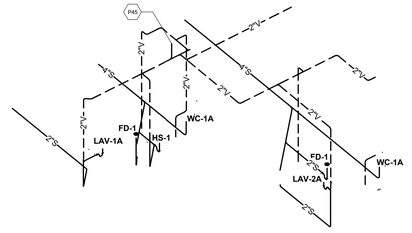
8 SANITARY RISER DIAGRAM T 126A, T 124A, & OT/PT 123



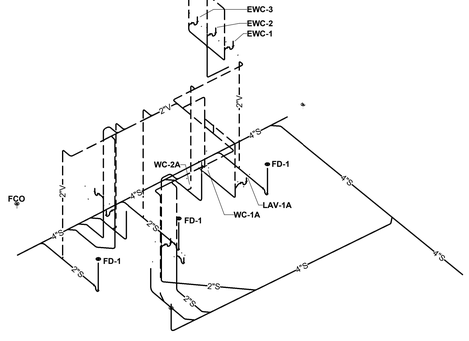
5 SANITARY RISER DIAGRAM T 110D



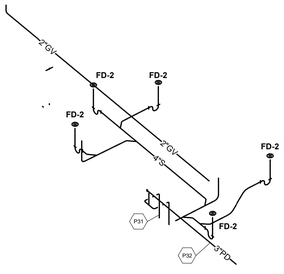
6 SANITARY RISER DIAGRAM T 109A UNISEX 111 & UNISEX 112



7 SANITARY RISER DIAGRAM T 119A, NURSE 119, & T 120



9 SANITARY RISER DIAGRAM T 139, T 137 A & T 140A



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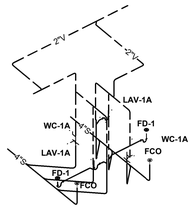
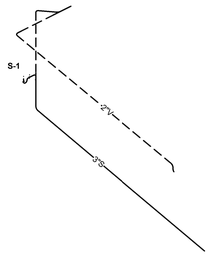
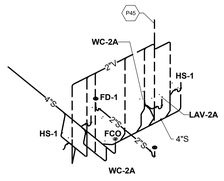


11 SANITARY RISER DIAGRAM T 138A & T 143

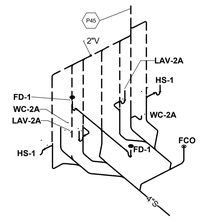


12 SANITARY RISER DIAGRAM BREAK/WORK RM 144

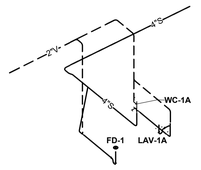
13 SANITARY RISER DIAGRAM CUST 145



14 SANITARY RISER DIAGRAM T 147 A & T 149A



15 SANITARY RISER DIAGRAM T 146A & T 149A



16 SANITARY RISER DIAGRAM T 118D

PLUMBING KEYNOTES

P31 NEW CONCRETE PIT FOR DUPLEX SEWAGE EJECTOR SYSTEM (SP-1 & SP-2). PROVIDE (2) 2" DISCHARGE RISERS & 2" VENT. INSTALL CHECK VALVE AND ISOLATION VALVE ON EACH DISCHARGE LINE. COORDINATE POWER AND CONTROLS WITH ELECTRICAL. REFER TO SCHEDULE AND DETAIL SHEETS FOR ADDITIONAL REQUIREMENTS. PIT CONSTRUCTION BY STRUCTURAL.

P32 3" PD TO TIE INTO GRAVITY SANITARY LINE. PROVIDE WYE FITTING IN DIRECTION OF FLOW COORDINATE EXACT CONNECTION LOCATION AND INVERT WITH FIELD CONDITIONS.

P45 4" VENT THROUGH ROOF. SEE ROOF PLUMBING PLAN FOR CONTINUATION. COORDINATE EXACT ROOF PENETRATION LOCATION WITH ALL TRADES.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
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PLUMBING RISERS - DRAINAGE

P7.2

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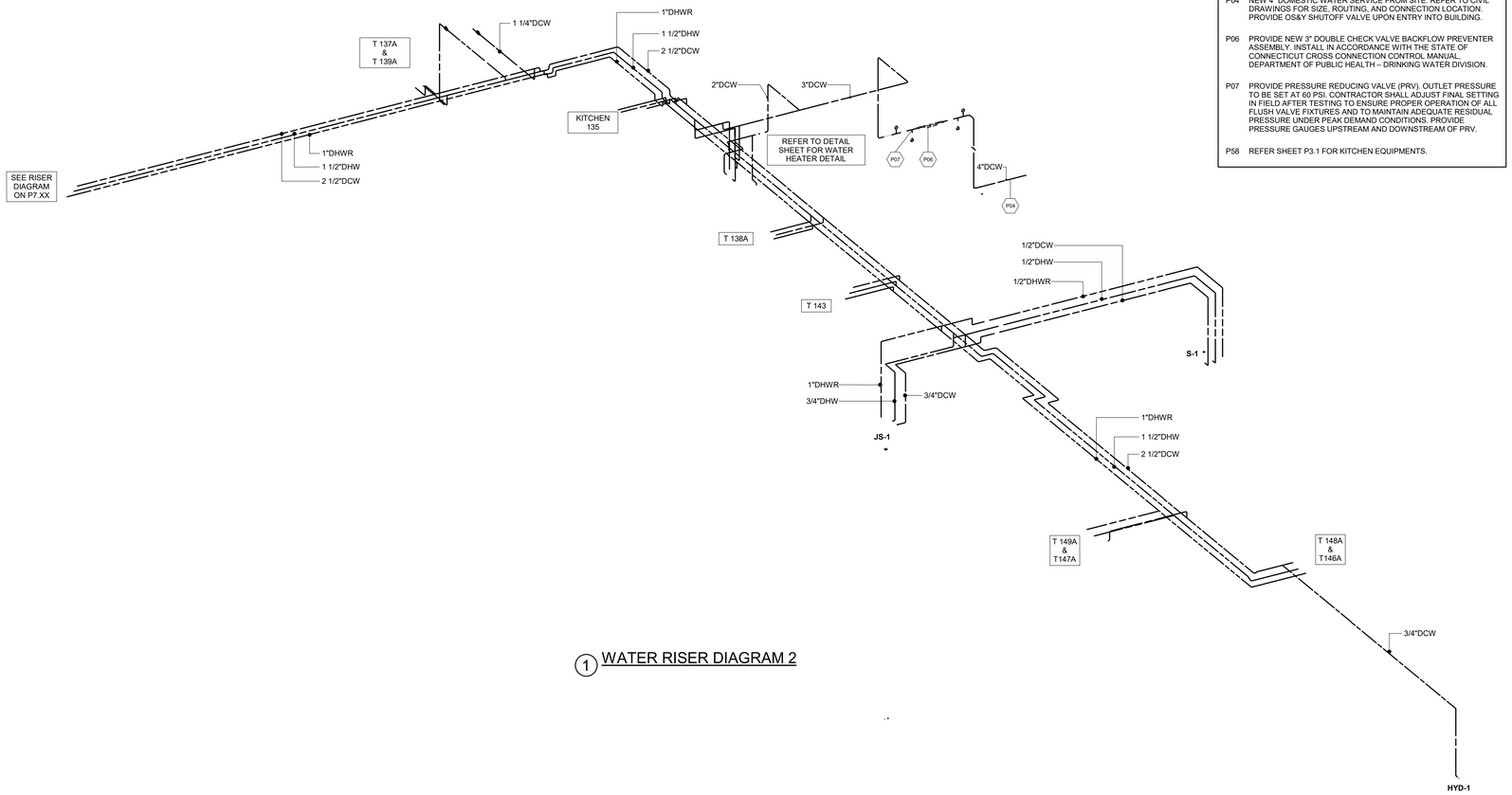
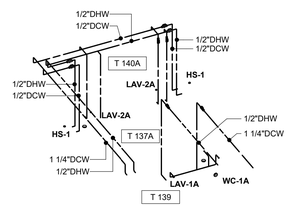
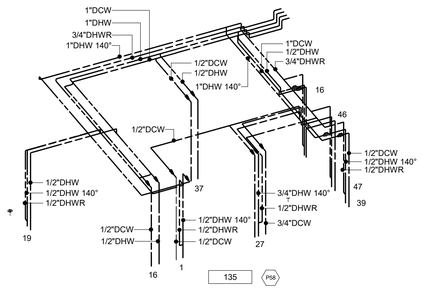


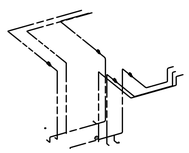
1 WATER RISER DIAGRAM 2



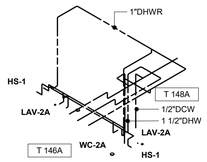
2 WATER RISER DIAGRAM - T 137A, T 139 & 140A



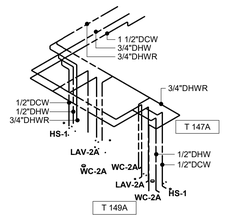
3 WATER RISER DIAGRAM - KITCHEN 135



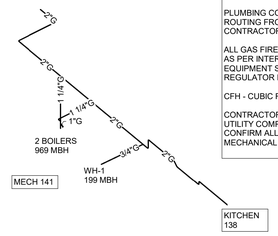
4 WATER RISER DIAGRAM - T 138A & T 143



5 WATER RISER DIAGRAM - T 146A & 148



6 WATER RISER DIAGRAM - T 147A & 149A



7 GAS RISER DIAGRAM

PLUMBING KEYNOTES

P04 NEW 4" DOMESTIC WATER SERVICE FROM SITE. REFER TO CIVIL DRAWINGS FOR SIZE, ROUTING, AND CONNECTION LOCATION. PROVIDE OS&Y SHUTOFF VALVE UPON ENTRY INTO BUILDING.

P06 PROVIDE NEW 3" DOUBLE CHECK VALVE BACKFLOW PREVENTER ASSEMBLY. INSTALL IN ACCORDANCE WITH THE STATE OF CONNECTICUT CROSS CONNECTION CONTROL MANUAL, DEPARTMENT OF PUBLIC HEALTH – DRINKING WATER DIVISION.

P07 PROVIDE PRESSURE REDUCING VALVE (PRV). OUTLET PRESSURE TO BE SET AT 60 PSI. CONTRACTOR SHALL ADJUST FINAL SETTING IN FIELD AFTER TESTING TO ENSURE PROPER OPERATION OF ALL FLUSH VALVE FIXTURES AND TO MAINTAIN ADEQUATE RESIDUAL PRESSURE UNDER PEAK DEMAND CONDITIONS. PROVIDE PRESSURE GAUGES UPSTREAM AND DOWNSTREAM OF PRV.

P58 REFER SHEET P3.1 FOR KITCHEN EQUIPMENTS.

NOTES:
TOTAL DEVELOPED LENGTH OF GAS PIPING FROM METER RIG TO FURTHEST OUTLET = 100FT.

GAS PIPING BASED ON SOUTHWEST GAS COMPANY REQUIREMENT AND IPC

NATURAL GAS INLET PRESSURE OF LESS THAN 2.0PSI, PRESSURE DROP OF 0.3 PSI AND 0.6 SPECIFIC GRAVITY.

PLUMBING CONTRACTOR TO COORDINATE ALL GAS VENT ROUTING FROM GAS REGULATORS, ETC... WITH MECHANICAL CONTRACTOR

ALL GAS FIRED EQUIPMENT SHALL BE CONNECTED TO PIPING AS PER INTERNATIONAL FUEL GAS CODE. EACH PIECE OF EQUIPMENT SHALL HAVE A DIRT LEG, UNION GAS COCK, & REGULATOR IF LOWER THEN SUPPLIED PRESSURE IS REQUIRED

CFH - CUBIC FEET PER HOUR MBH = M (1000) BTU PER HOUR

CONTRACTOR TO COORDINATE INSTALLATION WITH GAS UTILITY COMPANY
CONFIRM ALL PRESSURE REQUIREMENTS WITH APPROVED MECHANICAL EQUIPMENT.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

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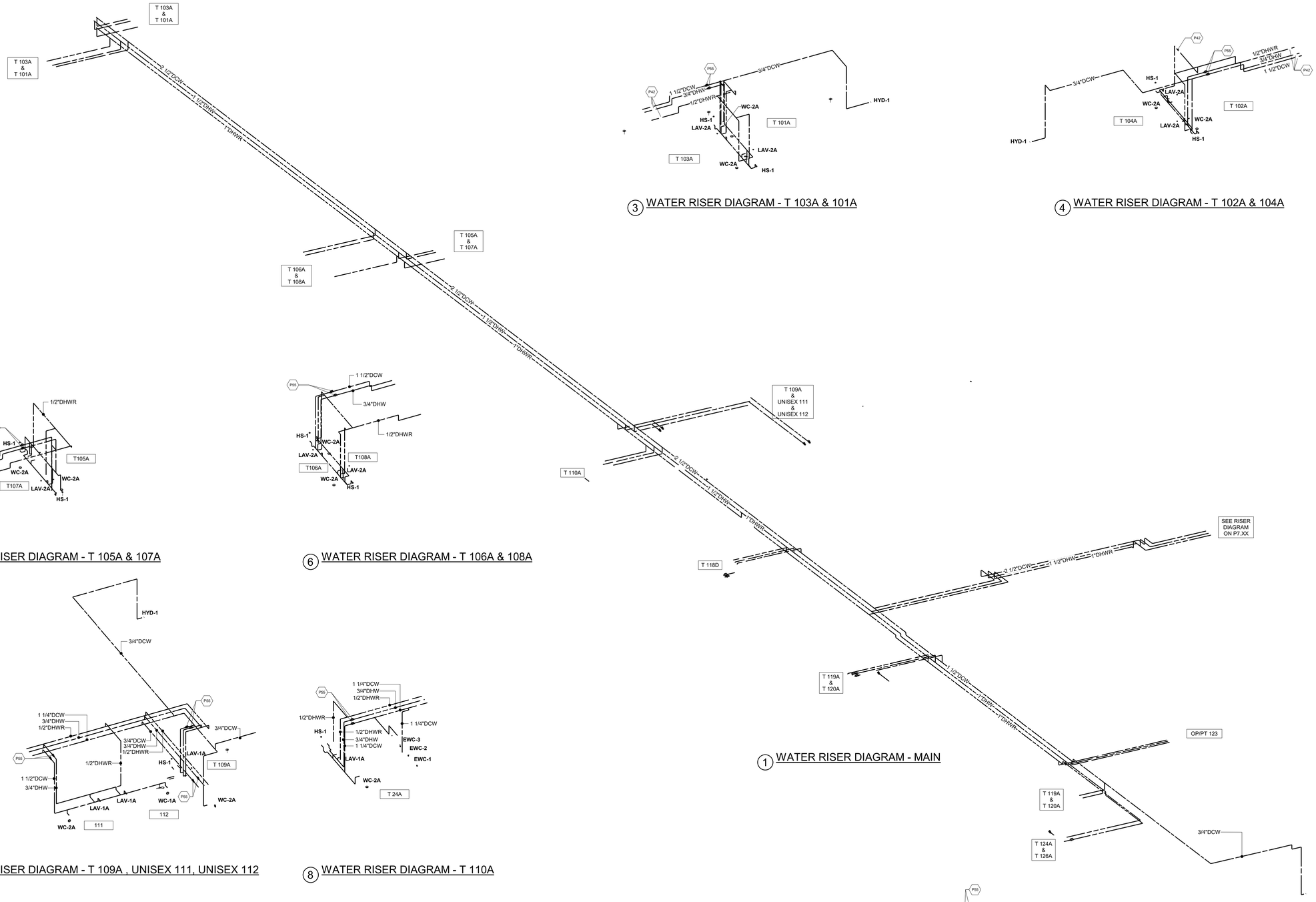
PLUMBING RISERS - SUPPLY

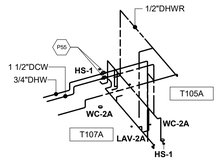
P7.3



1 WATER RISER DIAGRAM - MAIN

3 WATER RISER DIAGRAM - T 103A & 101A

4 WATER RISER DIAGRAM - T 102A & 104A

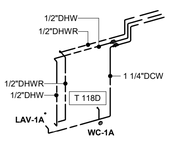


5 WATER RISER DIAGRAM - T 105A & 107A

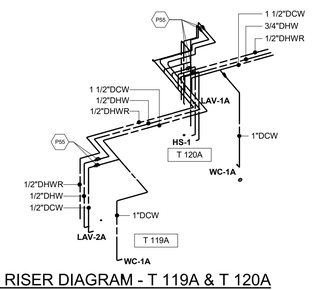
6 WATER RISER DIAGRAM - T 106A & 108A

7 WATER RISER DIAGRAM - T 109A , UNISEX 111, UNISEX 112

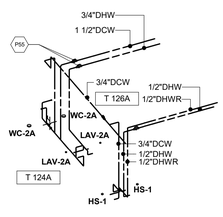
8 WATER RISER DIAGRAM - T 110A



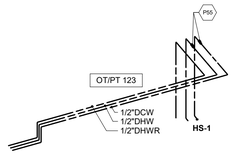
9 WATER RISER DIAGRAM - T 118D



10 WATER RISER DIAGRAM - T 119A & T 120A



11 WATER RISER DIAGRAM - T 124A & T 126A



12 WATER RISER DIAGRAM - OT/PT 123

PLUMBING KEYNOTES

P42 PROVIDE FULL PORT SHUTOFF VALVE. COORDINATE EXACT LOCATION AND ACCESS REQUIREMENTS WITH ARCHITECTURAL DRAWINGS.

P55 PROVIDE WATER HAMMER ARRESTORS PER PDI WH-201. INSTALL ABOVE ACCESSIBLE CEILINGS AS CLOSE AS PRACTICAL TO FIXTURES SERVED. SIZE PER PDI WH-201. PROVIDE ACCESS PANELS AS REQUIRED FOR MAINTENANCE AND REPLACEMENT.

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RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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PLUMBING RISERS - SUPPLY

P7.4

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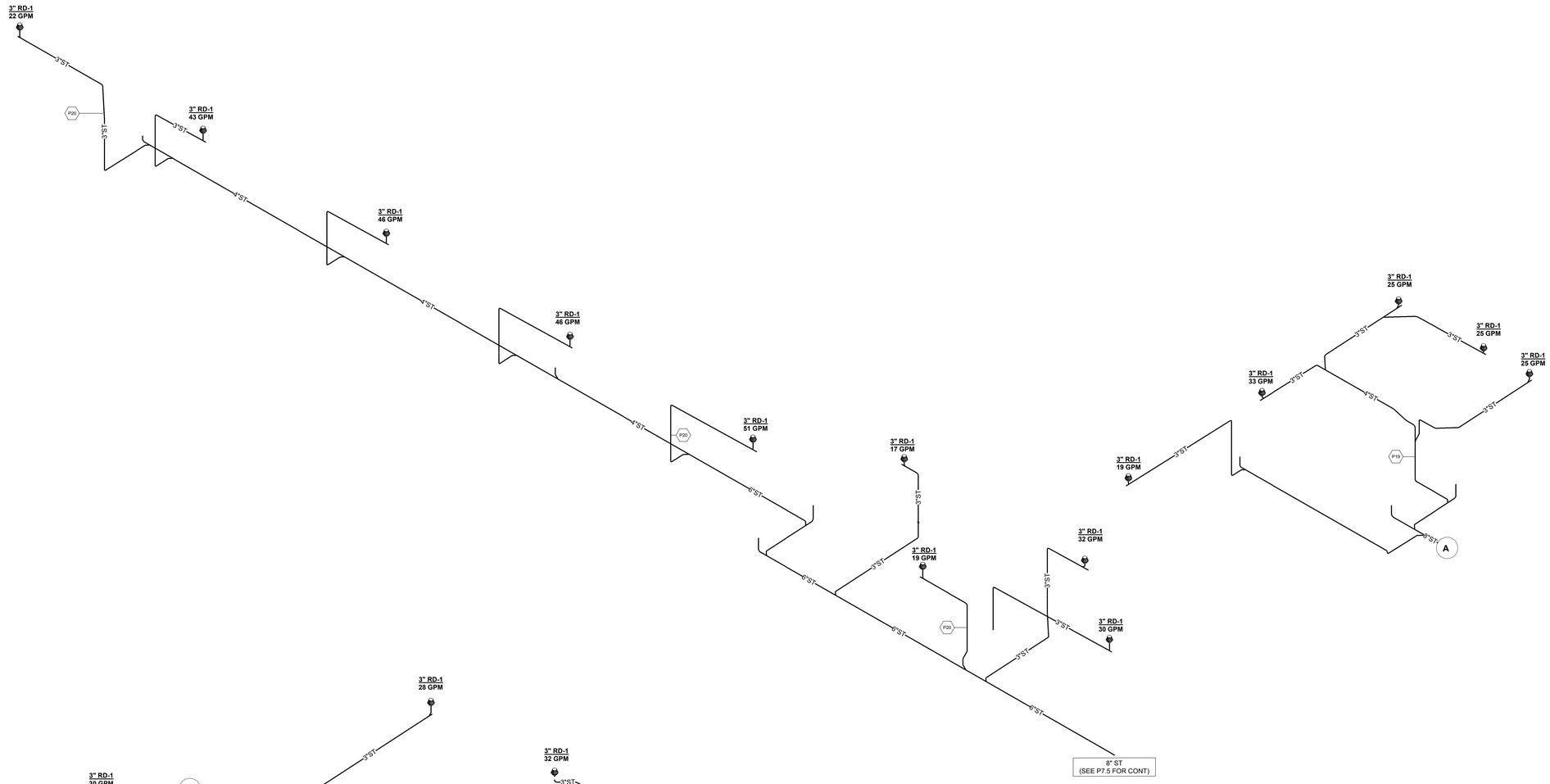
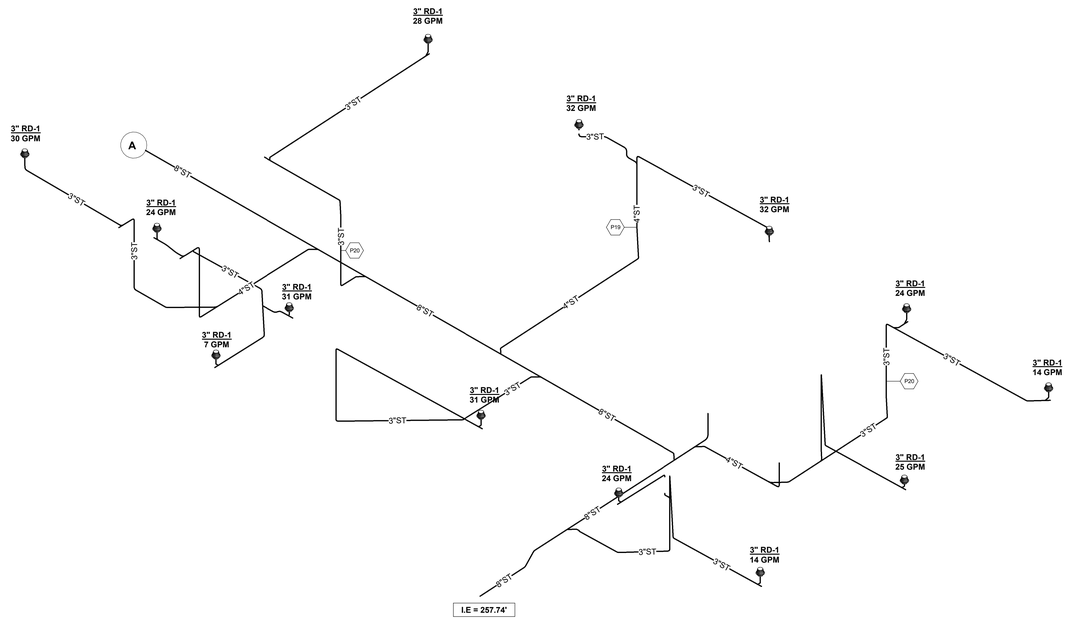


1 STORM RISER DIAGRAM



2 STORM RISER DIAGRAM 2

PLUMBING KEYNOTES

P19 4" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

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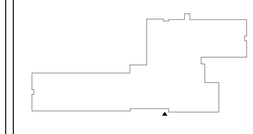
GM2

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
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PLUMBING RISERS - STORM

P7.5

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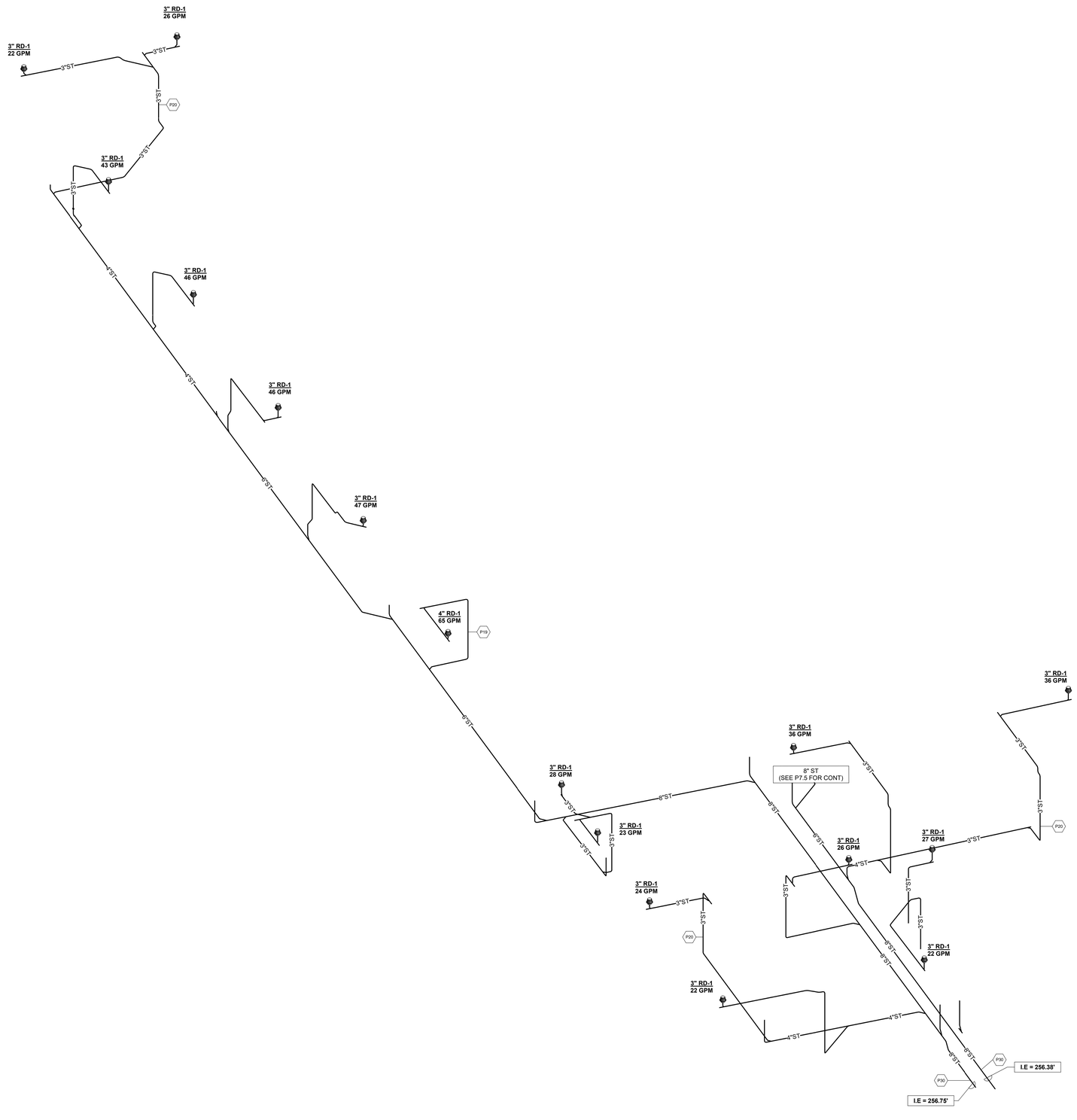

1 STORM RISER DIAGRAM 3

PLUMBING KEYNOTES

P19 4" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P20 3" STORM LEADER DROP BELOW SLAB AND CONNECT TO UNDER-SLAB STORM SYSTEM. PROVIDE CLEANOUT (CO) AT BASE OF STACK. COORDINATE INVERT AND ROUTING WITH UNDER-SLAB PIPING. VERIFY IN FIELD AND MAINTAIN REQ'D SLOPE.

P30 NEW 8" STORM TO EXISTING SITE STORM DRAIN REFER TO CIVIL FOR CONT. & CONNECTION. COORD. INVERTS & ROUTING W/ CIVIL & FIELD CONDITIONS. INVERT ELEVATION AT BUILDING EXIT : CONTRACTOR SHALL VERIFY ELEVATION IN FIELD AND MAINTAIN REQUIRED SLOPE TO POINT OF CONNECTION

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RENOVATIONS TO:
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345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PLUMBING RISERS - STORM

P7.6

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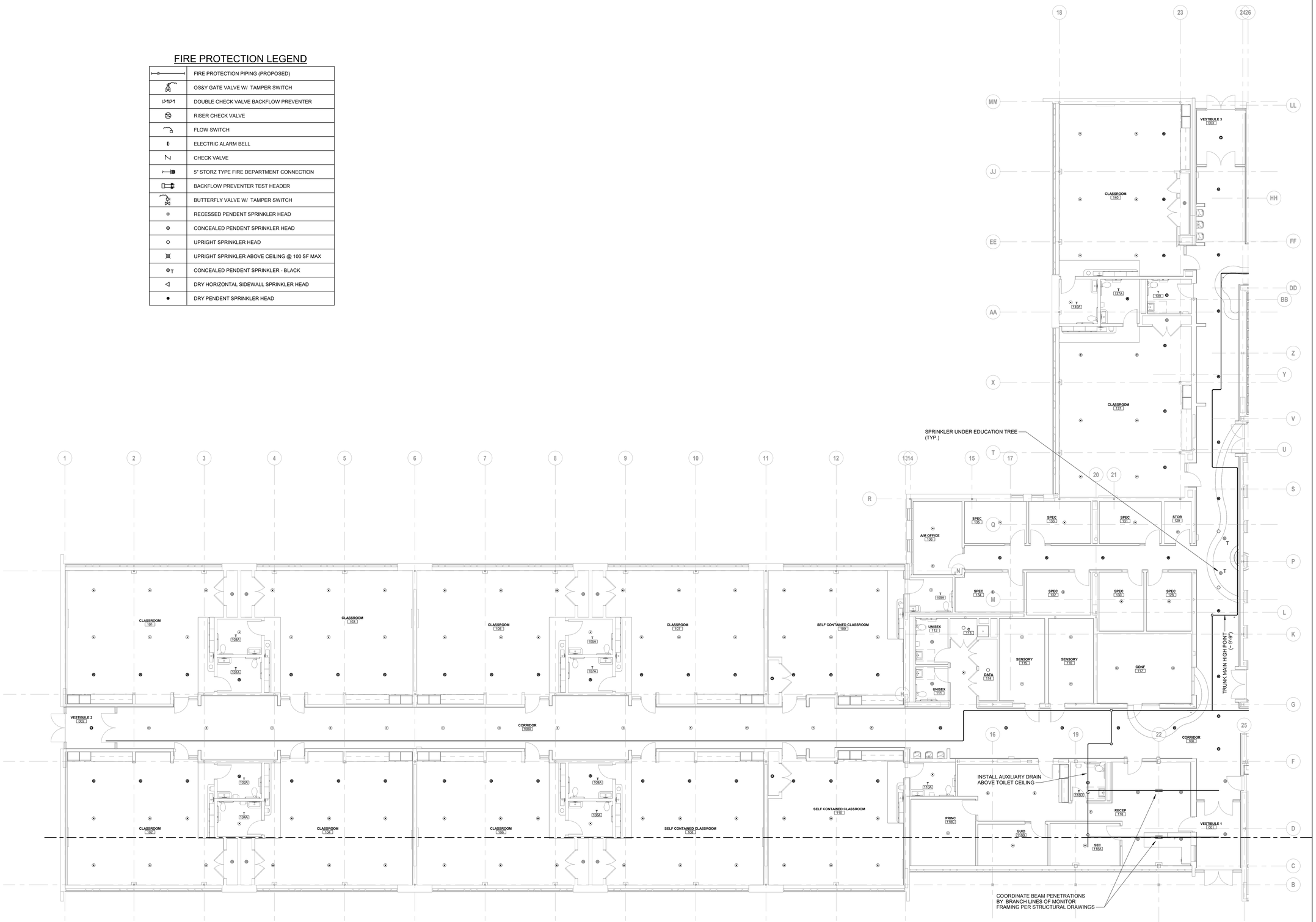
FIRE PROTECTION LEGEND

	FIRE PROTECTION PIPING (PROPOSED)
	OS&Y GATE VALVE W/ TAMPER SWITCH
	DOUBLE CHECK VALVE BACKFLOW PREVENTER
	RISER CHECK VALVE
	FLOW SWITCH
	ELECTRIC ALARM BELL
	CHECK VALVE
	5" STORZ TYPE FIRE DEPARTMENT CONNECTION
	BACKFLOW PREVENTER TEST HEADER
	BUTTERFLY VALVE W/ TAMPER SWITCH
	RECESSED PENDENT SPRINKLER HEAD
	CONCEALED PENDENT SPRINKLER HEAD
	UPRIGHT SPRINKLER HEAD
	UPRIGHT SPRINKLER ABOVE CEILING @ 100 SF MAX
T	CONCEALED PENDENT SPRINKLER - BLACK
	DRY HORIZONTAL SIDEWALL SPRINKLER HEAD
	DRY PENDENT SPRINKLER HEAD



1 FIRST FLOOR FIRE PROTECTION PLAN - AREA A
1/8" = 1'-0"

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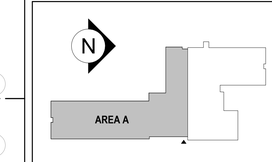
STATE OF CONNECTICUT
KENNETH A. HIPSKY
No. 21720
LICENSED
PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR FIRE PROTECTION PLAN - AREA A

FP1.1A

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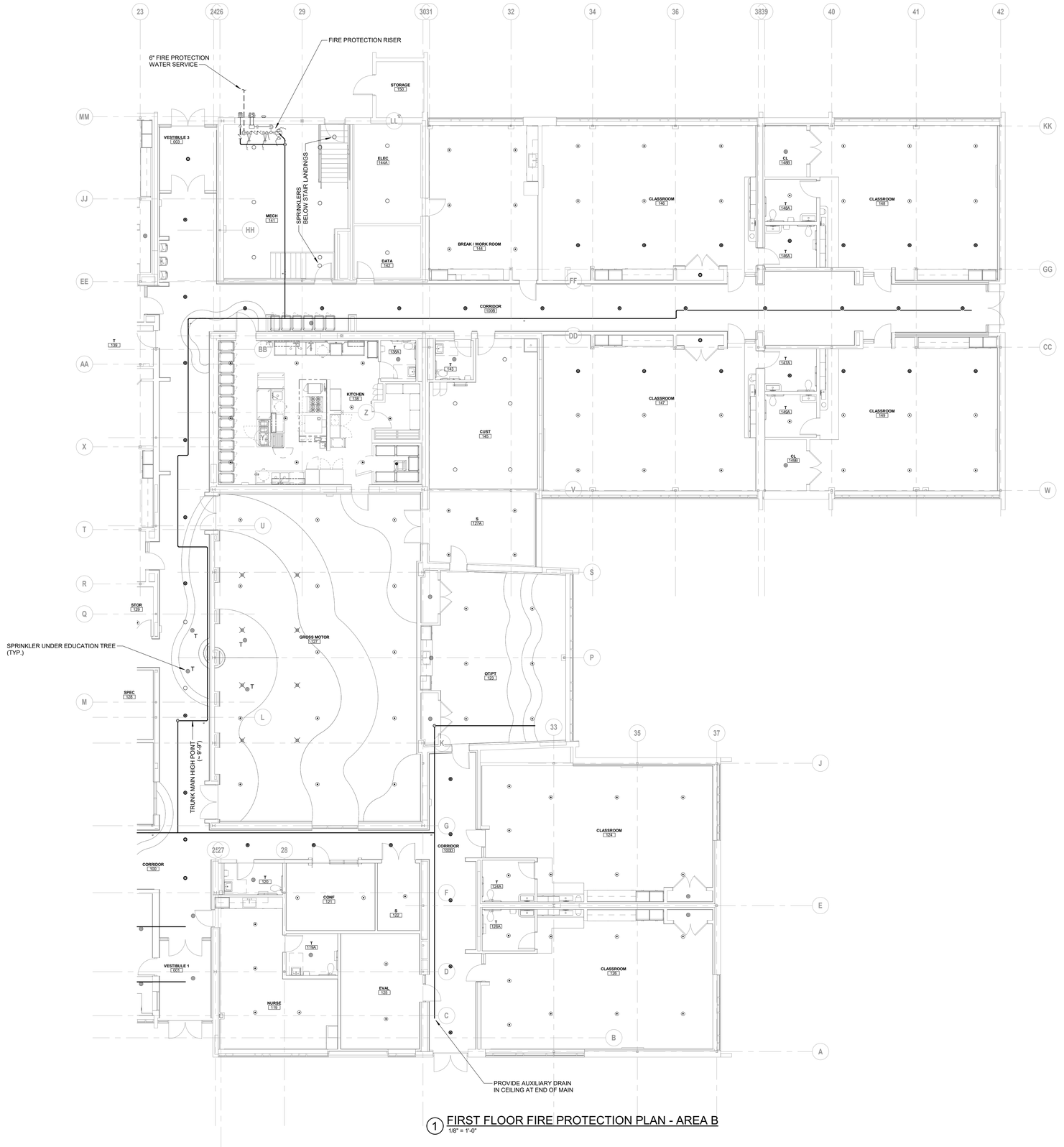
FIRE PROTECTION LEGEND

	FIRE PROTECTION PIPING (PROPOSED)
	OS&Y GATE VALVE W/ TAMPER SWITCH
	DOUBLE CHECK VALVE BACKFLOW PREVENTER
	RISER CHECK VALVE
	FLOW SWITCH
	ELECTRIC ALARM BELL
	CHECK VALVE
	5" STORZ TYPE FIRE DEPARTMENT CONNECTION
	BACKFLOW PREVENTER TEST HEADER
	BUTTERFLY VALVE W/ TAMPER SWITCH
	RECESSED PENDENT SPRINKLER HEAD
	CONCEALED PENDENT SPRINKLER HEAD
	UPRIGHT SPRINKLER HEAD
	UPRIGHT SPRINKLER ABOVE CEILING @ 100 SF MAX
T	CONCEALED PENDENT SPRINKLER - BLACK
	DRY HORIZONTAL SIDEWALL SPRINKLER HEAD
	DRY PENDENT SPRINKLER HEAD



1 FIRST FLOOR FIRE PROTECTION PLAN - AREA B
1/8" = 1'-0"

QA+M architecture
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Farmington, CT 06032
qamarch.com

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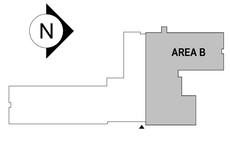
RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRST FLOOR FIRE PROTECTION PLAN - AREA B

FP1.1B

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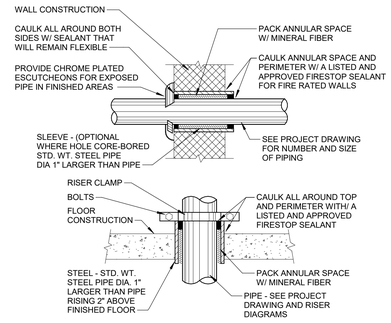
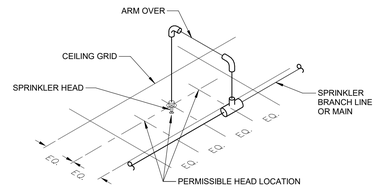


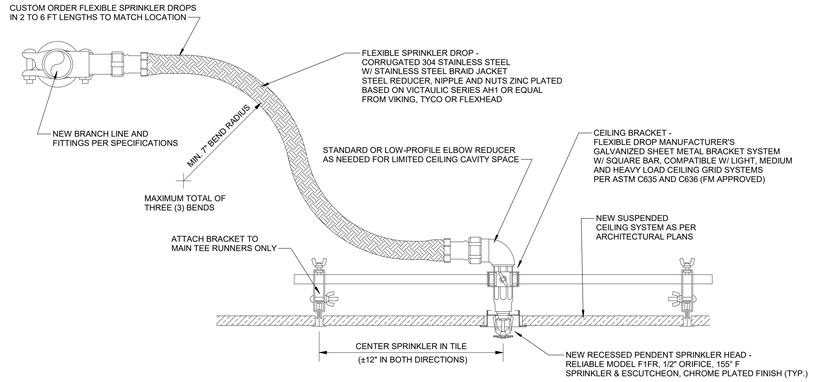
THROUGH-PENETRATION FIRE STOP SYSTEMS: (Based on HILTI FIRESTOP SYSTEMS)
1. GYPSUM WALL ASSEMBLY - 2Hr. FIRE RATED OR LESS - U.L. SYSTEM # WL1056
2. CONCRETE BLOCK WALL - 3 Hr. FIRE RATED OR LESS - U.L. SYSTEM # CAJ1155
3. CONCRETE FLOOR SLAB - 2Hr. FIRE RATED OR UNRATED - U.L. SYSTEM # CAJ1380

THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE U.L. LISTED FIRESTOP SYSTEM TO MATCH CONSTRUCTION AS NOTED OR OTHERS AS NEEDED. SUBMIT FOR APPROVAL. REFER TO ARCHITECTURAL PLANS AND DRAWINGS FOR LOCATION AND CONSTRUCTION OF FIRE RATED WALLS AND PARTITIONS.

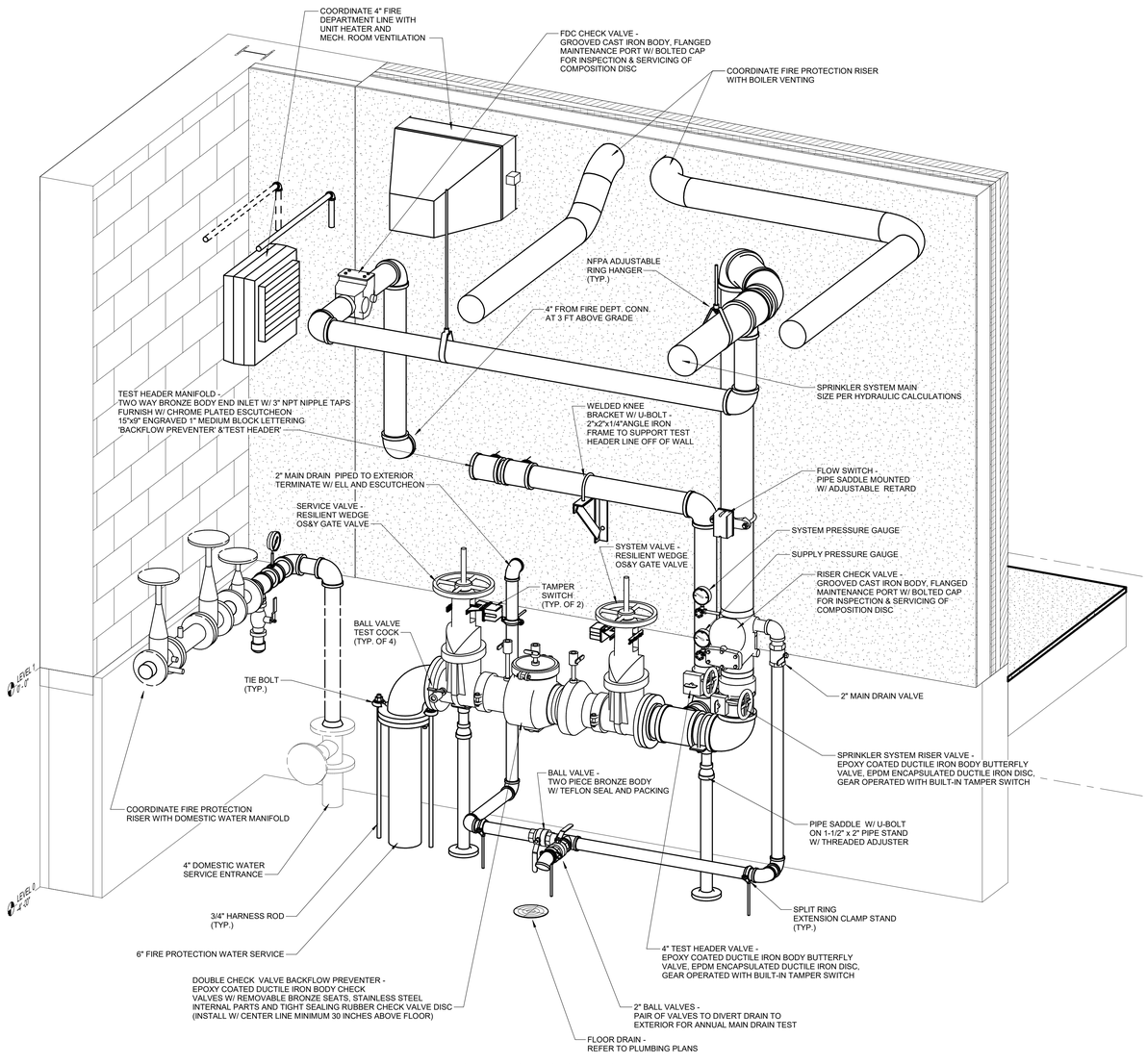
1 PIPE PENETRATION DETAILS
NTS



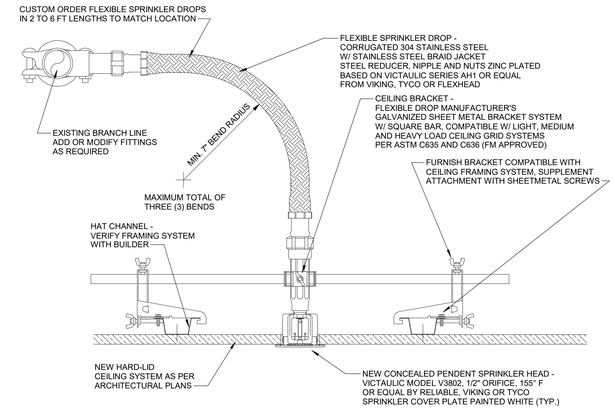
2 SPRINKLER CENTERING DETAIL
NTS



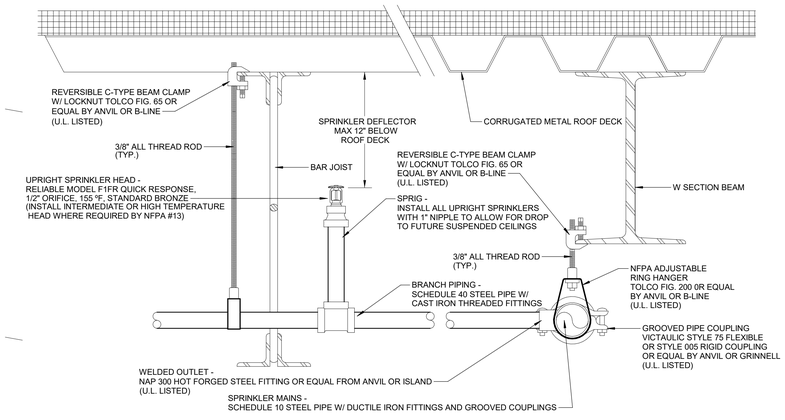
3 LOW-PROFILE FLEXDROP - RECESSED PENDENT SPRINKLER
1/8" = 1'-0"



6 FIRE PROTECTION RISER



4 FLEXDROP - CONCEALED SPRINKLER
NTS



5 TYPICAL PIPE HANGER DETAIL
NTS

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STATE OF CONNECTICUT
REGISTERED PROFESSIONAL ENGINEER
No. 21729
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PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
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Revisions

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

FIRE PROTECTION DETAILS

FP2.0

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ELECTRICAL SYMBOL LIST

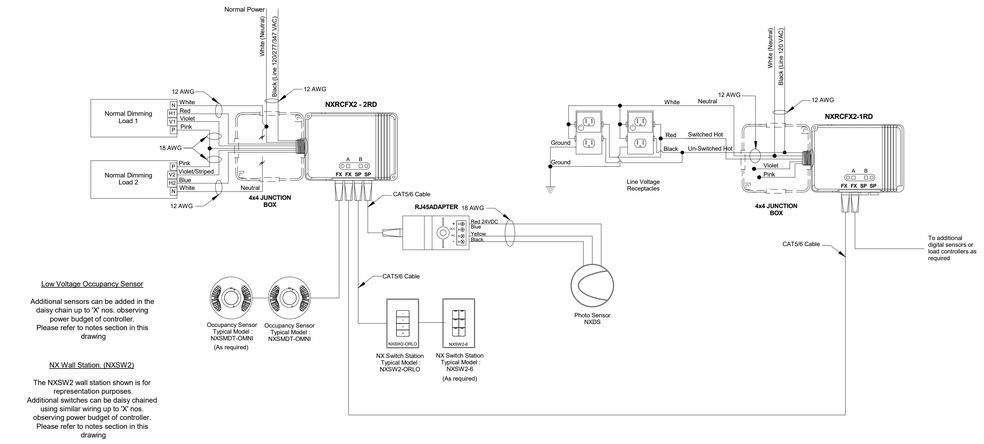
NOTE: ALL MOUNTING HEIGHTS GIVEN ARE TO CENTERLINE OF DEVICE UNLESS NOTED OTHERWISE.

SYMBOL	DESCRIPTION
	PENDANT MOUNTED LIGHT FIXTURE
	PENDANT MOUNTED LIGHT FIXTURE
	CEILING MOUNTED LIGHT FIXTURE
	RECESSED 2'X4' LIGHT FIXTURE
	RECESSED 2'X2' LIGHT FIXTURE
	LINEAR FIXTURE
	WALL MOUNTED FIXTURE
	WALL MOUNTED LIGHT FIXTURE
	SURFACE MOUNTED LIGHT FIXTURE
	RECESSED DOWN LIGHT FIXTURE
	SINGLE FACE EXIT SIGN WITH BATTERY AND DIRECTIONAL ARROWS UNIVERSAL MOUNT
	DOUBLE FACE EXIT SIGN WITH BATTERY AND DIRECTIONAL ARROWS UNIVERSAL MOUNT
	EMERGENCY BATTERY UNIT WITH TWO DIRECTIONAL HEADS
	EMERGENCY REMOTE, WEATHERPROOF, WITH DOUBLE DIRECTIONAL HEADS
$	SINGLE POLE TOGGLE SWITCH
$3	THREE WAY TOGGLE SWITCH
$4	FOUR WAY TOGGLE SWITCH
$K	SINGLE POLE KEYED TOGGLE SWITCH
$3K	THREE WAY KEYED TOGGLE SWITCH MOUNT
$4K	FOUR WAY KEYED TOGGLE SWITCH MOUNT
$T	THERMAL OVERLOAD SWITCH - MOUNT AT FRACTIONAL HP MOTORS
$D	DIMMER SWITCH
$PS	PROJECTION SCREEN SWITCH
$OC	WALL MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR SWITCH
B	DOORBELL BUZZER/CHIME - MOUNT 7'-0" A.F.F.
OS OS	CEILING MOUNTED DUAL TECHNOLOGY OCCUPANCY SENSOR
VS	CEILING MOUNTED DUAL TECHNOLOGY VACANCY SENSOR
PC	PHOTOCELL
E/G	EMERGENCY ELECTRIC/GAS SHUTOFF PUSHBUTTON OPERATOR
	GROUNDED DUPLEX RECEPTACLE
A	GROUNDED DUPLEX RECEPTACLE - MOUNT ABOVE COUNTER OR BACKSPLASH 42" A.F.F.
C	GROUNDED DUPLEX RECEPTACLE - MOUNT AT CEILING
GFI	GROUNDED DUPLEX GFI RECEPTACLE
WP	GROUNDED DUPLEX GFI RECEPTACLE "WEATHERPROOF WHILE IN-USE" COVER
S	GROUNDED DUPLEX RECEPTACLE - STUB UP TO 24" A.F.F. ON 1" (MIN) RGS CONDUIT
PM	VERTICAL PLUGMOLD WITH OUTLETS AT 12" O.C. - 5' LONG
MW	GROUNDED DUPLEX GFI RECEPTACLE DEDICATED FOR MICROWAVE OVEN - VERIFY EXACT MOUNTING LOCATION
	GROUNDED DOUBLE DUPLEX RECEPTACLE
	GROUNDED 240V RECEPTACLE
USB	GROUNDED GFI DUPLEX RECEPTACLE WITH INTEGRAL USB CHARGING PORT
	GROUNDED SIMPLEX RECEPTACLE
	SPECIAL PURPOSE RECEPTACLE - MATCH NEMA CONFIGURATION OF EQUIPMENT SERVED
	FLOOR MOUNTED DEVICES AS LISTED ABOVE
	RECESSED MOUNTED PANELBOARD
	SURFACE MOUNTED PANELBOARD
PP	COMBINATION POWER/TEL/DATA POLE
	TELEPHONE/DATA OUTLETS
WAP	WIRELESS ACCESS POINT (WAP - WIRELESS ACCESS POINT) INCLUDE CAT 5e CABLE
F	MANUAL FIRE ALARM PULL STATION - MOUNT AT 48" A.F.F.
H	HEAT DETECTOR
H 200°	HEAT DETECTOR 200°
S	AREA SMOKE DETECTOR
S D	DUCT SMOKE DETECTOR
S CO	AREA COMBINATION SMOKE AND CARBON MONOXIDE DETECTOR
S E	ELEVATOR RETURN SMOKE DETECTOR
CO	FIRE ALARM CARBON MONOXIDE DETECTOR
	FIRE ALARM REMOTE TEST SWITCH
M	MAGNETIC DOOR HOLDER
	FIRE ALARM VISUAL ONLY INDICATING UNIT - ENTIRE LENS BETWEEN 80" A.F.F. AND 96" A.F.F.
	FIRE ALARM SPEAKER/VISUAL INDICATING UNIT - ENTIRE LENS BETWEEN 80" A.F.F. AND 96" A.F.F.
R	LIGHTING CONTROL RELAY
AOM	FIRE ALARM ADDRESSABLE OUTPUT MODULE
AIM	FIRE ALARM ADDRESSABLE INPUT MODULE
$VC	SPEAKER VOLUME CONTROL
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM REMOTE ANNUNCIATOR PANEL
HGMP	HAZARDOUS GAS MONITOR PANEL FURNISHED BY DIV. 25, WIRED BY DIV. 26
	EMERGENCY "CALL-FOR-AID" BUZZER/LIGHT - MOUNT AT 7'-6" A.F.F.
$A	EMERGENCY "CALL-FOR-AID" SWITCH - MOUNT 48" A.F.F. WITH PULL CORD TO 6" A.F.F.

SYMBOL	DESCRIPTION
M/S	EMERGENCY SWITCH - MOUNT AT 48" A.F.F. - M=MASTER - S=SLAVE
J	JUNCTION BOX
J TC	JUNCTION BOX WITH 120V POWER FOR TEMPERATURE CONTROLS
J CATV	JUNCTION BOX FOR CATV OUTLET WITH 1 1/4" CONDUIT TO CEILING
J	FLOOR MOUNTED JUNCTION BOX
M	MOTOR
	NON-FUSED DISCONNECT SWITCH
	FUSED DISCONNECT SWITCH
	MAGNETIC MOTOR STARTER
	COMBINATION DISCONNECT SWITCH/MAGNETIC MOTOR STARTER
T	TRANSFORMER
	BRANCH CIRCUIT WIRING
	BRANCH CIRCUIT FEEDER
	ELECTRICAL GROUND
	FLEXIBLE EQUIPMENT CONNECTION
	FIXED/HARD - WIRED EQUIPMENT CONNECTION
TC	TIMECLOCK
C	CONTACTOR
	SECURITY SYSTEM CAMERA
DL	SECURITY SYSTEM DOOR LOCK
MD	SECURITY SYSTEM MOTION SENSOR
CR	SECURITY SYSTEM CARD READER
DC	SECURITY SYSTEM DOOR CONTACT
	SECURITY SYSTEM KEY PAD
FS	FLOW SWITCH
TS	TAMPER SWITCH
PS	PRESSURE SWITCH
S	WALL MOUNTED SPEAKER
S	CEILING MOUNTED SPEAKER
IC	INTERCOM STATION
	COMBINATION SPEAKER/CLOCK
	CLOCK

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	MODEL	LAMPS			VOLTAGE	REMARKS	ALTERNATE 1		ALTERNATE 2	
			LUMENS	WATTAGE	LUMENS/WATT			MANUFACTURER	MODEL	MANUFACTURER	MODEL
A2	COLUMBIA LIGHTING	LCAT22-S-35L036G-ED1U	3642 lm	25 W	144 lm/W	120 V	RECESSED 2X2	LITHONIA	STACK		
A2E	COLUMBIA LIGHTING	LCAT22-S-35L036G-ED1U-ELL14	3642 lm	25 W	144 lm/W	120 V	RECESSED 2X2 W/EM	LITHONIA	STACK		
A4	COLUMBIA LIGHTING	LCAT24-S-35L058G-ED1U	5879 lm	39 W	153 lm/W	120 V	RECESSED 2X4	LITHONIA	STACK		
B4	PICASSO	MX4-RF-4-D5-35-80-FWF-T2-ZT1-W	2000 lm	22 W	93 lm/W	120 V	4' RECESSED LINEAR	MARK	SLOT		
B4E	PICASSO	MX4-RF-4-D5-35-80-FWF-T2-ZT1-W-EMD	2000 lm	22 W	93 lm/W	120 V	4' RECESSED LINEAR W/EM	MARK	SLOT		
B6	PICASSO	MX4-RF-6-D5-35-80-FWF-T2-ZT1-W	3000 lm	32 W	93 lm/W	120 V	6' RECESSED LINEAR	MARK	SLOT		
B6E	PICASSO	MX4-RF-6-D5-35-80-FWF-T2-ZT1-W-EMD	3000 lm	32 W	93 lm/W	120 V	6' RECESSED LINEAR W/EM	MARK	SLOT		
C	DMF	M4NCRN-MD12935GAO-M4TRSWH	1250 lm	14 W	87 lm/W	120 V	4" DOWNLIGHT	LITHONIA	LDN4		
C1	DMF	M4NCRN-MD12930GAO-M4TRSWH	1250 lm	14 W	87 lm/W	120 V	4" DOWNLIGHT 30K	LITHONIA	LDN4		
C1E	DMF	M4NCRN12OEM-MD12930GAA-M4TRSWH	1250 lm	14 W	87 lm/W	120 V	4" DOWNLIGHT 30K W/EM	LITHONIA	LDN4		
CE	DMF	M4NCRN12OEM-MD12935GAA-M4TRSWH	1250 lm	14 W	87 lm/W	120 V	4" DOWNLIGHT W/EM	LITHONIA	LDN4		
D4	COLUMBIA LIGHTING	MPS4-35ML-CW-ED1U	4941 lm	31 W	158 lm/W	120 V	4' SUSPENDED LINEAR PROVIDE CM48SCF3-KIT	LITHONIA	CSS		
D4E	COLUMBIA LIGHTING	MPS4-35ML-CW-ED1U-ELL14	4941 lm	31 W	158 lm/W	120 V	4' SUSPENDED LINEAR W/EM PROVIDE CM48SCF3-KIT	LITHONIA	CSS		
D8	COLUMBIA LIGHTING	MPS8-35ML-CW-ED1U	9882 lm	62 W	161 lm/W	120 V	8' SUSPENDED LINEAR PROVIDE CM48SCF3-KIT	LITHONIA	CSS		
D8E	COLUMBIA LIGHTING	MPS8-35ML-CW-ED1U-ELL14	9882 lm	62 W	161 lm/W	120 V	8' SUSPENDED LINEAR W/EM PROVIDE CM48SCF3-KIT	LITHONIA	CSS		
F2	ARANCIA	C81-24-S-N-A-U-1-0-TBD	4640 lm	58 W	80 lm/W	120 V	2' SURFACE ROUND	LUMENWERX	POP COLOR ROUND		
F2E	ARANCIA	C81-24-S-N-A-U-B-0-TBD	4640 lm	58 W	80 lm/W	120 V	2' SURFACE ROUND W/EM	LUMENWERX	POP COLOR ROUND		
G	COLUMBIA LIGHTING	MPS4-35ML-CW-ED1U	4941 lm	31 W	158 lm/W	120 V	CLOSET LIGHT. WALL MOUNT OVER DOOR	LITHONIA	CSS		
H4	LIGHTLY	VEIL2X4-ALN-GC01-M35Z	3094 lm	37 W	83 lm/W	120 V	DECORATIVE 2X4				
J1	BETA CALCO	TMRP2P01-LMA0320-LMB0240-CR80-CTA35-CTB35-UD2-V1-DA01-SS1-FA01-CF01-E0-CS1	5600 lm	55 W	102 lm/W	120 V	18" SUSPENDED ROUND	LUMENWERX	POP CORE ROUND		
J2	BETA CALCO	TMRP2P02-LMA0530-LMB0240-CR80-CTA35-CTB35-UD2-V1-DA01-SS1-FA01-CF01-E0-CS1	7700 lm	72 W	107 lm/W	120 V	24" SUSPENDED ROUND	LUMENWERX	POP CORE ROUND		
J2E	BETA CALCO	TMRP2P02-LMA0530-LMB0240-CR80-CTA35-CTB35-UD2-V1-DA01-SS1-FA01-CF01-E1-CS1	7700 lm	72 W	107 lm/W	120 V	24" SUSPENDED ROUND	LUMENWERX	POP CORE ROUND		
K2	COLUMBIA LIGHTING	CBT22-A-LSCS-EDD	4593 lm	38 W	121 lm/W	120 V	KITCHEN 2X2	LITHONIA	CPX		
K2E	COLUMBIA LIGHTING	CBT22-A-LSCS-EDD-ELL14	4593 lm	38 W	121 lm/W	120 V	KITCHEN 2X2 W/EM	LITHONIA	CPX		
L	LIGHTHEADED	C3P-R-6-CC-CC-B60-35-9010-P-120-3C-8	1500 lm	13 W	115 lm/W	120 V	3" PENDANT	LUMENWERX	AERA 3"		
M	KUZCO	LP302005MBBG	2000 lm	53 W	38 lm/W	120 V	DECORATIVE CONF RM FIXTURE				
SL3	KIM	UR20-24L-25-3K7-3-UNV-ASQ-BLT-CLR	2959 lm	25 W	118 lm/W	120 V	POLE LIGHT	LITHONIA	RADEAN		
SL4	KIM	UR20-24L-25-3K7-4W-UNV-ASQ-BLT-CLR	3067 lm	25 W	123 lm/W	120 V	POLE LIGHT	LITHONIA	RADEAN		
SL5	KIM	UR20-24L-25-3K7-5QM-UNV-ASQ-BLT-CLR	2837 lm	25 W	113 lm/W	120 V	POLE LIGHT	LITHONIA	RADEAN		
WP3	AXIS	EX2WD-500-90-30K-ASO-3-CC-120-DP-1-HMD-BR	1500 lm	15 W	102 lm/W	120 V	3' EXTERIOR MULLION MOUNT W/EM	LUMENWERX	VIA 2 SEAL		
WP6	AXIS	EX2WD-500-90-30K-ASO-6-CC-120-DP-1-HMD-BR	3000 lm	29 W	102 lm/W	120 V	6' EXTERIOR MULLION MOUNT W/EM	LUMENWERX	VIA 2 SEAL		
XC1	EVENLITE	TS-EM-R-U-W		5 W		120 V	CEILING MOUNT SINGLE FACE EXIT SIGN	ISOLITE	LP		
XC1H	EVENLITE	TSCT-EM-R-U-W		5 W		120 V	CEILING MOUNT SIGNLE FACE EXIT SIGN WITH CT APPROVED HC SYMBOL	ISOLITE	LP-CTMA		
XW1	EVENLITE	TS-EM-R-U-W		5 W		120 V	WALL MOUNT SINGLE FACE EXIT SIGN	ISOLITE	LP		
XW1H	EVENLITE	TSCT-EM-R-U-W		5 W		120 V	WALL MOUNT SINGLE FACE EXIT SIGN WITH CT APPROVED HC SYMBOL	ISOLITE	LP-CTMA		



1 TYPICAL CONTROL DIAGRAM
12" = 1'-0"

Sequence of Operations Matrix

	OCCUPANCY SENSOR					TIME CLOCK			WALL SWITCH					DAY LIGHT RESPONSIVE CONTROL	RECEPTACLE CONTROL	OTHER			
	VACANCY MODE (MANUAL ON)	OCCUPANCY MODE (AUTO ON)	OCCUPANCY MODE (AFTER HOUR OPERATION)	SENSOR TIME OUT PERIOD (MINUTES)	DUAL TECHNOLOGY	SCHEDULE ON TIME	SCHEDULE OFF TIME	SCHEDULE OVERRIDE SWITCH	MANUAL (ON/OFF)	MANUAL DIMMING	WALL OCCUPANCY SWITCH (AUTO ON W/ OVERRIDE)	TOUCH SCREEN (ON/OFF/DIM/SCENES)	PILOT SWITCH			PHOTO CELL	EXTERIOR LOCATION	WIRELESS	NETWORKED
GROSS MOTOR ROOM	X		X	20	X	TBD	TBD		X	X					X				X
CLASSROOM	X			20	X				X	X				X	X				
CONFERENCE ROOM	X			20	X				X	X					X				
CORRIDOR			X	20	X	TBD	TBD												X
CUSTODIAN	X				X				X						X				
KITCHEN	X		X	20	X	TBD	TBD		X										X
RECEPTION	X		X	20	X	TBD	TBD		X	X					X				X
NURSE	X		X	20	X	TBD	TBD		X	X					X				
OFFICES	X			20	X				X	X				X	X				
SINGLE STALL RESTROOMS		X		20	X						X								
SITE LIGHTING						DUSK	9:30P	X								X	X	X	X
BREAK/WORK ROOM		X		20	X				X					X	X				
STORAGE ROOMS		X		20	X						X								
UTILITY ROOMS									X										

General Notes:
1. Lighting Control panel to be interconnected with BMS System.
2. Provide Contacts for Fire Alarm input in Lighting Control Panel & Program the Networked lights to be on to full brightness.
3. Provide Site lighting control panel with BMS integration capability or Provide Separate contacts to support BMS integration.

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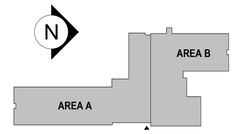
STATE OF CONNECTICUT — MICHAEL J. MALIK — No. 17729 — LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

LIGHTING FIXTURE SCHEDULE

E1.0

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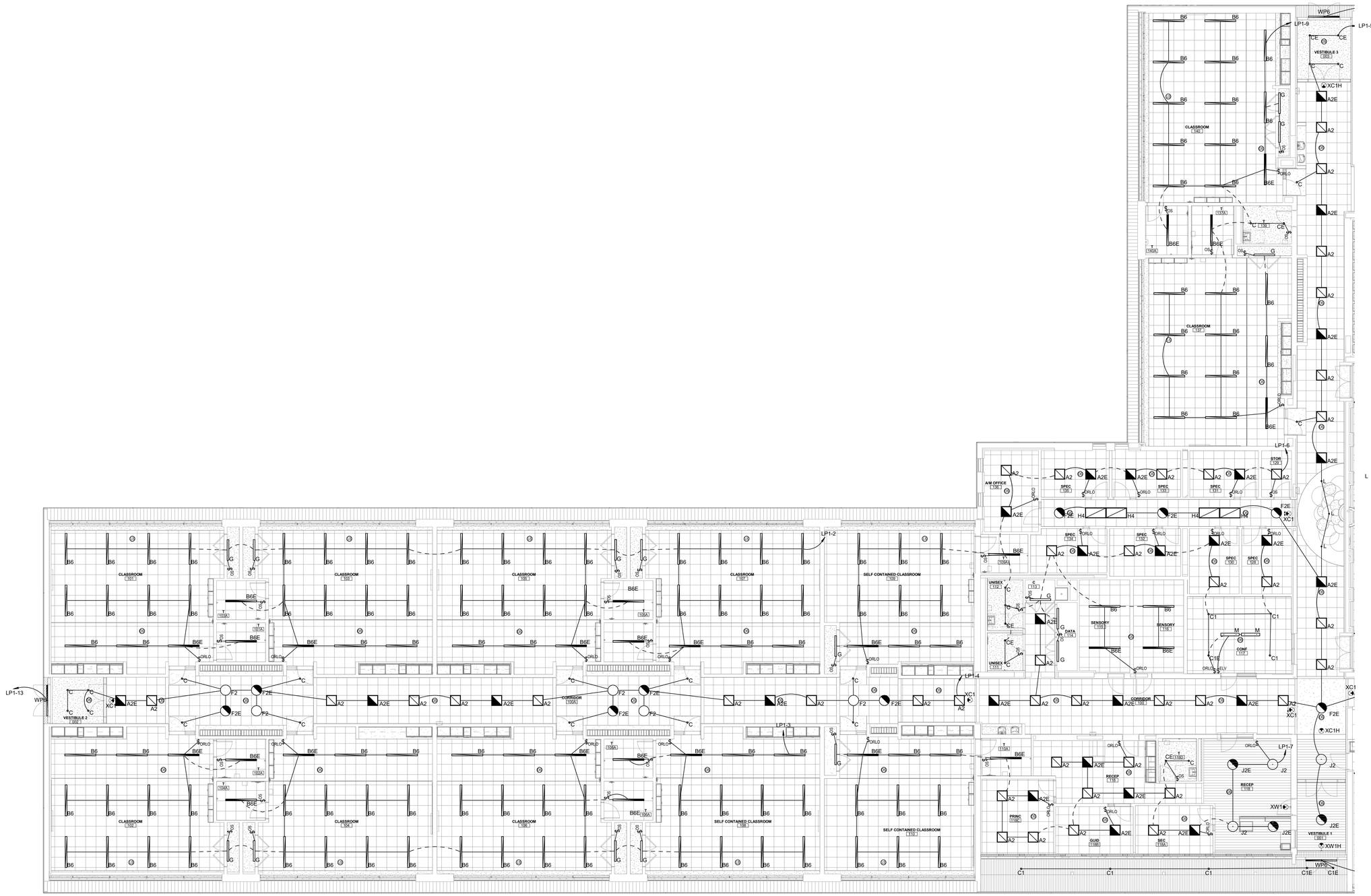

1 FIRST FLOOR LIGHTING PLAN - AREA A
1/8" = 1'-0"

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RENOVATIONS TO:
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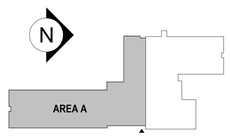

CONSTRUCTION DOCUMENTS
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FIRST FLOOR LIGHTING PLAN - AREA A

E1.1A

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1 FIRST FLOOR LIGHTING PLAN - AREA B
1/8" = 1'-0"

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RENOVATIONS TO:

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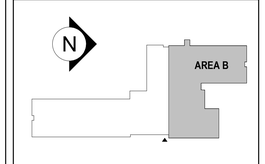

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FIRST FLOOR LIGHTING PLAN - AREA B

E1.1B

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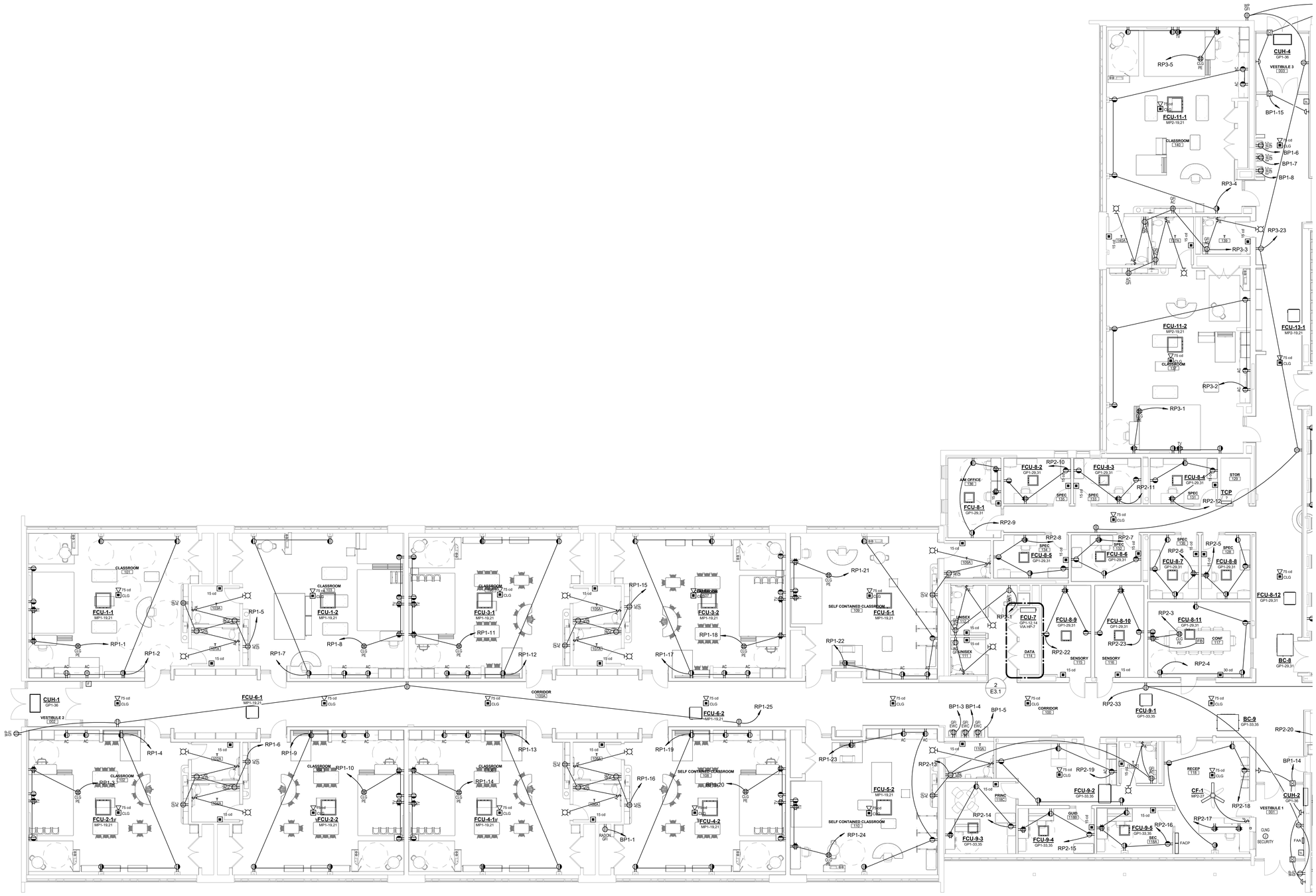

1 FIRST FLOOR POWER PLAN - AREA A
1/8" = 1'-0"

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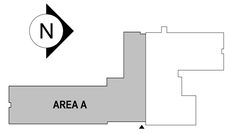

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FIRST FLOOR POWER PLAN - AREA A

E2.1A

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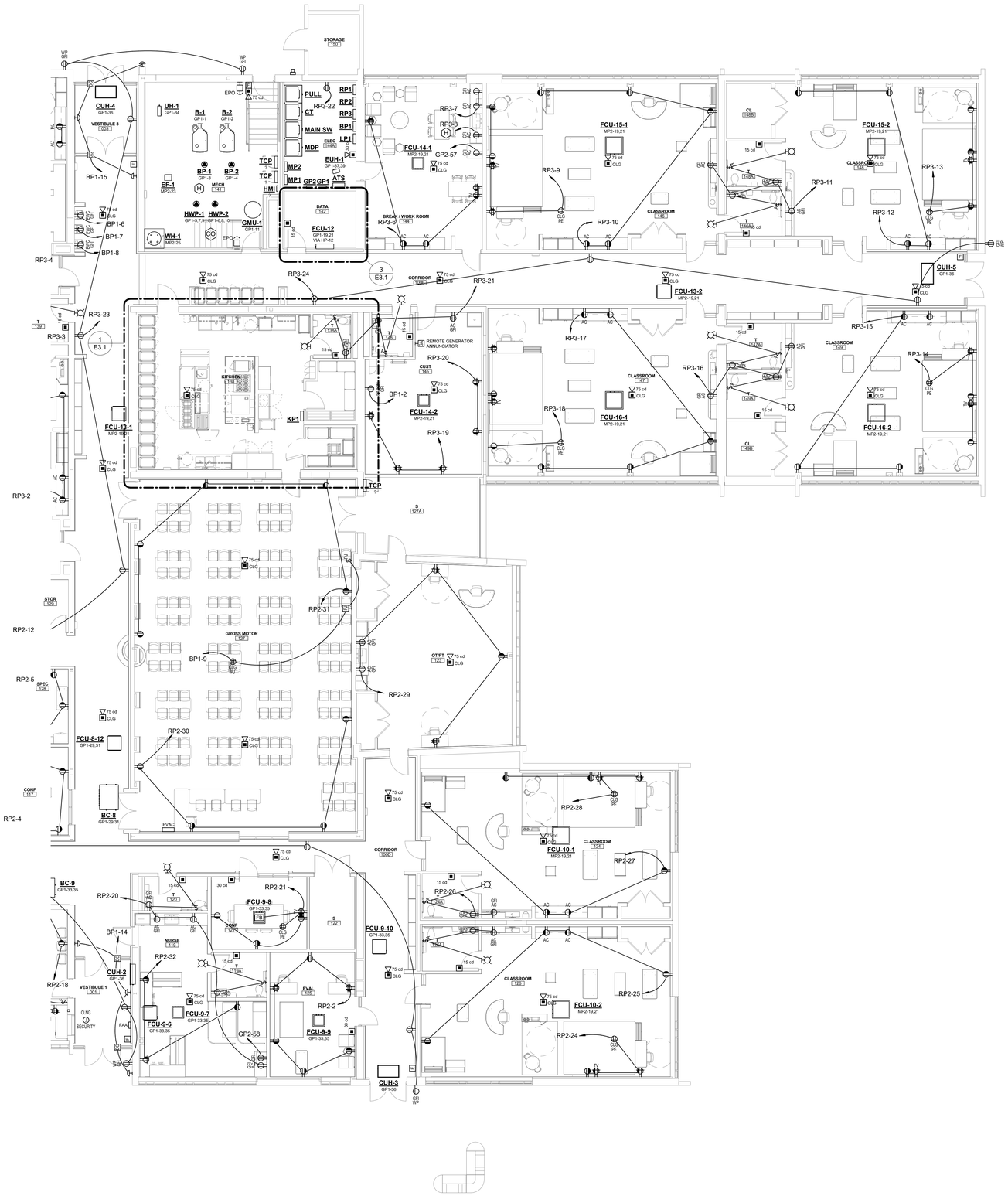

1 FIRST FLOOR POWER PLAN - AREA B
1/8" = 1'-0"

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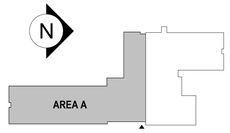

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JUNE 5, 2026

FIRST FLOOR POWER PLAN - AREA B

E2.1B

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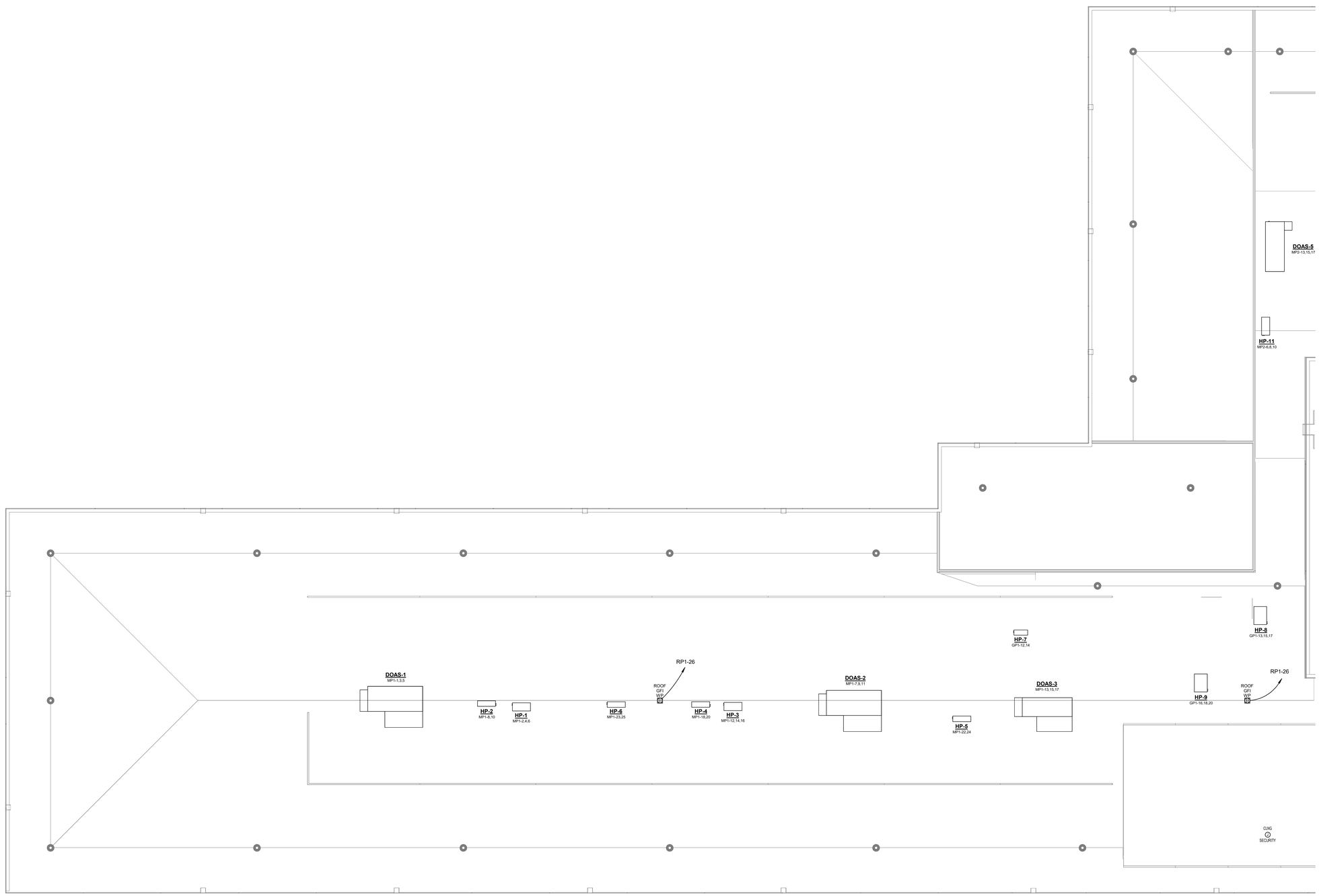

1 ELECTRICAL ROOF PLAN - AREA A
1/8" = 1'-0"

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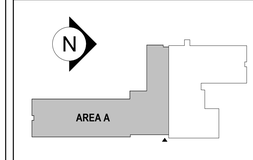

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JUNE 5, 2026

ROOF POWER PLAN - AREA A

E2.2A

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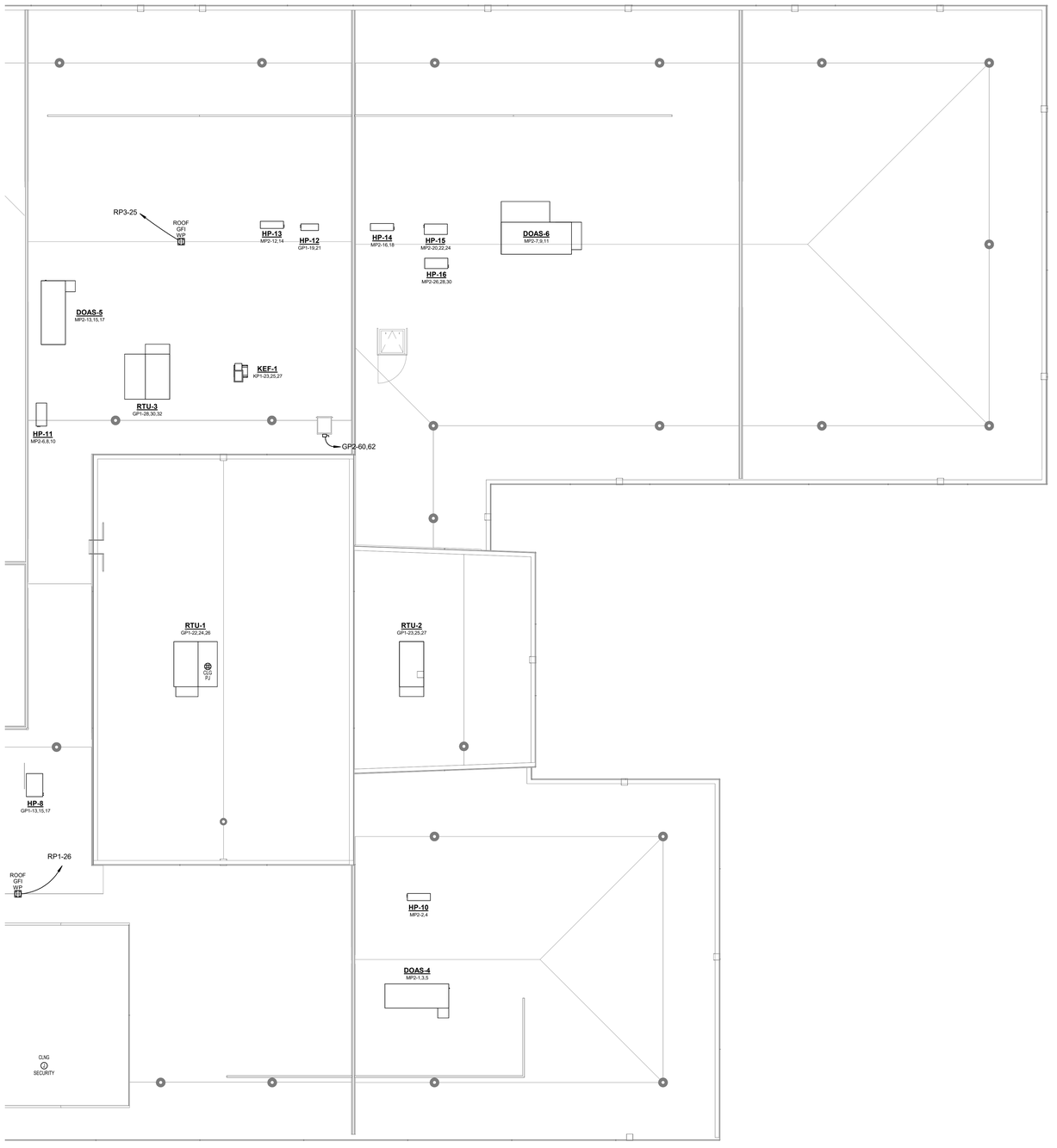

1 ELECTRICAL ROOF PLAN - AREA B
1/8" = 1'-0"

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STATE OF CONNECTICUT
No. 27729
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RENOVATIONS TO:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT 06010

State Project #: 017-0090 RNV
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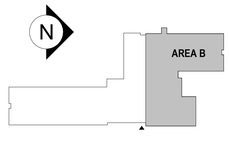

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ROOF POWER PLAN - AREA B

E2.2B

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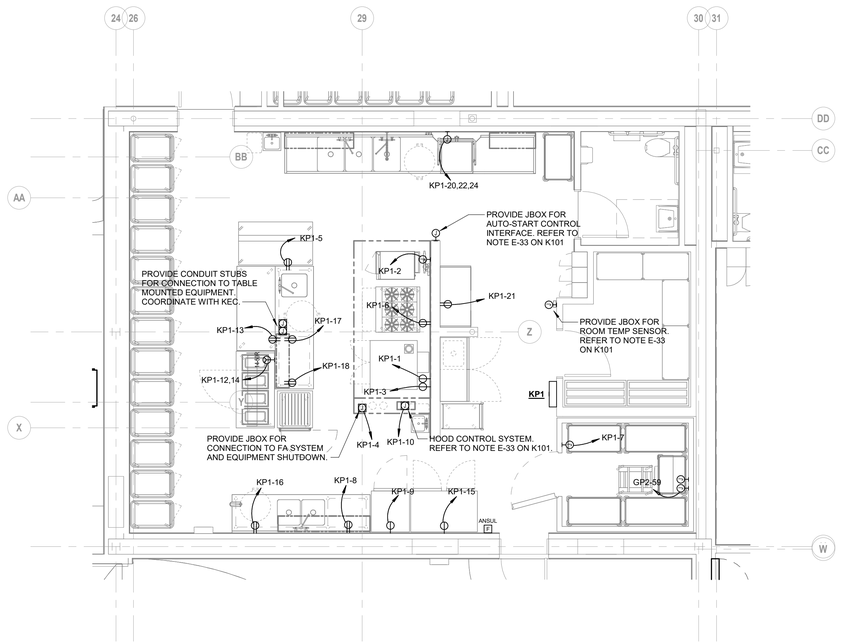
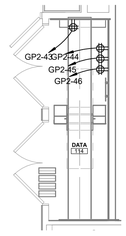
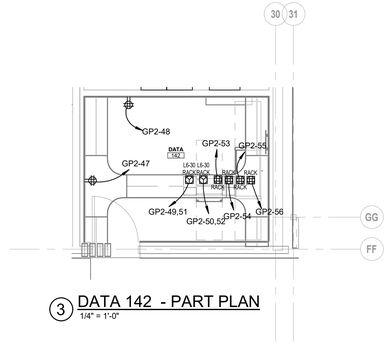


1 FIRST FLOOR POWER KITCHEN PART PLAN - AREA B
1/4" = 1'-0"



2 DATA 114 - PART PLAN
1/4" = 1'-0"



3 DATA 142 - PART PLAN
1/4" = 1'-0"

KITCHEN EQUIPMENT NOTES

1. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF ALL KITCHEN EQUIPMENT CONNECTION DEVICES WITH FOOD SERVICE DRAWINGS AND KITCHEN EQUIPMENT CONTRACTOR.
2. PROVIDE RECEPTACLES WITH NEMA CONFIGURATION AS INDICATED ON FOOD SERVICE DRAWINGS OR AS REQUIRED BY MANUFACTURER.
3. ALL 20A/1P RECEPTACLES INSTALLED IN KITCHEN AREA SHALL BE PROTECTED BY LISTED GFCI PROTECTION DEVICE.
4. HOOD EXHAUST FANS TO BE WIRED THROUGH SWITCH PROVIDED INTEGRAL WITH HOOD. HOOD LIGHTS FURNISHED BY HOOD MANUFACTURER AND INSTALLED BY ELECTRICAL CONTRACTOR PER MANUFACTURERS INSTRUCTIONS.
5. SOLENOID IN ELECTRONIC GAS VALVES PROVIDED BY PLUMBING CONTRACTOR TO BE INTERLOCKED WITH FAN SWITCH PROVIDED INTEGRAL WITH HOOD AND FIRE SUPPRESSION SYSTEM IN ORDER TO SHUT RESPECTIVE GAS VALVES WHEN EXHAUST FAN IS NOT RUNNING OR WHEN FIRE SUPPRESSION SYSTEM HAS BEEN ACTIVATED. REFER TO PLUMBING DRAWINGS FOR VALVE LOCATION.
6. REFER TO FOOD SERVICE DRAWINGS FOR ALL INTERCONNECTIONS BETWEEN EQUIPMENT, INCLUDING, BUT NOT LIMITED TO, WALK-IN COOLERS, COMPRESSORS, HOOD, EXHAUST FANS, FIRE SUPPRESSION SYSTEM, ETC.
7. ALL WORK SHOWN AS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR ON THE FOOD SERVICE DRAWINGS SHALL BE INCLUDED, WHETHER SHOWN ON THIS DRAWING OR NOT. CAREFUL COORDINATION SHALL BE MADE BETWEEN THE FOOD SERVICE DRAWINGS AND ALL TRADES TO INSURE PROPER OPERATION OF ALL EQUIPMENT, INCLUDING HOOD FIRE SUPPRESSION SYSTEM AND THE SEQUENCE OF OPERATIONS OF SUCH EQUIPMENT.

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State Project #: 017-0090 RNV
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CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ELECTRICAL PART PLANS

E3.1

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EQUIPMENT COORDINATION SCHEDULE

NOTE: REFER TO WIRE SCHEDULE FOR CONDUCTOR SIZING FOR EACH PIECE OF EQUIPMENT.

	EQUIPMENT INFORMATION					CIRCUIT INFORMATION				CONTROL			STARTER			DISCONNECT			
TAG	FLA	MCA	MOCP	VOLT	PH	PANEL	NO.	APPARENT LOAD	LOAD CLASSIFICATION	TYPE	FURNISH	INSTALL	TYPE	FURNISH	INSTALL	TYPE	FURNISH	INSTALL	REMARKS
B-1	6 A	7.5 A	0 A	120 V	1	GP1	1	720 VA	HEAT	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
B-2	6 A	7.5 A	0 A	120 V	1	GP1	2	720 VA	HEAT	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
BC-8	0.1 A	0.1 A	0 A	208 V	1	GP1	29,31	27 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
BC-9	0.1 A	0.1 A	0 A	208 V	1	GP1	33,35	27 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
BP-1	16 A	20 A	30 A	115 V	1	GP1	3	1,840 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
BP-2	16 A	20 A	30 A	115 V	1	GP1	4	1,840 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
CF-1	0.2 A	0.3 A	0 A	120 V	1	MP2	27	25 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
CUH-1	0.6 A	0.8 A	0 A	120 V	1	GP1	36	72 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
CUH-2	0.6 A	0.8 A	0 A	120 V	1	GP1	36	72 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
CUH-3	0.6 A	0.8 A	0 A	120 V	1	GP1	36	72 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
CUH-4	0.6 A	0.8 A	0 A	120 V	1	GP1	36	72 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
CUH-5	0.6 A	0.8 A	0 A	120 V	1	GP1	36	72 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
DOAS-1	53 A	57 A	70 A	208 V	3	MP1	1,3,5	19,094 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
DOAS-2	86 A	92 A	110 A	208 V	3	MP1	7,9,11	30,983 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
DOAS-3	45 A	51 A	70 A	208 V	3	MP1	13,15,17	16,212 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
DOAS-4	35 A	39 A	50 A	208 V	3	MP2	1,3,5	12,609 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
DOAS-5	35 A	39 A	50 A	208 V	3	MP2	13,15,17	12,609 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
DOAS-6	58 A	62 A	70 A	208 V	3	MP2	7,9,11	20,895 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
EF-1	1.5 A	1.9 A	15 A	120 V	1	MP2	23	98 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
EUH-1	14.4 A	18 A	0 A	208 V	1	GP1	37,39	3,000 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
FCU-1-1	0.9 A	0.9 A	0 A	208 V	1	MP1	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-1-2	0.9 A	0.9 A	0 A	208 V	1	MP1	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-2-1	0.6 A	0.6 A	0 A	208 V	1	MP1	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-2-2	0.6 A	0.6 A	0 A	208 V	1	MP1	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-3-1	0.9 A	0.9 A	0 A	208 V	1	MP1	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-3-2	0.9 A	0.9 A	0 A	208 V	1	MP1	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-4-1	0.6 A	0.6 A	0 A	208 V	1	MP1	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-4-2	0.6 A	0.6 A	0 A	208 V	1	MP1	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-5-1	0.6 A	0.6 A	0 A	208 V	1	MP1	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-5-2	0.6 A	0.6 A	0 A	208 V	1	MP1	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-6-1	1.9 A	1.9 A	0 A	208 V	1	MP1	19,21	391 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-6-2	1.9 A	1.9 A	0 A	208 V	1	MP1	19,21	391 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-7	0 A	0 A	0 A	208 V	1	GP1	12,14	0 VA	AC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
FCU-8-1	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-2	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-3	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-4	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-5	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-6	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-7	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-8	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-9	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-10	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-11	0.4 A	0.4 A	0 A	208 V	1	GP1	29,31	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-8-12	1.2 A	1.2 A	0 A	208 V	1	GP1	29,31	243 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-1	1.9 A	1.9 A	0 A	208 V	1	GP1	33,35	395 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-2	2.5 A	2.5 A	0 A	208 V	1	GP1	33,35	520 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-3	0.4 A	0.4 A	0 A	208 V	1	GP1	33,35	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-4	0.4 A	0.4 A	0 A	208 V	1	GP1	33,35	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-5	0.4 A	0.4 A	0 A	208 V	1	GP1	33,35	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-6	1.9 A	1.9 A	0 A	208 V	1	GP1	33,35	395 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-7	0.4 A	0.4 A	0 A	208 V	1	GP1	33,35	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-8	0.4 A	0.4 A	0 A	208 V	1	GP1	33,35	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-9	0.4 A	0.4 A	0 A	208 V	1	GP1	33,35	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-9-10	1.9 A	1.9 A	0 A	208 V	1	GP1	33,35	395 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-10-1	0.6 A	0.6 A	0 A	208 V	1	MP2	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-10-2	0.6 A	0.6 A	0 A	208 V	1	MP2	19,21	119 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-11-1	0.9 A	0.9 A	0 A	208 V	1	MP2	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-11-2	0.9 A	0.9 A	0 A	208 V	1	MP2	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-12	0 A	0 A	0 A	208 V	1	GP1	19,21	0 VA	AC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
FCU-13-1	1.9 A	1.9 A	0 A	208 V	1	MP2	19,21	391 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-13-2	1.9 A	1.9 A	0 A	208 V	1	MP2	19,21	391 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-14-1	0.4 A	0.4 A	0 A	208 V	1	MP2	19,21	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-14-2	0.4 A	0.4 A	0 A	208 V	1	MP2	19,21	75 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-15-1	0.9 A	0.9 A	0 A	208 V	1	MP2	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-15-2	0.9 A	0.9 A	0 A	208 V	1	MP2	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-16-1	0.9 A	0.9 A	0 A	208 V	1	MP2	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
FCU-16-2	0.9 A	0.9 A	0 A	208 V	1	MP2	19,21	189 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
GMU-1	7.2 A	9 A	20 A	120 V	1	GP1	11	864 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	CB	DIV. 26	DIV. 26	
HP-1	25.5 A	32 A	58 A	208 V	3	MP1	2,4,6	9,187 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-2	36 A	45 A	80 A	208 V	1	MP1	8,10	7,488 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-3	25.5 A	32 A	58 A	208 V	3	MP1	12,14,16	9,187 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-4	36 A	45 A	80 A	208 V	1	MP1	18,20	7,488 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-5	36 A	45 A	80 A	208 V	1	MP1	22,24	7,488 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-6	28 A	36 A	64 A	208 V	1	MP1	23,25	5,824 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-7	12 A	16 A	27 A	208 V	1	GP1	12,14	2,496 VA	AC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-8	40.8 A	51 A	80 A	208 V	3	GP1	13,15,17	14,699 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-9	48 A	60 A	100 A	208 V	3	GP1	16,18,20	17,293 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-10	36 A	45 A	80 A	208 V	1	MP2	2,4	7,488 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-11	25.5 A	32 A	58 A	208 V	3	MP2	6,8,10	9,187 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-12	17.3 A	24 A	39 A	208 V	1	GP1	19,21	3,598 VA	AC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-13	28.4 A	36 A	64 A	208 V	1	MP2	12,14	5,907 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-14	28.4 A	36 A	64 A	208 V	1	MP2	16,18	5,907 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-15	25.5 A	32 A	58 A	208 V	3	MP2	20,22,24	9,187 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HP-16	25.5 A	32 A	58 A	208 V	3	MP2	26,28,30	9,187 VA	HVAC	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HWP-1	24.2 A	30.3 A	50 A	208 V	3	GP1	5,7,9	8,718 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
HWP-2	24.2 A	30.3 A	50 A	208 V	3	GP1	6,8,10	8,718 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	
KEF-1	4.6 A	5.8 A	15 A	208 V	3	KP1	23,25,27	1,657 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
RTU-1	44 A	50 A	70 A	208 V	3	GP1	22,24,26	15,852 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
RTU-2	25 A	27 A	35 A	208 V	3	GP1	23,25,27	9,007 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
RTU-3	45 A	52 A	80 A	208 V	3	GP1	28,30,32	16,212 VA	HVAC	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
UH-1	0.7 A	0.9 A	0 A	120 V	1	GP1	34	86 VA	HEAT	BMS	DIV. 23	DIV. 23	SPP	MANUF.	MANUF.	NFS	MANUF.	MANUF.	
WH-1	5 A	6.3 A	0 A	120 V	1	MP2	25	600 VA	HEAT	AC	MANUF.	DIV. 23	SPP	MANUF.	MANUF.	NFS	DIV. 26	DIV. 26	

CONTROL TYPES

TYPE	DESCRIPTION
AC	AUTOMATIC CONTROLLER
BMS	BUILDING MANAGEMENT SYSTEM

STARTER TYPES

TYPE	DESCRIPTION
SPP	SINGLE POINT POWER

DISCONNECT TYPES

TYPE	DESCRIPTION
CB	CIRCUIT BREAKER
NFS	NON-FUSED SWITCH

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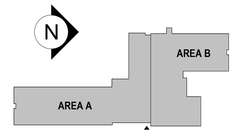
GM2

STATE OF CONNECTICUT
MICHAEL J. MALIK
No. 17729
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

EQUIPMENT COORDINATION SCHEDULE

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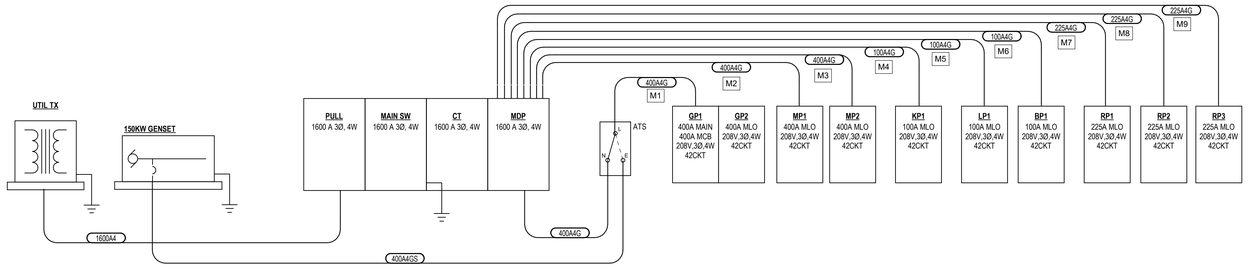

1 POWER RISER DIAGRAM
1/2" = 1'-0"

FEEDER SCHEDULE	
KEY	CONDUIT & CONNECTORS
100A4G	2" C - 4#1, 1#8G
225A4G	2-1/2" C - 4#4/0, 1#4G
400A4G	2 [2" C - 4#3/0, 1#3G]
400A4GS	2 [4" C - 4#3/0, 1#3G]
1600A4	5 [4" C - 4#400]

E-MON D-MON METER SCHEDULE

TAG	MAKE/MODEL	VOLTAGE/PHASE	LOAD MONITORED
M1	E-mon D-mon class 3200 smart meter	208V/3PH	GENERATOR
M2	E-mon D-mon class 3200 smart meter	208V/3PH	HVAC
M3	E-mon D-mon class 3200 smart meter	208V/3PH	HVAC
M4	E-mon D-mon class 3200 smart meter	208V/3PH	KITCHEN
M5	E-mon D-mon class 3200 smart meter	208V/3PH	LIGHTING
M6	E-mon D-mon class 3200 smart meter	208V/3PH	BUILDING OPS
M7	E-mon D-mon class 3200 smart meter	208V/3PH	RECEPTS
M8	E-mon D-mon class 3200 smart meter	208V/3PH	RECEPTS
M9	E-mon D-mon class 3200 smart meter	208V/3PH	RECEPTS

LOAD CONSUMPTION SHALL BE REPORTED TO BMS AS FOLLOWS:	
GENERATOR LOAD	M1
HVAC LOAD	M2
HVAC LOAD	M3
BUILDING OPERATIONS LOAD	M4
LIGHTING LOAD	M5
BUILDING OPERATIONS LOAD	M6
RECEPTACLE LOAD	M7
RECEPTACLE LOAD	M8
RECEPTACLE LOAD	M9

2 METER SCHEDULE AND NOTES
12" = 1'-0"

THE ADVANCED ENERGY METERING MUST HAVE THE FOLLOWING CHARACTERISTICS:

- METERS MUST BE PERMANENTLY INSTALLED, RECORD AT INTERVALS OF ONE HOUR OR LESS, AND TRANSMIT DATA TO A REMOTE LOCATION.
- ELECTRICITY METERS MUST RECORD BOTH CONSUMPTION AND DEMAND. WHOLE-BUILDING ELECTRICITY METERS SHOULD RECORD THE POWER FACTOR, IF APPROPRIATE.
- THE DATA COLLECTION SYSTEM MUST USE A LOCAL AREA NETWORK, BUILDING AUTOMATION SYSTEM, WIRELESS NETWORK, OR COMPARABLE COMMUNICATION INFRASTRUCTURE.
- THE SYSTEM MUST BE CAPABLE OF STORING ALL METER DATA FOR AT LEAST 36 MONTHS.
- THE DATA MUST BE REMOTELY ACCESSIBLE.
- ALL METERS IN THE SYSTEM MUST BE CAPABLE OF REPORTING HOURLY, DAILY, MONTHLY, AND ANNUAL ENERGY USE.

ELECTRIC METER:

THE CONTROLLER (BMS) SHALL MONITOR THE ELECTRIC METER FOR ELECTRIC CONSUMPTION ON A CONTINUAL BASIS (REAL TIME DEMAND). THESE VALUES SHALL BE MADE AVAILABLE TO THE SYSTEM AT ALL TIMES. ALARM SHALL BE GENERATED AS FOLLOWS:
- METER ALARM: SENSOR READING INDICATES AN INVALID VALUE FROM THE ELECTRIC METER.

PEAK DEMAND HISTORY:

THE CONTROLLER(BMS) SHALL MONITOR AND RECORD THE PEAK (HIGH AND LOW) DEMAND READINGS FROM THE ELECTRIC METER. PEAK READINGS SHALL BE RECORDED ON A DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.

USAGE HISTORY:

THE CONTROLLER(BMS) SHALL MONITOR AND RECORD ELECTRIC METER READINGS SO AS TO PROVIDE A POWER CONSUMPTION HISTORY. USAGE READINGS SHALL BE RECORDED ON A DAILY, MONTH-TO-DATE, AND YEAR-TO-DATE BASIS.

DEMAND LEVELS:

THE CONTROLLER (BMS) SHALL SET THE SYSTEM DEMAND LEVEL (ADJ.) BASED ON THE CURRENT POWER CONSUMPTION READINGS FROM THE ELECTRIC METER. THERE SHALL BE SIX DAILY TIME PERIODS IN WHICH THE DEMAND SHALL BE ADJUSTED ON THREE LEVELS. THESE DEMAND LEVELS SHALL BE AVAILABLE FOR FACILITY EQUIPMENT TO UTILIZE FOR DEMAND LIMITING.
- DEMAND LEVEL 1: POWER CONSUMPTION HAS EXCEEDED THE FIRST DEMAND LEVEL THRESHOLD (ADJ.).
- DEMAND LEVEL 2: POWER CONSUMPTION HAS EXCEEDED THE SECOND DEMAND LEVEL THRESHOLD (ADJ.).
- DEMAND LEVEL 3: POWER CONSUMPTION HAS EXCEEDED THE THIRD DEMAND LEVEL THRESHOLD (ADJ.).

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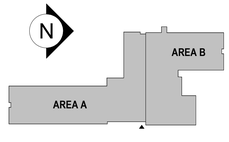
GM2

STATE OF CONNECTICUT
ANDREW J. BERRY
No. 27729
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ELECTRICAL RISER DIAGRAM

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SWITCHBOARD: MAIN SW

LOCATION: ELEC 144A **VOLTAGE:** 120/208 Wye
MAIN DEVICE: 1600 A **AIC RATING:**
BUS AMPS: **SPECIAL:**

MAIN SECTION

C.T. COMPARTMENT: CURRENT TRANSFORMER, POTENTIAL TRANSFORMER
CUSTOMER POWER QUALITY METER

MAIN DEVICE

	FRAME	POLES	BREAKER	SPECIAL	DESCRIPTION/NAMEPLATE
		3	1600		

DISTRIBUTION SECTION No. 1

CKT	Rating	POLES	Load	DESCRIPTION/NAMEPLATE	NOTES
1	400 A	3	115,201 VA	MP1	
2	400 A	3	96,005 VA	MP2	
3	225 A	3	33,880 VA	KP1	
4	400 A	3	124,469 VA	GP1	
5	225 A	3	26,820 VA	RP1	
6	225 A	3	30,780 VA	RP2	
7	225 A	3	22,500 VA	RP3	
8	225 A	3	17,440 VA	BP1	
9	225 A	3	17,552 VA	LP1	
10					
11					
12					

LOAD SUMMARY

SWBD LOAD	CONN. LOAD
MDP	484,646 VA

LOAD CLASSIFICATION	CONNECTED	DEMAND	ESTIMATED	PANEL TOTALS	
AC	6,094 VA	100.00%	6,094 VA		
HEAT	26,603 VA	0.01%	3 VA		
HVAC	289,465 VA	100.00%	289,465 VA		
KTCH	31,768 VA	65.00%	20,649 VA		
LITES	17,552 VA	125.00%	21,940 VA		
Other	0 VA	0.00%	0 VA		
RCPT	89,940 VA	55.56%	49,970 VA	**CONN. LOAD:**	484,646 VA
SPEC	23,224 VA	100.00%	23,224 VA	**EST. DEMAND LOAD:**	411,345 VA
				CONN. CURRENT:	1345.2 A
				EST. DEMAND CURRENT:	1141.8 A

NOTES:

Branch Panel: MP1

Location: ELEC 144A **Volts:** 120/208 Wye **A.I.C. Rating:**
Supply From: MDP **Phases:** 3 **Mains Type:** MLO
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 400 A
Enclosure: NEMA 1

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A		B		C		Poles	Trip	Type	Circuit Description	CKT
1					6.4	3.1									2
3	DOAS-1		70 A	3			6.4	3.1			3	40 A		HP-1	4
5									6.4	3.1					6
7					10.3	3.7									8
9	DOAS-2		110 A	3			10.3	3.7			2	60 A		HP-2	10
11									10.3	3.1					12
13					5.4	3.1									14
15	DOAS-3		70 A	3			5.4	3.1			3	40 A		HP-3	16
17									5.4	3.7					18
19	FCUs 1 THRU 6		15 A	2	1.1	3.7					2	60 A		HP-4	20
21							1.1	3.7							22
23	HP-6		50 A	2					2.9	3.7	2	60 A		HP-5	24
25					2.9										26
27															28
29															30
31															32
33															34
35															36
37															38
39															40
41															42
			Total Load:		39.7 kVA		36.8 kVA		38.6 kVA						
			Total Amps:		333.5 A		307 A		324.1 A						

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	115,201 VA	100.00%	115,201 VA		
				Total Conn. Load:	115,201 VA
				Total Est. Demand:	115,201 VA
				Total Conn.:	319.8 A
				Total Est. Demand:	319.8 A

Notes:

Branch Panel: MP2

Location: ELEC 144A **Volts:** 120/208 Wye **A.I.C. Rating:**
Supply From: MDP **Phases:** 3 **Mains Type:** MLO
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 400 A
Enclosure: NEMA 1

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A		B		C		Poles	Trip	Type	Circuit Description	CKT
1					4.2	3.7					2	60 A		HP-10	2
3	DOAS-4		50 A	3			4.2	3.7							4
5									4.2	3.1					6
7					7.0	3.1					3	40 A		HP-11	8
9	DOAS-6		70 A	3			7.0	3.1							10
11									7.0	3.0	2	50 A		HP-13	12
13					4.2	3.0									14
15	DOAS-5		50 A	3			4.2	3.0			2	50 A		HP-14	16
17									4.2	3.0					18
19	FCUs 10 THRU 16		15 A	2	1.2	3.1					3	40 A		HP-15	20
21							1.2	3.1							22
23	EF-1 MECH 141		20 A	1					0.1	3.1					24
25	WH-1 MECH 141		20 A	1	0.6	3.1									26
27	CF-1 RECEP 117		20 A	1			0.0	3.1			3	50 A		HP-16	28
29										3.1					30
31															32
33															34
35															36
37															38
39															40
41															42
			Total Load:		33.0 kVA		32.4 kVA		30.6 kVA						
			Total Amps:		277.5 A		272.7 A		254.7 A						

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	95,405 VA	100.00%	95,405 VA		
HEAT	600 VA	0.01%	0 VA	**Total Conn. Load:**	96,005 VA
				Total Est. Demand:	95,405 VA
				Total Conn.:	266.5 A
				Total Est. Demand:	264.8 A

Notes:

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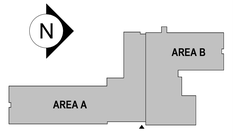
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

GM2

STATE OF CONNECTICUT
MICHAEL L. OLSEN
No. 27229
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PANEL SCHEDULES

E5.1

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Branch Panel: BP1

Location: ELEC 144A
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	RADON RCPT STORAGE 108B		20 A	1	0.2	0.2		1	20 A		RADON RCPT CUST 145	2
3	EWC RCPT CORRIDOR 100		20 A	1			0.6	0.6	1	20 A		EWC RCPT CORRIDOR 100	4
5	EWC RCPT CORRIDOR 100		20 A	1	0.6	0.6			1	20 A		EWC RCPT CORRIDOR 100	6
7	EWC RCPT CORRIDOR 100		20 A	1					1	20 A		EWC RCPT CORRIDOR 100	8
9	PROJECTOR & SCREEN ROOM 127		20 A	1		0.6	3.1						10
11	EV CHARGER		40 A	2			3.1	3.1	2	40 A		EV CHARGER	12
13					3.1	0.2			1	20 A		DOOR OPERATORS	14
15	DOOR OPERATORS		20 A	1		0.2							16
17													18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
				Total Load:	4.9 kVA	5.1 kVA	7.4 kVA					
				Total Amps:	40.7 A	43 A	62.3 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Other	0 VA	0.00%	0 VA		
RCPT	4,200 VA	100.00%	4,200 VA	**Total Conn. Load:**	17,440 VA
SPEC	13,240 VA	100.00%	13,240 VA	**Total Est. Demand:**	17,440 VA
				Total Conn.:	48.4 A
				Total Est. Demand:	48.4 A

Notes:

Branch Panel: LP1

Location: ELEC 144A
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	POLE LITES		20 A	1	0.7	1.7		1	20 A		LITES ROOM 101, 103, 105, 107	2
3	LITES ROOM 102, 104, 106, 108		20 A	1			1.7	1.1	1	20 A		LITES ROOM 100A, 002	4
5	LITES ROOM 100, 100C, 001, 100D, 00...		20 A	1					1	20 A		LITES ROOM 109, 111, 112, 115, 134,...	6
7	LITES ROOM 110, 117, 117B, 117C,...		20 A	1	1.0	1.7			1	20 A		LITES ROOM 125, 118, 126, 124, 121,...	8
9	LITES ROOM 139, 137, 137A, 140A, 14...		20 A	1			1.0	1.6	1	20 A		LITES ROOM 141, 148B, 144, 142, 144...	10
11	LITES ROOM 145, 138, 143, 138A, 149....		20 A	1					1	20 A		LITES CORRIDOR 100B	12
13	EXT BLDG MTD LITES		20 A	1	0.2	1.6			1	20 A		LITES GROSS MOTOR 127	14
15													16
17													18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
				Total Load:	7.0 kVA	5.3 kVA	5.3 kVA					
				Total Amps:	58.1 A	44.4 A	43.9 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
LITES	17,552 VA	125.00%	21,940 VA		
				Total Conn. Load:	17,552 VA
				Total Est. Demand:	21,940 VA
				Total Conn.:	48.7 A
				Total Est. Demand:	60.9 A

Notes:

Branch Panel: GP1

Location: ELEC 144A
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MCB
Mains Rating: 400 A
MCB Rating: 400 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	B-1 MECH 141		20 A	1	0.7	0.7		1	20 A		B-2 MECH 141	2
3	BP-1 MECH 141		30 A	1		1.8	1.8	1	30 A		BP-2 MECH 141	4
5							2.9	2.9					6
7	HWP-1 MECH 141		50 A	3	2.9	2.9			3	50 A		HWP-2 MECH 141	8
9						2.9	2.9						10
11	GMU-1 MECH 141		20 A	1			0.9	1.2					12
13					4.9	1.2			2	20 A		HP-7, FCU-7	14
15	HP-8		60 A	3		4.9	5.8						16
17								4.9	5.8	3	80 A	HP-9	18
19	HP-12, FCU-12		30 A	2	1.8	5.8							20
21						1.8	5.3						22
23								3.0	5.3	3	70 A	RTU-1	24
25	RTU-2		35 A	3	3.0	5.3							26
27						3.0	5.4						28
29	FCUs 8		15 A	2				0.5	5.4	3	80 A	RTU-3	30
31					0.5	5.4							32
33	FCUs 9		15 A	2		1.1	0.1			1	20 A	UH-1 MECH 141	34
35								1.1	0.4	1	20 A	CUHs VESTIBULES	36
37	EUH-1 ELEC 144A		20 A	2	1.5								38
39						1.5							40
41													42
				Total Load:	43.7 kVA	44.4 kVA	36.4 kVA					
				Total Amps:	373.5 A	379.3 A	303.2 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	77,202 VA	100.00%	77,202 VA		
RCPT	3,960 VA	100.00%	3,960 VA	**Total Conn. Load:**	124,469 VA
SPEC	9,984 VA	100.00%	9,984 VA	**Total Est. Demand:**	98,468 VA
KTCH	1,225 VA	100.00%	1,225 VA	**Total Conn.:**	345.5 A
HEAT	26,003 VA	0.01%	3 VA	**Total Est. Demand:**	273.3 A
AC	6,094 VA	100.00%	6,094 VA		

Notes:
PROVIDE FEED THRU LUGS TO SUPPLY PANEL GP2

Branch Panel: GP2

Location: ELEC 144A
Supply From: GP1
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 400 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
43	SECURITY RCPT DATA 114		20 A	1	0.4	0.4		1	20 A		RCPT DATA 114	44
45	RCPT DATA 114		20 A	1			0.4	0.4	1	20 A		RCPT DATA 114	46
47	SECURITY RCPT DATA 142		20 A	1					1	20 A		PA RCPT DATA 142	48
49	RACK DATA 142		30 A	2	2.5	2.5							50
51							2.5	2.5	2	30 A		RACK DATA 142	52
53	RACK RCPT DATA 142		20 A	1			0.4	0.4	1	20 A		RACK RCPT DATA 142	54
55	RACK RCPT DATA 142		20 A	1	0.4	0.4			1	20 A		RACK RCPT DATA 142	56
57	FRIDGE RCPT BREAK / WORK ROOM...		20 A	1			0.2	0.2	1	20 A		UC FRIDGE RCPT NURSE 118	58
59	WALK IN EVAP UNIT		20 A	1				0.1	0.6	2	20 A	WALK IN COND UNIT	60
61						0.6							62
63													64
65													66
67													68
69													70
71													72
73													74
75													76
77													78
79													80
81													82
83													84
				Total Load:	7.0 kVA	6.1 kVA	2.1 kVA					
				Total Amps:	63.4 A	55.7 A	17.5 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
RCPT	3,960 VA	100.00%	3,960 VA		
SPEC	9,984 VA	100.00%	9,984 VA	**Total Conn. Load:**	15,169 VA
KTCH	1,225 VA	100.00%	1,225 VA	**Total Est. Demand:**	15,169 VA
				Total Conn.:	42.1 A
				Total Est. Demand:	42.1 A

Notes:
CONNECT TO FEED THRU LUGS IN PANEL GP1

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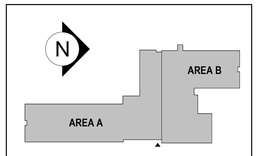
GM2

STATE OF CONNECTICUT
No. 27729
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PANEL SCHEDULES

E5.2

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Branch Panel: RP1

Location: ELEC 144A
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	RCPT CLASSROOM 101		20 A	1	1.4 0.9			1	20 A		RCPT CLASSROOM 101	2
3	RCPT CLASSROOM 102		20 A	1		1.4 0.9		1	20 A		RCPT CLASSROOM 102	4
5	GFI RCPTS		20 A	1			0.7 0.7	1	20 A		GFI RCPTS	6
7	RCPT CLASSROOM 103		20 A	1	0.9 1.4			1	20 A		RCPT CLASSROOM 103	8
9	RCPT CLASSROOM 104		20 A	1		0.9 1.4		1	20 A		RCPT CLASSROOM 104	10
11	RCPT CLASSROOM 105		20 A	1			1.4 0.9	1	20 A		RCPT CLASSROOM 105	12
13	RCPT CLASSROOM 106		20 A	1	0.9 1.4			1	20 A		RCPT CLASSROOM 106	14
15	GFI RCPTS		20 A	1		0.7 0.7		1	20 A		GFI RCPTS	16
17	RCPT CLASSROOM 107		20 A	1			0.9 1.3	1	20 A		RCPT CLASSROOM 107	18
19	RCPT SELF CONTAINED CLASSROO...		20 A	1	0.9 1.4			1	20 A		RCPT SELF CONTAINED CLASSROO...	20
21	RCPT SELF CONTAINED CLASSROO...		20 A	1		1.3 0.9		1	20 A		RCPT SELF CONTAINED CLASSROO...	22
23	RCPT SELF CONTAINED CLASSROO...		20 A	1			0.9 1.3	1	20 A		RCPT SELF CONTAINED CLASSROO...	24
25	RCPT CORRIDOR 100A		20 A	1	0.7 0.4			1	20 A		ROOF RCPT	26
27												28
29												30
31												32
33												34
35												36
37												38
39												40
41												42
				Total Load:	10.4 kVA	8.3 kVA	8.1 kVA					
				Total Amps:	87.2 A	69.2 A	67.5 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
RCPT	26,820 VA	68.64%	18,410 VA		
				Total Conn. Load:	26,820 VA
				Total Est. Demand:	18,410 VA
				Total Conn.:	74.4 A
				Total Est. Demand:	51.1 A

Notes:

Branch Panel: RP2

Location: ELEC 144A
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	GFI RCPTS		20 A	1	0.9 1.4			1	20 A		RCPT EVAL 115	2
3	RCPT CONF 116		20 A	1		1.3 0.7		1	20 A		RCPT CONF 116	4
5	RCPT SPEC 128		20 A	1			1.1 1.1	1	20 A		RCPT SPEC 130	6
7	RCPT SPEC 132		20 A	1	1.1 0.9			1	20 A		RCPT SPEC 134	8
9	RCPT A/M OFFICE 136		20 A	1		1.1 0.7		1	20 A		RCPT SPEC 135	10
11	RCPT SPEC 133		20 A	1			0.7 0.9	1	20 A		RCPT SPEC 131	12
13	GFI RCPTS		20 A	1	0.5 0.7			1	20 A		RCPT PRINC 117C	14
15	RCPT GUID 117B		20 A	1		0.7 0.9		1	20 A		RCPT SEC 117A	16
17	RCPT RECEP 117		20 A	1			0.7 0.7	1	20 A		RCPT RECEP 117	18
19	RCPT RECEP 117		20 A	1	0.9 0.9			1	20 A		GFI RCPTS	20
21	RCPT CONF 120		20 A	1		1.6 0.7		1	20 A		RCPT SENSORY 126	22
23	RCPT SENSORY 124		20 A	1			0.7 1.3	1	20 A		RCPT CLASSROOM 125	24
25	RCPT CLASSROOM 125		20 A	1	0.7 0.7			1	20 A		GFI RCPTS	26
27	RCPT CLASSROOM 123		20 A	1		0.7 1.4		1	20 A		RCPT CLASSROOM 123	28
29	RCPT OT/PT 122		20 A	1			1.3 0.7	1	20 A		RCPT GROSS MOTOR 127	30
31	RCPT GROSS MOTOR 127		20 A	1	0.9 0.9			1	20 A		RCPT NURSE 118	32
33	RCPT ROOM 100, 001, 100C, 100D		20 A	1		1.1						34
35												36
37												38
39												40
41												42
				Total Load:	10.6 kVA	11.0 kVA	9.2 kVA					
				Total Amps:	90.3 A	93.3 A	76.5 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
RCPT	30,780 VA	66.24%	20,390 VA		
				Total Conn. Load:	30,780 VA
				Total Est. Demand:	20,390 VA
				Total Conn.:	85.4 A
				Total Est. Demand:	56.6 A

Notes:

Branch Panel: KP1

Location: KITCHEN 138
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 100 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	CONVECTION OVEN	GFI	20 A	1	0.1 0.5			1	20 A	GFI	STEAMER	2
3	CONVECTION OVEN	GFI	20 A	1		0.1 0.5		1	20 A		HOOD ANSUL SYSTEM	4
5	RCPT KITCHEN 138	GFI	20 A	1			0.2 0.2	1	20 A	GFI	RANGE	6
7	WALK IN LIGHTS/ALARMS	GFI	20 A	1	1.1 0.2			1	20 A	GFI	RCPT KITCHEN 138	8
9	REACH IN FREEZER	GFI	20 A	1		1.2 1.2		1	20 A		HOOD CONTROL SYSTEM	10
11							2.7	2	50 A	GFI	HEATED SERVING COUNTER	12
13	RCPT KITCHEN 138	GFI	20 A	1	0.2 2.7							14
15	REACH IN FREEZER	GFI	20 A	1		1.3 0.2		1	20 A	GFI	RCPT KITCHEN 138	16
17	RCPT KITCHEN 138	GFI	20 A	1			0.2 0.2	1	20 A	GFI	RCPT KITCHEN 138	18
19					6.4							20
21	RCPT KITCHEN 138	GFI	20 A	1		0.2 6.4		3	70 A	GFI	DISHWASHER	22
23							0.6 6.4					24
25	KEF-1		20 A	3	0.6							26
27						0.6						28
29												30
31												32
33												34
35												36
37												38
39												40
41												42
				Total Load:	11.7 kVA	11.7 kVA	10.5 kVA					
				Total Amps:	99.3 A	98.7 A	87.4 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
HVAC	1,657 VA	100.00%	1,657 VA		
RCPT	1,680 VA	100.00%	1,680 VA	**Total Conn. Load:**	33,880 VA
KTCH	30,542 VA	65.00%	19,853 VA	**Total Est. Demand:**	23,190 VA
				Total Conn.:	94 A
				Total Est. Demand:	64.4 A

Notes:

Branch Panel: RP3

Location: ELEC 144A
Supply From: MDP
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

A.I.C. Rating:
Mains Type: MLO
Mains Rating: 225 A

Notes:
If A.I.C. Rating not provided, refer to short circuit analysis requirement in contract specifications.

CKT	Circuit Description	Type	Trip	Poles	A	B	C	Poles	Trip	Type	Circuit Description	CKT
1	RCPT CLASSROOM 137		20 A	1	1.4 0.9			1	20 A		RCPT CLASSROOM 137	2
3	GFI RCPTS		20 A	1		0.9 0.9		1	20 A		RCPT CLASSROOM 140	4
5	RCPT CLASSROOM 140		20 A	1			1.4 1.4	1	20 A		RCPT BREAK / WORK ROOM 144	6
7	RCPT BREAK / WORK ROOM 144		20 A	1	0.4 0.2			1	20 A		RCPT BREAK / WORK ROOM 144	8
9	RCPT CLASSROOM 146		20 A	1		1.4 0.9		1	20 A		RCPT CLASSROOM 146	10
11	GFI RCPTS		20 A	1			0.7 0.7	1	20 A		RCPT CLASSROOM 148	12
13	RCPT CLASSROOM 148		20 A	1	1.4 1.4			1	20 A		RCPT CLASSROOM 149	14
15	RCPT CLASSROOM 149		20 A	1		0.7 0.7		1	20 A		GFI RCPTS	16
17	RCPT CLASSROOM 147		20 A	1			0.9 1.4	1	20 A		RCPT CLASSROOM 147	18
19	RCPT CUST 145		20 A	1	1.1 0.7			1	20 A		RCPT CUST 145	20
21	GFI RCPTS		20 A	1		0.5 0.2		1	20 A		RCPT ELEC 144A	22
23	RCPT ROOM 100E, 100, 003		20 A	1			1.1 0.7	1	20 A		RCPT CORRIDOR 100B	24
25	ROOF RCPT		20 A	1	0.2							26
27												28
29												30
31												32
33												34
35												36
37												38
39												40
41												42
				Total Load:	7.7 kVA	6.3 kVA	8.5 kVA					
				Total Amps:	66.3 A	52.5 A	72.3 A					

Legend:
Blank = Standard, AFI = Arc Fault Circuit Interrupter, GFI = Ground Fault Circuit Interrupter (6mA), EPD = Equipment Protection Device, ST = Shunt Trip Circuit Breaker, HACR = Heating, Air Conditioning, Refrigeration Circuit Breaker, GFPE=Ground Fault Protection of Equipment (30mA), HO=Handel Lock-On Device, HP= Handle Padlock attachment, N=New Circuit Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
RCPT	22,500 VA	72.22%	16,250 VA		
				Total Conn. Load:	22,500 VA
				Total Est. Demand:	16,250 VA
				Total Conn.:	62.5 A
				Total Est. Demand:	45.1 A

Notes:

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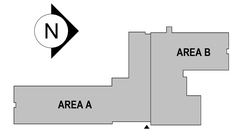
STATE OF CONNECTICUT
MICHAEL LAWRENCE MALIK
No. 17729
LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

PANEL SCHEDULES

E5.3

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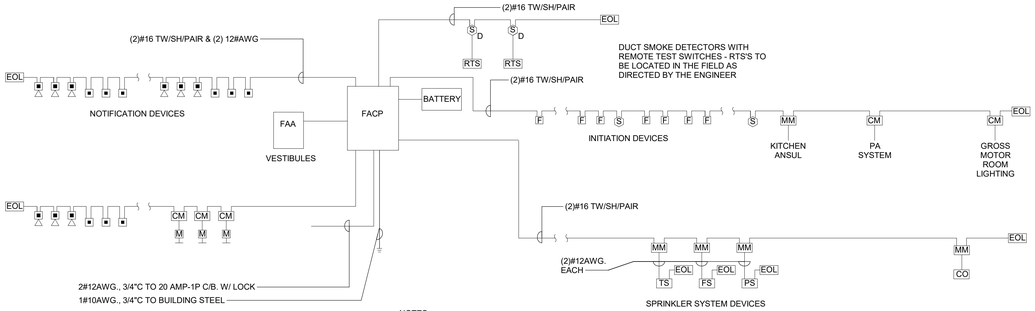


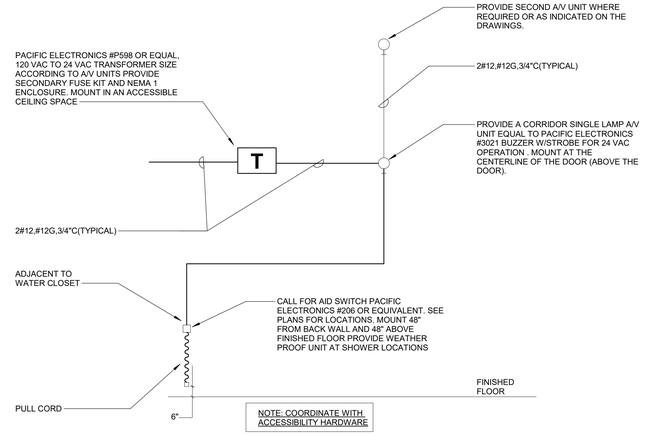
FIRE ALARM SEQUENCE OF OPERATION:

1. ACTIVATION OF ANY MANUAL PULL STATION , AREA SMOKE AND HEAT DETECTOR, COMBINATION SMOKE/CO DETECTOR OR FIRE SUPPRESSION SYSTEM FLOW SWITCH(S) SHALL REPORT TO THE FIRE ALARM CONTROL PANEL (FACP) AN ALARM CONDITION. ALL DOOR HOLD OPENS SHALL RELEASE AND ALL FIRE ALARM CONTROL MODULES SHALL ACTIVATE SOUND SYSTEM OVERRIDES.
2. ACTIVATION OF ANY DUCT DETECTOR SHALL REPORT TO THE FACP A TROUBLE CONDITION TO THE FACP AND SHUTDOWN ASSOCIATED HVAC EQUIPMENT.
3. ACTIVATION OF ANY FIRE SUPPRESSION SYSTEM MONITORING MODULES LOCATED ON TAMPER SWITCHES SHALL REPORT A TROUBLE CONDITION TO THE FACP.
4. ACTIVATION OF ANY "LOCKDOWN" MANUAL PUSH BUTTON SHALL REPORT BUILDING LOCKDOWN CONDITION TO THE FACP. A SPECIFIC PRE-RECORDED MESSAGE FOR LOCKDOWN CONDITION SHALL BE BROADCAST THROUGHOUT THE BUILDING.
5. ACTIVATION OF ANY ELEVATOR LOBBY, HOISTWAY, OR MACHINE SPACE SMOKE DETECTORS SHALL INITIATE ELEVATOR RECALL FOR FIRE FIGHTERS SERVICE AND SHALL PROVIDE ALARM INITIATION. PROVIDE SUPERVISIORY SIGNAL FOR ELEVATOR SHUT-DOWN CONTROL CIRCUITS.
6. ANY ALARM CONDITION OR TROUBLE CONDITION SHALL BE BROADCAST TO THE DISTRICT CENTRAL MONITORING ENTITY VIA A DIALER IN THE FACP. TWO TELEPHONE SHALL BE PROVIDED FOR REDUNDANCY.

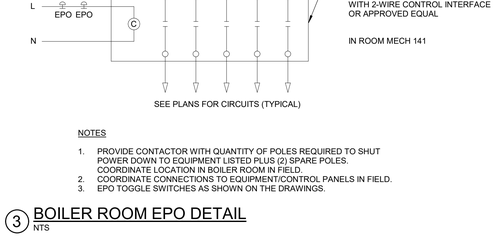
NOTES:

1. ALL WIRING PER MANUFACTURERS RECOMMENDATIONS TO BE INSTALLED IN AN APPROVED RACEWAY SYSTEM.
2. THIS DIAGRAM IS INTENDED TO SHOW THE GENERAL RELATIONSHIP OF DEVICES AND CONTROL PANEL IS NOT INTENDED TO SHOW ALL DEVICES. REFER TO FLOOR PLANS FOR EXACT QUANTITIES AND LOCATION OF ALL DEVICES.
3. DIVISION 26 CONTRACTOR TO PROVIDE AND SUPPLY ALL DUCT MOUNTED SMOKE DETECTORS TO THE DIVISION 23 CONTRACTOR FOR INSTALLATION IN THE DUCT. DIVISION 26 CONTRACTOR SHALL BE RESPONSIBLE FOR WIRING OF DUCT DETECTORS.

1 FIRE ALARM RISER DIAGRAM 1
NTS



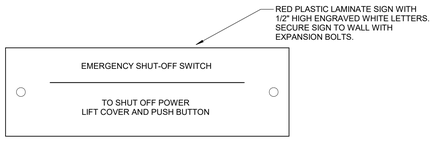
2 TYPICAL CALL FOR AID WIRING DETAIL
NTS

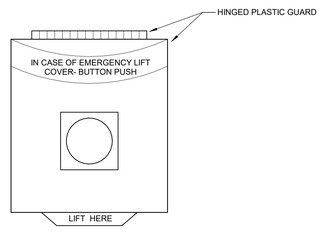


NOTES

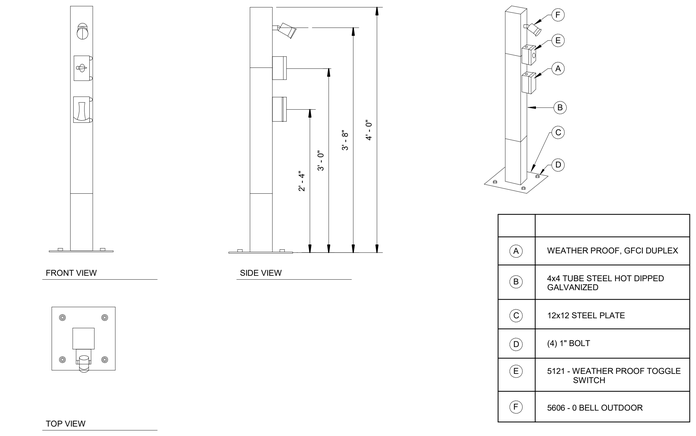
1. PROVIDE CONTACTOR WITH QUANTITY OF POLES REQUIRED TO SHUT POWER DOWN TO EQUIPMENT LISTED PLUS (2) SPARE POLES. COORDINATE LOCATION IN BOILER ROOM IN FIELD.
2. COORDINATE CONNECTIONS TO EQUIPMENT/CONTROL PANELS IN FIELD.
3. EPO TOGGLE SWITCHES AS SHOWN ON THE DRAWINGS.

3 BOILER ROOM EPO DETAIL
NTS





4 EMERGENCEY SHUT-OFF SWITCH WITH PLASTIC GUARD DETAIL
NTS



A	WEATHER PROOF, GFCI DUPLEX
B	4x4 TUBE STEEL HOT DIPPED GALVANIZED
C	12x12 STEEL PLATE
D	(4) 1" BOLT
E	5121 - WEATHER PROOF TOGGLE SWITCH
F	5606 - 0 BELL OUTDOOR

5 ROOF RECEPTACLE PEDESTAL
NOT TO SCALE

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STATE OF CONNECTICUT — MICHAEL J. MALIK — No. 17229 — LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
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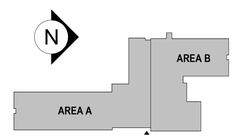
BRISTOL, CT 06010
State Project #: 017-0090 RNV
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ELECTRICAL DETAILS

E6.1

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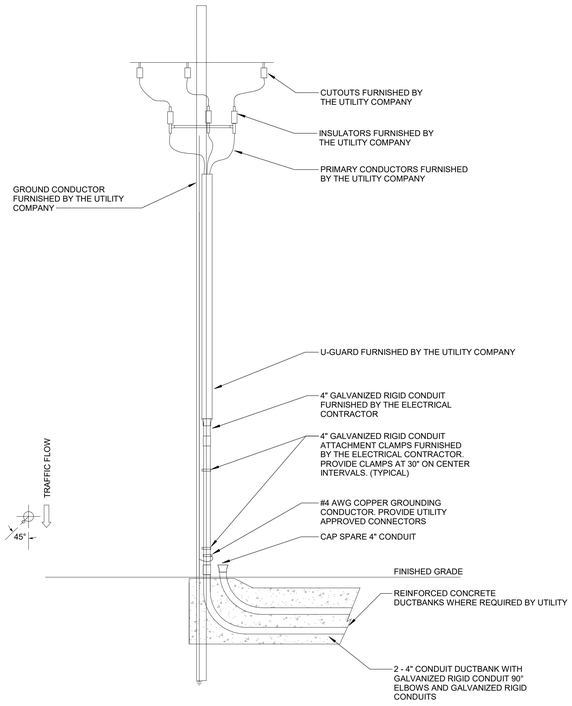
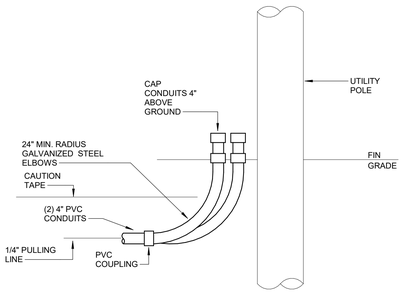


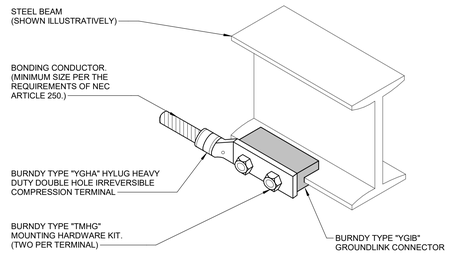
GENERAL NOTES:

1. RIGID CONDUIT RISERS SHALL BE ON THE SIDE OF THE POLE THAT IS AWAY FROM TRAFFIC.
2. CAP SPARE 4" CONDUIT
3. PROVIDE 1/4" PULL ROPE FOR BOTH PRIMARY CONDUITS.

1 PRIMARY POLE RISER DETAIL
NTS



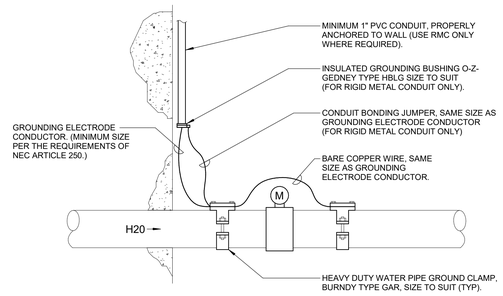
2 PRIMARY RISER POLE CONDUIT DETAIL
NTS



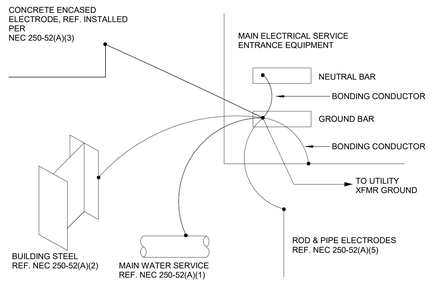
NOTES:

1. WIDE FLANGE BEAM SHOWN. USE WITH OTHER STRUCTURAL ELEMENTS ONLY AS SPECIFIED BY MANUFACTURER.
2. INSTALL ACCORDING TO MANUFACTURER'S SPECIFICATIONS, USING MANUFACTURER'S RECOMMENDED INSTALLATION TOOLS.
3. PREPARE BEAM SURFACE ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
4. UPON COMPLETION OF INSTALLATION REPAIR & RESTORE ALL DISTURBED FIREPROOFING AND CORROSION PROTECTION.
5. DETAIL SHOWS ONLY COMPONENT FAMILY TYPES. COORDINATE WITH MANUFACTURER TO DETERMINE EXACT PART NUMBER APPROPRIATE FOR SIZE/TYPE OF EACH BEAM AND BONDING CONDUCTOR.

3 BONDING TO BUILDING STEEL
1/8" = 1'-0"



4 WATER MAIN GROUNDING DETAIL
1/8" = 1'-0"



NOTES:

A. REFER TO GROUNDING ELECTRODE TABLE FOR CONNECTIONS REQUIRED AS RELATED TO THIS PROJECT.

B. ALL CONNECTIONS SHALL BE IN ACCORDANCE WITH NEC ARTICLE 250.

GROUNDING ELECTRODE CONNECTIONS AVAILABILITY AND REQUIREMENTS FOR THIS PROJECT

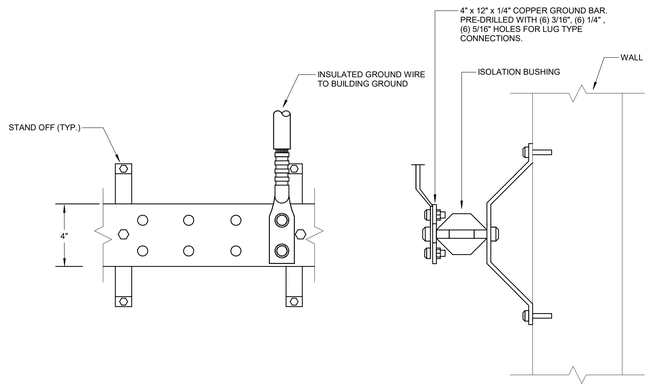
NEC REFERENCE	AVAIL. YES	REQ'D YES	NOTES
250-52(A)(1)	X	X	1
250-52(A)(2)	X	X	1
250-52(A)(3)	X	X	1,4
250-52(A)(4)	X		2
250-52(A)(5)	X	X	2
250-52(A)(6)	X		2
250-52(A)(7)	X		2

GROUNDING ELECTRODE CONDUCTOR SIZE:3/0 AWG COPPER

NOTES:

1. NEC ARTICLE 250-52 INDICATES A PRIORITY LIST OF GROUNDING ELECTRODE CONNECTIONS WITH (1) BEING THE HIGHEST PRIORITY AND (7) BEING THE LOWEST.
2. CONNECTION TO ITEMS MADE UNDER ARTICLE 250-52(A)(4),(5),(6) & (7) SHALL NOT SUBSTITUTE CONNECTIONS TO 250-52 (1), (2), OR (3), UNLESS NONE OF THESE SYSTEMS ARE AVAILABLE.
3. GROUNDING ELECTRODE SYSTEM INSTALLATION SHALL COMPLY WITH NEC ARTICLE 250.53.
4. REFER TO NEC ARTICLE 250.50, EXCEPTION.

5 GROUNDING ELECTRODE SYSTEM DETAIL
NTS



6 GROUNDING BUS BAR DETAIL
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STATE OF CONNECTICUT — MICHAEL J. MALIK — No. 17229 — LICENSED PROFESSIONAL ENGINEER

RENOVATIONS TO:
EDGEWOOD PRE-K ACADEMY
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BRISTOL, CT 06010
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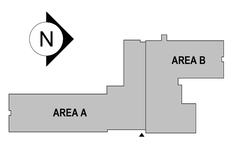
Project #:25064

Revisions



CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ELECTRICAL DETAILS

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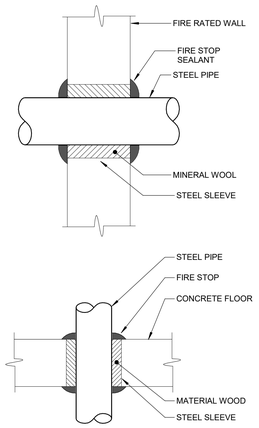
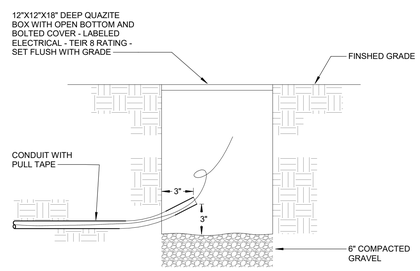


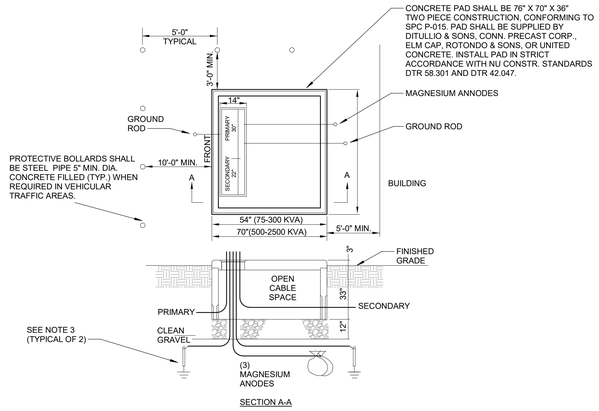
NOTES:

1. 4" STEEL PIPE MAXIMUM (REFER TO FLOOR PLANS FOR SIZE REQUIREMENTS).
2. 6" DIA. OPENING (MAX) WITH STEEL SLEEVE.
3. SLEEVE: 4" OF 4PCF MINERAL WOOL IN OPENING.
4. APPLY FIRE STOP SEALANT THICKNESS MANUFACTURE'S INSTALLATION INSTRUCTIONS. APPLY SEALANT OVER MINERAL WOOL ON EACH SIDE OF PENETRATION.

1 CONDUIT/SLEEVE WALL & FLOOR PENETRATION DETAILS
NTS



2 QUAZITE BOX INSTALLATION DETAIL
NTS

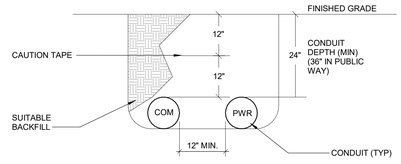


SECTION A-A

NOTES:

1. PRIMARY CABLE:
   A. INSTALL DIRECT - BURIED CABLES A MINIMUM OF 30 INCHES BELOW GRADE.
   B. INSTALL CABLES IN CONDUIT A MINIMUM OF 24 INCHES BELOW GRADE.
   C. LOOP CABLES IN PIT BEFORE MAKING CONNECTIONS.
2. SECONDARY CABLE:
   LEAVE ENOUGH CABLE TO EXTEND 6 FEET ABOVE PAD FOR FUTURE CONNECTING TO TRANSFORMERS WITH HIGHER SECONDARY TERMINALS. E.C. TO PROVIDE CABLES ENTERING THROUGH THE REAR KNOCKOUT AND SHALL BE CONFINED TO THE AREA DEFINED AS THE SECONDARY CABLE AREA.
3. COPPER CLAD GROUND RODS-INSTALL IN TRENCH AND CONNECT #2 COPPER CONDUCTORS FROM RODS THROUGH PAD OPENING AND EXTENDING 5 FEET ABOVE PAD. MINIMUM SEPARATION OF GROUND RODS IS 8 FEET.
4. MEET ALL UTILITY COMPANY REQUIREMENTS

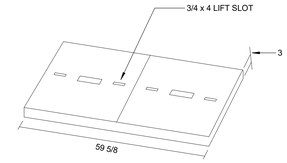
3 TRANSFORMER PAD DETAIL
NTS

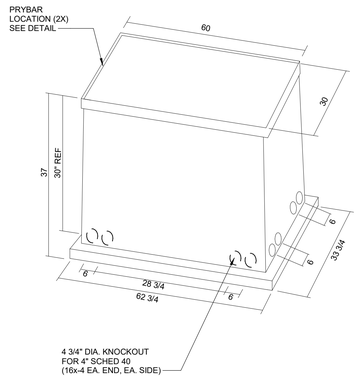


UNDERGROUND CAUTION TAPE: PERMANENT, BRIGHT -COLORED, CONTINUOUS PRINTED, VINYL TAPE FOR PERMANENT DIRECT- BURIAL SERVICE, AND WITH THE FOLLOWING FEATURES:

1. NOT LESS THAN 6 INCHES WIDE BY 4 MILS THICK.
2. EMBEDDED CONTINUOUS METALLIC STRIP OR CORE.
3. PRINTED LEGEND THAT INDICATES TYPE OF UNDERGROUND LINE.

4 TRENCH DETAIL
NTS





NOTES:

1. MATERIAL: FIBERGLASS REINFORCED POLYMER CONCRETE & FIBERGLASS REINFORCED POLYMER
2. COLOR: CONCRETE GRAY
3. LOAD RATING: A16(ASTM C857)
4. LOGO: ELECTRIC
5. COVER WEIGHT: 215 LBS
6. BOX WEIGHT: 253 LBS
7. COVER & BOX TOTAL WEIGHT: 478 LBS

5 TYPICAL PRIMARY CABLE HANDHOLE
NTS

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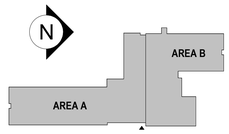

CONSTRUCTION DOCUMENTS
JUNE 5, 2026

ELECTRICAL DETAILS

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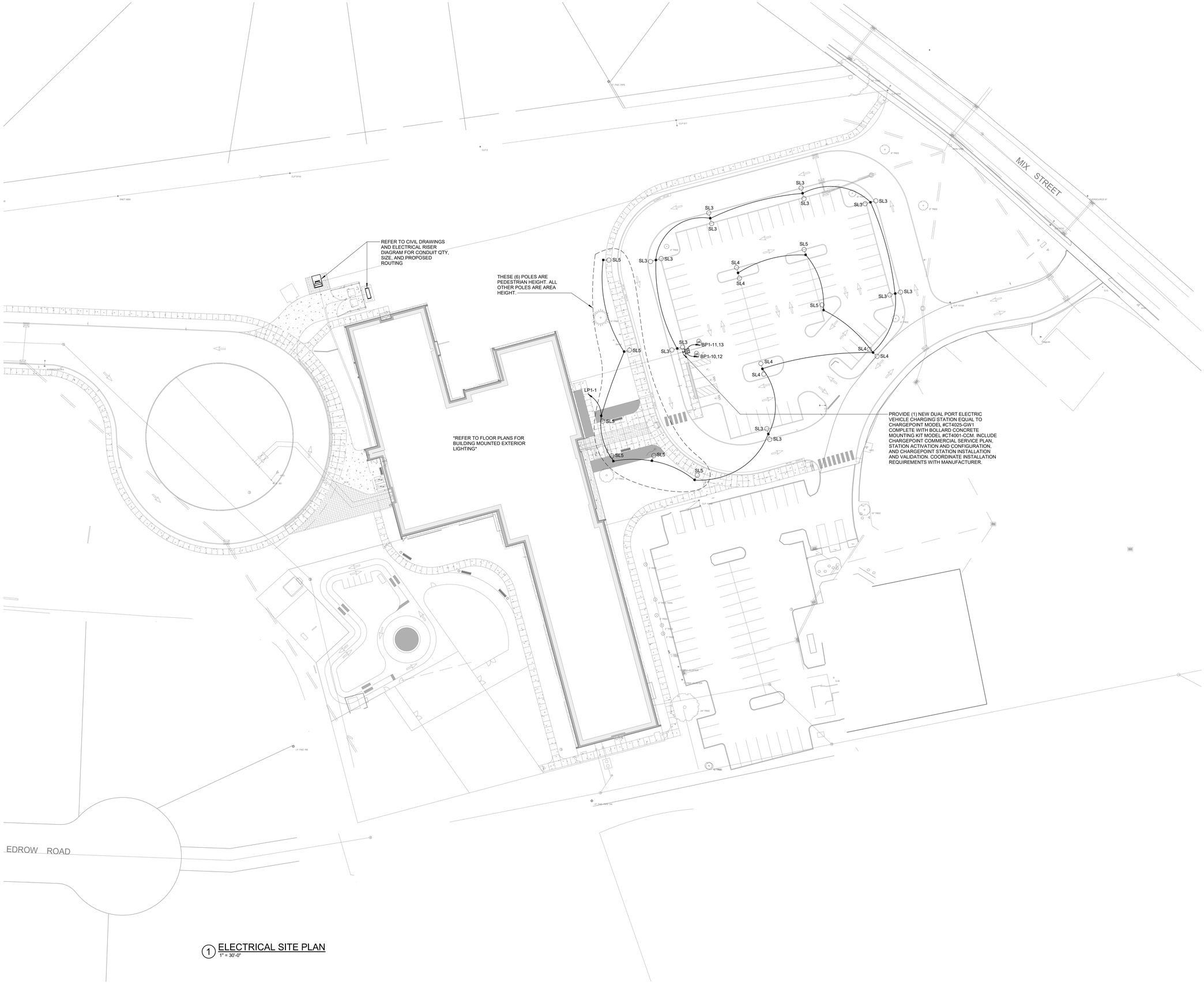

1 ELECTRICAL SITE PLAN
1" = 30'-0"

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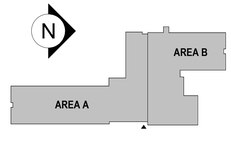

CONSTRUCTION DOCUMENTS
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ELECTRICAL SITE PLAN

ES1.1

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COMMUNICATION CABLING INFRASTRUCTURE

REFER TO SPECIFICATION SECTION 27 1000 FOR DEVICES

SYMBOL	DESCRIPTION	OUTLET BOX & CONDUIT SIZES PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR: MOUNTING AFF UNLESS OTHERWISE NOTED	1 G - 2-1/2" DP	4 x 4" x 2-1/8" DP	1G DEVICE RING	1" C	CHIEF #PAC525FCW	LEGRAND #EFSB4	CABLE & TERMINATION PROVIDED & INSTALLED BY LOW VOLTAGE CONTRACTOR: CAT6A PLENUM CABLE	8P8C (RJ45) JACK - CAT6A	FACEPLATE - DATA	WALL PHONE MTG PLATE	HUBBELL #HBB2WP						COMMMENTS
W ▶	WALL PHONE OUTLET	48" AFF	1		1	1			1	1		1							
1D ▷	1 DATA OUTLET	18" AFF		1	1	1			1	1	1								
2D ▷	2 DATA OUTLET	18" AFF		1	1	1			2	2	1								
3D ▷	3 DATA OUTLET	18" AFF		1	1	1			3	3	1								
4D ▷	4 DATA OUTLET	18" AFF		1	1	1			4	4	1								
1V1D ▶▷	1 VOICE - 1 DATA OUTLET	18" AFF		1	1	1			2	2	1								
1V2D ▶▷	1 VOICE - 2 DATA OUTLET	18" AFF		1	1	1			3	3	1								
2V2D ▶▷	2 VOICE - 2 DATA OUTLET	18" AFF		1	1	1			4	4	1								
1V ▶	1 VOICE OUTLET	18" AFF		1	1	1			1	1	1								
#V #D ▷	FLOOR BOX					A/R			A/R	A/R	1								REFER TO ELECTRICAL DRAWINGS FOR FLOOR BOX CONDUIT REQUIREMENTS. # - DENOTES QTY OF CABLES
#V #D ◁	CEILING MOUNTED BOX			1	1	A/R			A/R	A/R	1								CEILING MOUNTED DEVICES. # - DENOTES QTY OF CABLES
APC ◁▶	WIRELESS ACCESS POINT CEILING MOUNTED								2	2			1						CEILING MOUNTED AP SHALL HAVE A 15FT SERVICE LOOP AND LOCATED AT APPROXIMATE LOCATIONS SHOWN ON PLANS. REFER TO DETAILS FOR ADDITIONAL INFORMATION.
AP ▶	WIRELESS ACCESS POINT WALL MOUNTED		1		1	1			2	2			1						
▬◀	ETHERNET CABLE FOR CAMERA			1	1				1	1			1						INCLUDE 10 FT SERVICE LOOP FOR CABLING. CONFIRM NO OBSTRUCTIONS BLOCK THE INTENDED CAMERA FIELD OF VIEW PRIOR TO INSTALLATION OF CABLING, WHICH MAY INCLUDE SIGNAGE, PENDANT LIGHTS, SPEAKERS, TREES, OR ANY OTHER OBSTRUCTIONS IN THE IMMEDIATE FIELD OF VIEW. BRING ALL FIELD OF VIEW OBSTRUCTIONS TO THE ATTENTION OF THE SECURITY CONSULTANT.
▬◀	ETHERNET CABLE FOR CAMERA			1	1				1	1			1						
▬◀	ETHERNET CABLE FOR CAMERA			1	1				1	1			1						

PUBLIC ADDRESS & CLOCKS

REFER TO SPECIFICATION 27 5116 FOR PA DEVICES & 27 5313 OF CLOCK DEVICES

SYMBOL	DESCRIPTION	OUTLET BOX & CONDUIT SIZES PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR: MOUNTING AFF UNLESS OTHERWISE NOTED	2G - 2-1/2" DP	1G - DEVICE RING	3/4" C	CABLING PROVIDED & INSTALLED BY PA CONTRACTOR: PLENUM RATED CABLE A/R					COMMMENTS
(S) VC	PA SPEAKER W/BUILT-IN VOLUME CONTROLS					1					VERIFY COLOR WITH ARCHITECT
(S)	PA SPEAKER - 8" DIAMETER					1					
(S) 2x2	CLASSROOM SPEAKER 2' X 2' TILE					1					
S	PA WALL MOUNTED BOX SPEAKER		1		1	1					
VC ▷	PA VOLUME CONTROL	48" AFF	1	1	1	1					VOLUME CONTROL SHALL CONTROL THE SPEAKERS SHOWN WITHIN THE SAME ROOM. CONFIRM COLOR WITH ARCHITECT.
PA	PA MASTER HANDSET BOGEN #MCDS4					1					INCLUDE CABLING A/R, DATA JACK, & FACEPLATE FOR CABLING.
CS ▷	PA CALL SWITCH	48" AFF	1	1	1	1					CS SHALL ACTIVATE 2-WAY CONVERSATIONS BETWEEN CLASSROOM SPEAKERS AND MAIN OFFICE. CABLING A/R
• H	PA HORN SPEAKER		1		1	1					SECURE HORNS TO STRUCTURE. EXTERIOR HORNS SHALL RECEIVE PROPER WEATHER PROOFING ASSEMBLY.
PSB	PA STROBE	108" AFF	1	1	1	1					
PS	PA PENDANT SPEAKER		1		1	1					
	CLOCK - ALL CLOCKS ARE 12" DIA. CLOCKS NOTED AS 16 ARE TO BE 16" DIA. CLOCKS	96" AFF									REFER TO ARCHITECTURAL PLAN FOR MOUNTING HEIGHT.

GENERAL PLAN SYMBOLS

- DETAIL NUMBER / SHEET NUMBER — DETAIL/PLAN IDENTIFIER
- DETAIL NUMBER / SHEET NUMBER — SECTION IDENTIFIER
- DETAIL NUMBER / SHEET NUMBER — ELEVATION IDENTIFIER
- DRAWINGS KEYNOTE NOTE TAG
- EQUIPMENT NOTE TAG
- CONDUIT SLEEVE - THROUGH CEILING TO ABOVE FLOOR
- CONDUIT SLEEVES - THROUGH FLOOR TO BELOW FLOOR
- CONDUIT SLEEVES - HORIZONTAL

AUDIO VISUAL

REFER TO SPECIFICATION SECTION 27 4100 FOR DEVICES

SYMBOL	DESCRIPTION	OUTLET BOX & CONDUIT SIZES PROVIDED & INSTALLED BY ELECTRICAL CONTRACTOR: MOUNTING AFF UNLESS OTHERWISE NOTED	4 x 4" x 4" DP	6 x 4" x 4" DP	2G DEVICE RING	3G DEVICE RING	3/4" C	1" C	1-1/4" C	CHIEF #PAC525FCW	LEGRAND #EFSB4	CABLING PROVIDED & INSTALLED BY LOW VOLTAGE CONTRACTOR (ALL CABLING TO BE PLENUM RATED): CAT6A CABLE	8P8C (RJ45) JACK - CAT6A	AV CABLING INDICATED ON SIGNAL FLOW DIAGRAMS							COMMMENTS
ID-XX ▷	**INTERACTIVE BOARD PROVIDED BY OWNER & INSTALLED BY CONTRACTOR** XX = DISPLAY SIZE	*						2	1			2	2	1							* REFER TO ARCHITECTUAL ELEVATIONS FOR MOUNTING HIEGHTS. ETHERNET TERMINATES TO LAN (MDF / IDF). **INTERACTIVE BOARD PROVIDED BY OWNER & INSTALLED BY CONTRACTOR**
MON-XX ▷	MONITOR OUTLET LOCATION XX = DISPLAY SIZE	60" AFF						1	1			2	2	1							ETHERNET TERMINATES TO LAN (MDF / IDF)
A ▷	AV INTERFACE BACKBOX INPUT END	18" AFF	1		1				2					1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
B ▷	AV CONTROL PANEL	48" AFF	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
C ▷	AV TRANSMITTER	18" AFF	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
D ▷	AV TRANSMITTER	18" AFF	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
E ▷	AV CONTROL PANEL	48" AFF	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
GS ▷	SPEAKER - GYM & CAFETERIA	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
ALS ▷	ASSISTED LISTENING TRANSMITTER	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
ANT ▷	ANTENNA - WIRELESS MIC RECEIVER	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
MIC ▷	MICROPHONE - DIGITAL INPUT PLATE	18" AFF	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
P ▷	PROJECTOR PASS-THRU PLATE	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
PE ◁	CEILING MOUNTED PLENUM RATED ENCLOSURE						1					1	1	1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS. ETHERNET TERMINATES TO LAN (MDF / IDF)
S1	SPEAKER - FLUSH MOUNTED QSYS #AD-C6T-LPZB OR EQUIV.													1							
S2	SPEAKER - PENDANT													1							
S3 ▷	SPEAKER - 8" LOUD SPEAKER	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
S4 ▷	SPEAKER - 12" LOUD SPEAKER	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
S5 ▷	SPEAKER - 15" LOUD SPEAKER	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
SC ▷	SCREEN PASS-THRU PLATE	As Noted	1		1		1							1							REFER TO SIGNAL FLOW DIAGRAMS FOR CABLING AND ROUTING REQUIREMENTS
XX ▷	FLOOR BOX MOUNTED DEVICE																				REFER TO ELECTRICAL DRAWINGS FOR FLOOR BOX REQUIREMENTS. XX - DENOTES DEVICE AND CABLING REQUIREMENTS
XX ◁	CEILING MOUNTED DEVICE																				CEILING MOUNTED DEVICE XX - DENOTES DEVICE AND CABLING REQUIREMENTS

TECHNOLOGY ABBREVIATIONS

(NOTE: NOT ALL ABBREVIATIONS APPLICABLE)

AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISHED GRADE
A/C	ABOVE COUNTER
ACS	ACCESS CONTROL SYSTEM
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
A/R	AS REQUIRED
AWG	AMERICAN WIRE GAUGE
BICSI	BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL
BNC	BAYONET NEIL-CONCELMAN
C	CONDUIT(S)
DEMARC	DEMARCATION
DPDT	DOUBLE THROW DOUBLE PULL
EIA	ELECTRONICS INDUSTRIES ALLIANCE
EMT	ELECTRICAL METALLIC TUBING
FACP	FIRE ALARM CONTROL PANEL
F	FACSIMILE (FAX)
IDS	INTRUSION DETETECTION SYSTEM
LAN	LOCAL AREA NETWORK
MER	MAIN EQUIPMENT ROOM
NEC	NATIONAL ELECTRIC CODE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OFE	OWNER FURNISHED EQUIPMENT
PA	PUBLIC ADDRESS
PBX	PRIVATE BRANCH EXCHANGE
PC	PERSONAL COMPUTER
PoE	POWER OVER ETHERNET
PP	PATCH PANEL
PVC	POLYVINYL CHLORIDE CONDUIT
QYT	QUANTITY
STP	SHIELDED TWISTED PAIR
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TGB	TELECOMMUNICATIONS GROUNDING BUSBAR
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATIONS
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUSBAR
TR	TELECOMMUNICATIONS ROOM
TV	TELEVISION
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
VGA	VIDEO GRAPHICS ARRAY
VoIP	VOICE OVER INTERNET PROTOCOL
VSS	VIDEO SURVEILLANCE SYSTEM
W	WALL TELEPHONE (VOICE)
WAN	WIDE AREA NETWORK
WAO	WORK AREA OUTLET
WAP	WIRELESS (DATA) ACCESS POINT
WG	WIRE GUARD
WP	WEATHERPROOF

GENERAL NOTES

1. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT.
2. ALL COMMUNICATION, SECURITY, AND AV OUTLETS MUST COINCIDE WITH ELECTRICAL POWER DRAWINGS. THE CONTRACTOR MUST COORDINATE ALL LOCATIONS OF THE ELECTRICAL OUTLETS WITH THESE OUTLETS.
3. REQUIRED CABLE COLORS: SUBMIT ALL CABLE AND JACK COLOR WITH PRODUCT SUBMITTALS PRIOR TO PROCUREMENT
4. LABEL ALL CABLES WITHIN 12" OF FINAL TERMINATION.
5. THE CONTRACTOR SHALL MAINTAIN THE TWIST OF THE INDIVIDUAL PAIRS TO WITHIN 1/2" OF FINAL TERMINATION FOR ALL CATEGORY 3 OR HIGHER CABLE.
6. USE ONLY HOOK AND LOOP CABLE TIES (VELCRO) FOR CABLES RATED CATEGORY 3 OR HIGHER.
7. ALL CABLES RUN IN CEILING AREAS SHALL BE PROPERLY SUPPORTED WITH CONDUIT OR J-HOOKS MOUNTED TO SLAT AT MINIMUM OF 5' INTERVALS. NO CABLE SHALL REST OR TOUCH CEILING ASSEMBLIES. CABLES SHALL NOT BE INSTALLED EXPOSED IN OPEN CEILING AREAS.
8. ALL LABELS SHALL BE MACHINE PRINTED. NO HAND LETTERED CABLES SHALL BE USED.
9. USE ONLY PLENUM RATED CABLES.
10. DO NOT RUN ETHERNET CABLES PARALLEL TO POWER CABLES. CROSS POWER CABLES ONLY AT RIGHT ANGLES.
11. MAINTAIN 8" DISTANCE FROM ALL LIGHTING TRANSFORMERS.
12. COLOR AND STYLE OF TELECOMMUNICATION FACE PLATES SHALL MATCH ELECTRICAL FACE PLATES AND BE COORDINATED WITH AND CONFIRMED BY THE ARCHITECT.
13. OBTAIN AND EXTEND TO OWNER ALL AVAILABLE MANUFACTURER AND SYSTEM EXTENDED MANUFACTURER WARRANTEES. THE LOW VOLTAGE INSTALLATION CONTRACTOR SHALL SUBMIT ALL TEST RESULTS TO THE CABLE MANUFACTURER TO CERTIFY THE CABLING INSTALLATION AND ATTAIN AND DELIVER TO THE OWNER THE EXTENDED MANUFACTURER'S WARRANTY FOR MATERIAL AND WORKMANSHIP.
14. SPLICING CABLES IS NOT PERMITTED EXCEPT AS SPECIFICALLY NOTED.
15. DEVICE CABLING SHALL BE TERMINATED WITHIN THE INDICATED DATA ROOMS AND SHALL BE TERMINATED ONTO A 19" RACK MOUNTED, RJ45, 48 PORT, CATEGORY 6A RATED PATCH PANEL.
16. THE FOLLOWING CABLING SHALL BE TERMINATED ONTO IT'S OWN DISCRETE AND SEPARATE CATEGORY 6A RATED, RACK MOUNTED PATCH PANELS. REFER TO RACK ELEVATION DETAILS:
    - A. ALL WIRELESS AP'S
    - B. ALL VIDEO SURVEILLANCE CAMERAS (REFER TO SECURITY DRAWINGS FOR PLACEMENT)
17. LOCATIONS OF EQUIPMENT FOR ALL OTHER TRADES SHALL BE COORDINATED BEFORE CONSTRUCTION.
18. THE CONTRACTOR SHALL COORDINATE LAYOUT LOCATIONS AND CLEARANCE OF ALL EQUIPMENT WITH OTHER TRADES AND ATTAIN OWNER'S APPROVAL PRIOR TO INSTALLATION.
19. CONTRACTOR SHALL COORDINATE ALL RACEWAYS, LOCATIONS, AND POWER REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR.
20. ALL VOICE AND DATA OUTLETS THAT DO NOT HAVE AN ELECTRICAL OUTLET WITHIN 3FT SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE THE PROJECT ARCHITECT, CONSTRUCTION MANAGER, AND TECHNOLOGY CONSULTANT PRIOR TO THE TIME OF INSTALLATION.
21. ALL DEVICES SHOWN ON THESE PLANS MUST BE COORDINATED AND APPROVED BY THE ARCHITECT. THE INSTALLATION CONTRACTOR SHALL DEPICT ALL DEVICES ONTO ELEVATION SUBMITTALS BEFORE INSTALLATION. ANY DEVICE THAT IS NOT APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION MAY BE REQUIRED TO BE RELOCATED AS DIRECTED BY THE ARCHITECT AND CORRECTED BY THE CONTRACTOR WITH NO ADDITIONAL CHARGE TO THIS PROJECT.
22. ALL PATHWAYS, INCLUDING ALL WALL AND CEILING PENETRATIONS ARE REQUIRED TO INSTALL CABLING TO THE END DEVICE AND SHALL BE COORDINATED BETWEEN THE LOW VOLTAGE AND SECURITY CONTRACTOR AND THE ELECTRICAL CONTRACTOR AND SHALL BE INCLUDED AS PART OF THIS SECTION.
23. SECURE ATTACHMENT OF TECHNOLOGY AND SECURITY DEVICES:
    - A. TO ENSURE PROPER ATTACHMENT OF FIXTURES, FURNISHINGS & EQUIPMENT ITEMS, INCLUDING AND TECHNOLOGY ITEMS, WHERE "ITEMS" ARE ATTACHED TO WALL, CEILING, OVERHEAD STRUCTURE, AND/OR FLOOR, CONTRACTOR SHALL PROVIDE INFORMATION ADEQUATE FOR ARCHITECT TO VERIFY ITEMS, ATTACHED TO WALL, CEILING, AND/OR FLOOR ARE ATTACHED SECURELY AND PER MANUFACTURER'S RECOMMENDATIONS. ARCHITECT'S REVIEW MAY BE IMPLEMENTED DURING SUBMITTAL PROCESS.
    - B. CONTRACTOR SHALL PROVIDE STRUTS, HANGERS, FASTENERS, SAFETY HARNESSES, CHANNELS, BOLTS, SCREWS, RODS, ETC. TO SECURELY ATTACH ITEMS TO THE EXISTING STRUCTURE AS REQUIRED TO MEET FIELD CONDITIONS AND MEET APPLICABLE CODES.
24. ALL CONDUIT IS INSTALLED TO ABOVE ACCESSIBLE CEILING UNLESS OTHERWISE NOTED.
25. PLACEMENT OF ALL SECURITY VIDEO SURVEILLANCE CAMERA CABLING MUST BE COORDINATED WITH THE SECURITY CONTRACTOR AND APPROVED BY THE SECURITY CONSULTANT AND/OR OWNER PRIOR TO CONSTRUCTION.

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STATE OF CONNECTION — CHRISTOPHER MALIK — No. 9199 — REGISTERED ARCHITECT

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

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TECH-AV SYMBOL LEGEND & GENERAL NOTES

TN0.1

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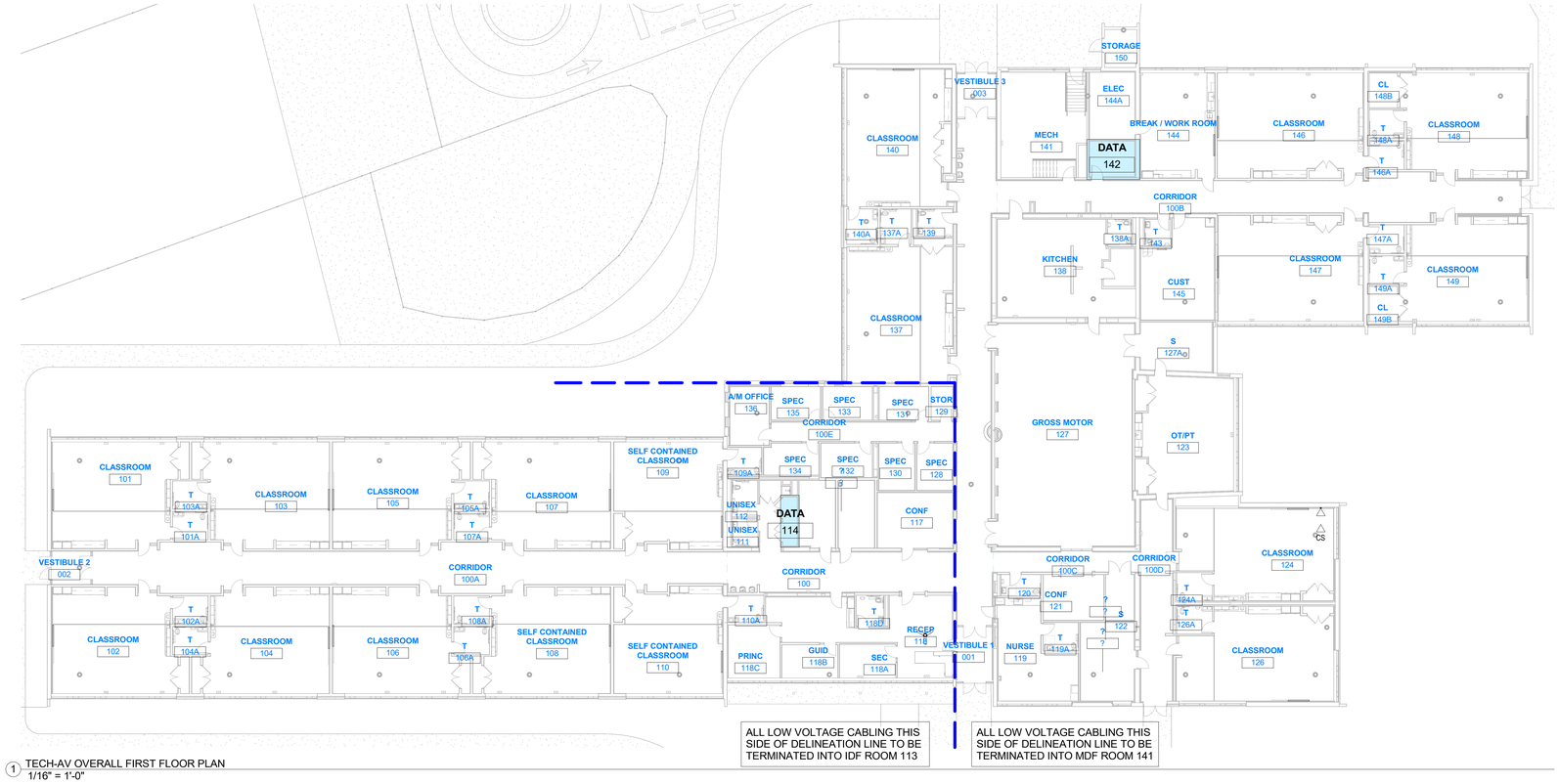

1 TECH-AV OVERALL FIRST FLOOR PLAN
1/16" = 1'-0"

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RENOVATE AS NEW:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

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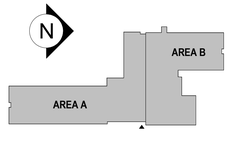

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TECH-AV OVERALL FIRST FLOOR PLAN

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1 FIRST FLOOR PLAN - AREA A
1/8" = 1'-0"

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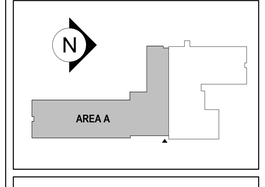

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TECH-AV FIRST FLOOR PLAN - AREA A

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1 FIRST FLOOR PLAN - AREA B
1/8" = 1'-0"

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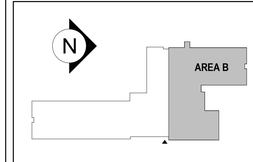

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TECH-AV FIRST FLOOR PLAN - AREA B

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1 TECH-AV OVERALL RCP PLAN
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KRISTOPHER MALIK
REG. 21027
REG. 9109
LICENSED ARCHITECT

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EDGEWOOD PRE-K ACADEMY
345 MIX STREET
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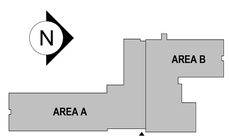

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TECH-AV OVERALL RCP PLAN

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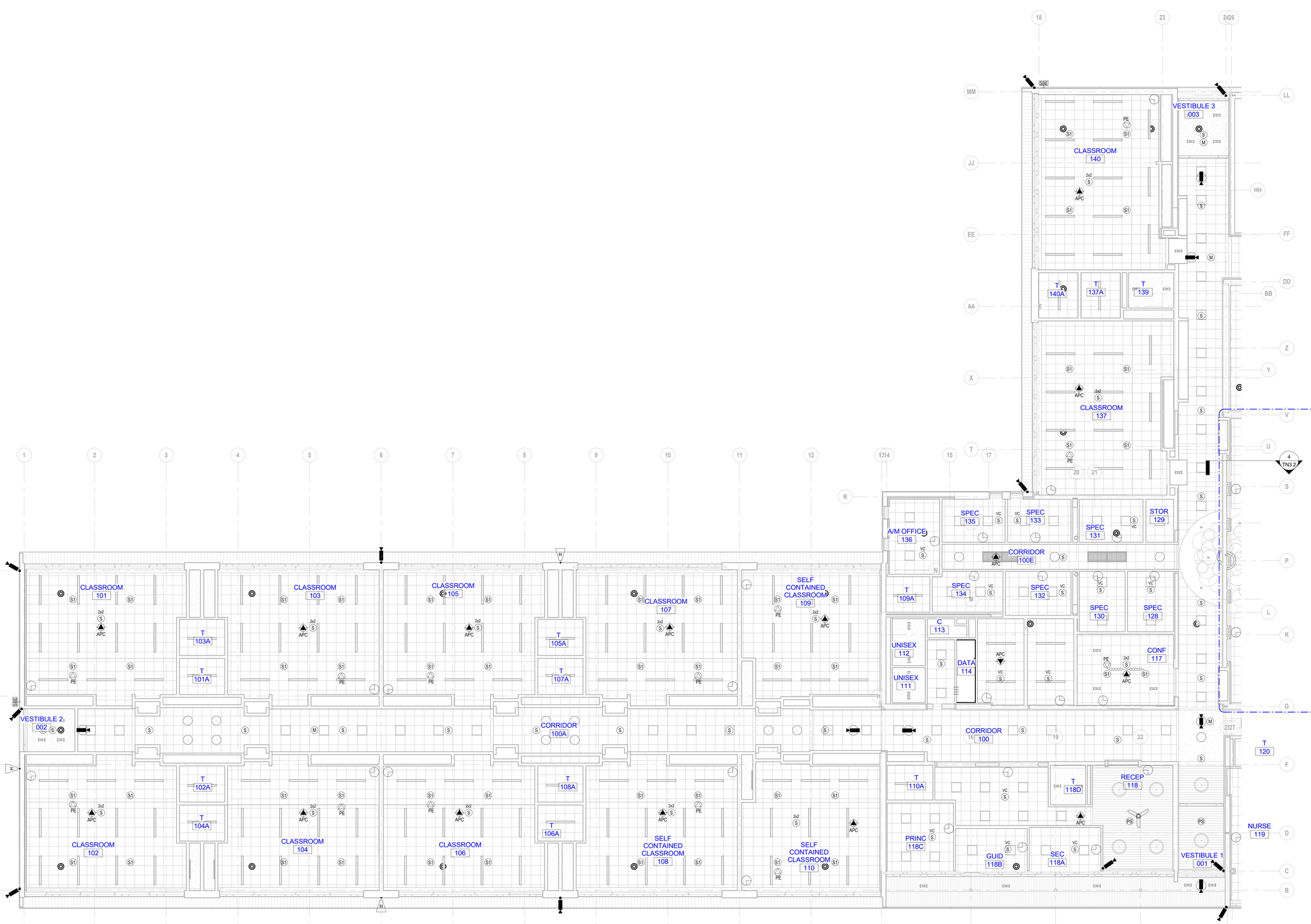

1 TECH-AV OVERALL RCP PLAN - AREA A
1/8" = 1'-0"

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RENOVATE AS NEW:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT

State Project #: 017-0090 RNV
Project #:25064

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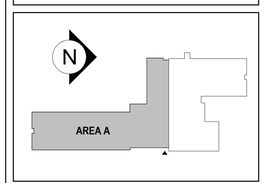

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TECH-AV RCP PLAN - AREA A

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1 TECH-AV OVERALL RCP PLAN - AREA B
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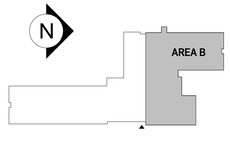

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TECH-AV RCP PLAN - AREA B

TN2.1B

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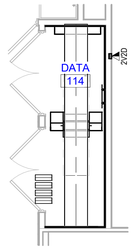
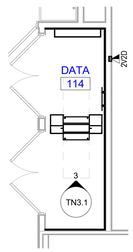


2 IDF 113 RCP VIEW
1/4" = 1'-0"



1 IDF 113 PLAN VIEW
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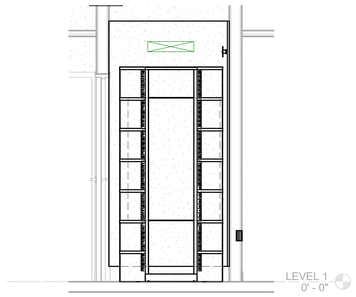
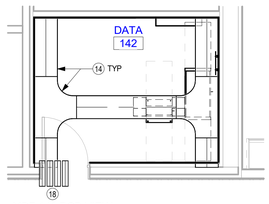
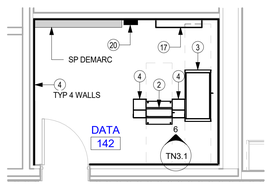


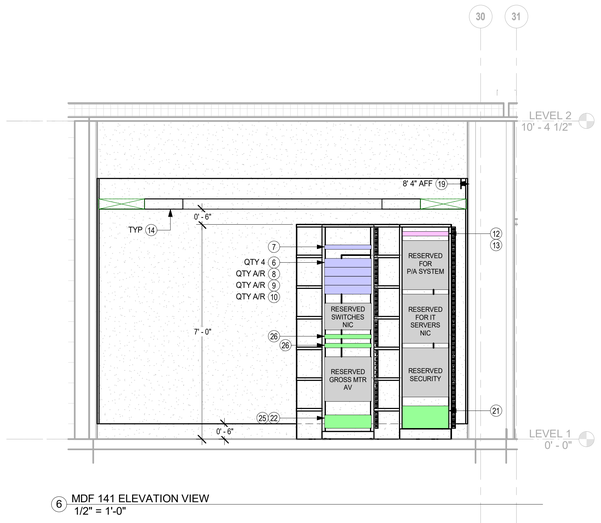
3 IDF 113 ELEVATION VIEW
1/2" = 1'-0"



5 MDF 141 RCP VIEW
1/4" = 1'-0"

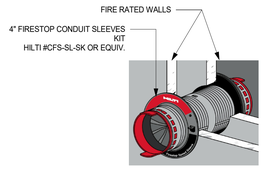


4 MDF 141 PLAN VIEW
1/4" = 1'-0"



6 MDF 141 ELEVATION VIEW
1/2" = 1'-0"

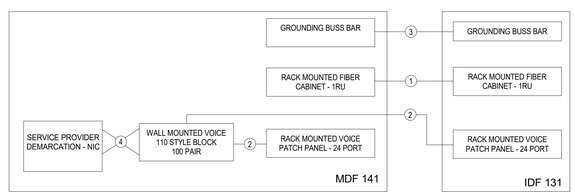
PRODUCT DESCRIPTION		
KEY	DESCRIPTION	MANUFACTURER #
1	3/4" FIRE RATED PLYWOOD PAINTED WITH 2 COATS OF FIRE RETARDANT PAINT AS SPECIFIED. MOUNT BOTTOM OF PLAYWOOD AT 6" AFF.	AS REQUIRED
2	TWO-POST RACK; 45 RMU 19" W x 7' H x 3" D	CPI #46353-703 OR EQUIV
3	ADJUSTABLE RAIL QUADRACK; 84", 45U H x 23.62" W x 35.43" D; 35.43 to 41.33" to 41.33" RAIL DEPTH; BLACK	CPI #15252-703 OR EQUIV
4	6" WIDE, DOUBLE SIDED VERTICAL WIRE MANAGER	CPI #13912-703 OR EQUIV
5	HORIZONTAL WIRE MANAGER - 1RU	AS SPECIFIED
6	48 PORT MODULAR ANGLED PATCH PANELS, 2RU	AS SPECIFIED
7	24 PORT CATEGORY 5E ANGLED PATCH PANELS, 1RU - VOICE BACKBONE	AS SPECIFIED
8	CATEGORY 6A JACK MODULE, BLUE (DATA)	AS SPECIFIED
9	CATEGORY 6A JACK MODULE, RED (WAP'S)	AS SPECIFIED
10	CATEGORY 6A JACK MODULE, YELLOW (VSS CAMERAS)	AS SPECIFIED
11	FIBER OPTIC CABINET - 2RU	AS SPECIFIED
12	FIBER OPTIC CABINET - 1RU	AS SPECIFIED
13	LC ADAPTER PLATES, 6 LC DUPLEX (12 FIBER STRANDS), COLOR: AQUA	AS SPECIFIED
14	18" WIDE CABLE TRAY MOUNTED TO CEILING DECK, INCLUDE THREADED RODS W/PROTECTIVE COVERS, TRAPEZE BRIDGE SUPPORT AND ALL REQUIRED MOUNTING ACCESSORIES	CPI OR EQUIV
15	18" WIDE RADIUS DROP	CPI OR EQUIV
16	PUBLIC ADDRESS WALL CABINET	AS SPECIFIED
17	SECURITY PANEL LOCATION	AS SPECIFIED
18	4" CONDUITS SLEEVES - REFER TO DETAIL # 8 THIS SHEET	AS SPECIFIED
19	GROUNDING BUSBAR	FURNISHED BE DIV 26 0000
20	110 STYLE WALL MOUNTED VOICE BLOCK, 100 PAIR. COORDINATE LOCATIONS WITH SERVICE PROVIDERS DEMARCATION.	AS SPECIFIED
21	APC Smart-UPS SRT 5000VA RM 208V to 120V 2U Step-Down Transformer, with APC Smart-UPS SRT 19" Rail Kit for Smart-UPS SRT 5/6/8/10kVA	APC #SRT5KRMXLT-5KTF APC #SRTRK2
22	APC Smart-UPS On-Line, 5kVA, Rackmount 3U, 208V, 2x L6-20R+2x L6-30R NEMA outlets, Network Card+SmartSlot, Extended runtime, W/ rail kit, TAA	APC #SRT5KRMXLTUS APC #SRTRK2
23	APC Smart-UPS SRT 2200VA RM 230V	APC #SRT2200RMXLI
24	UPS Network Management Card 2 -Remote monitoring and control of UPS	APC #AP9630
25	TEMPERATURE & HUMIDITY SENSOR	APC #AP9335TH
26	PDU -208V, 1 RU -- (1 PER 5KVA UPS)	APC #AP9571A



8 FIRE STOP HILTI SLEEVE DETAIL
NTS

BACKBONE DIAGRAM KEYNOTES

1. 12 STRAND OS2 SINGLE-MODE FIBER OPTIC PLENUM RATED ARMORED CABLE TERMINATED ONTO "LC" TYPE ADAPTER PLATES WHICH WILL BE TERMINATED WITHIN RACK MOUNTED FIBER OPTIC CABINETS AT EACH ENDS.
2. 25 PAIR CATEGORY 5E RATED PLENUM CABLE FROM 300 PAIR 110 STYLE WALL MOUNTED BLOCK IN THE MDF #141 AND TERMINATED ONTO 110 STYLE 24 PORT, RACK MOUNTED PATCH PANELS IN MDF #141 & IDF 113. TERMINATE EACH PAIR OF THE COPPER RISER CABLES ON THE BLUE PAIR (PR 1) OF EACH PORT OF THE PATCH PANELS. COIL THE 25TH PAIR (VIOLET/SLATE) AT THE PATCH PANEL END OF EACH CABLE FOR REPAIR OR FUTURE USE.
3. INSTALL #6 AWG (OR AWG AS REQUIRED PER DISTANCES) GROUNDING BUSS WIRE TERMINATING ONTO GROUNDING BUSS BARS AT EACH END.



7 WIRING DIAGRAM - BACKBONE CABLING
NTS

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203.497.3064 da-technology.com

STATE OF CONNECTICUT
ANTHONY MALIK
No. 21827
LICENSED ARCHITECT

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

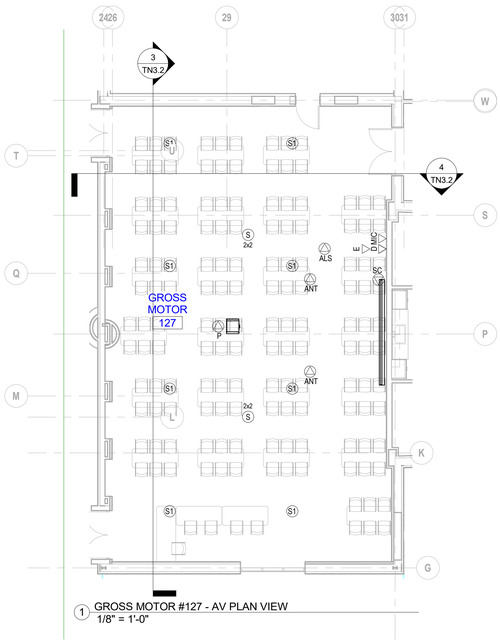
Revisions

100% CONSTRUCTION DOCUMENTS
JUNE 5, 2026

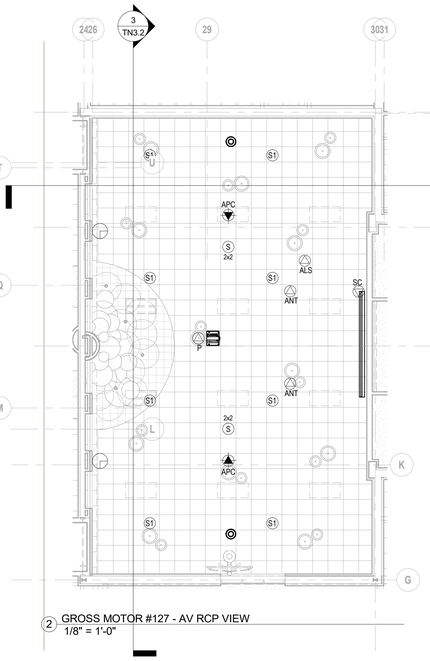
TECH-AV DATA ROOM DETAILS

TN3.1

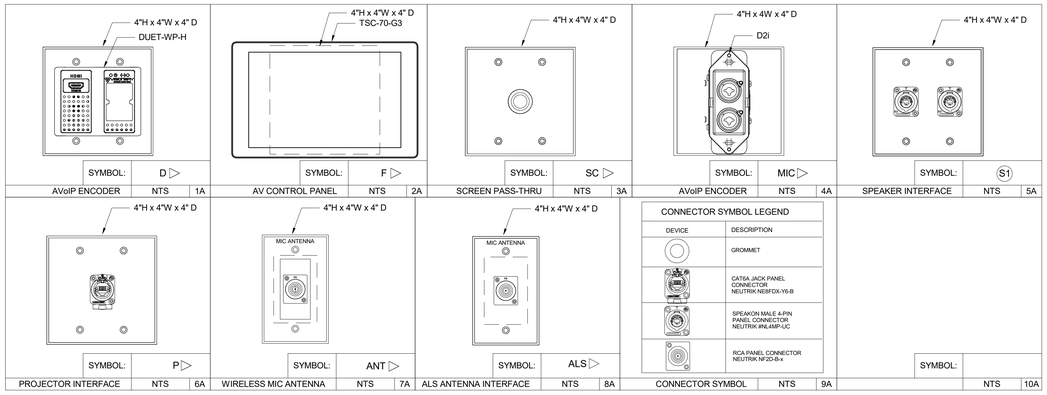
6/4/2026 11:08:00 AM Autodesk Docs://Bristol Edgewood Pre-K Academy/Edgewood Tech New R26.rvt

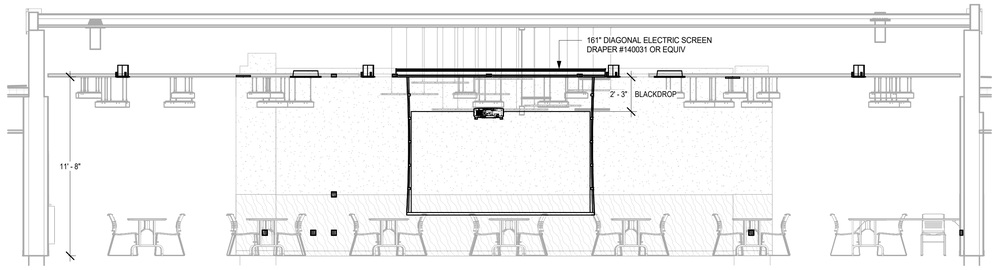


1 GROSS MOTOR #127 - AV PLAN VIEW
1/8" = 1'-0"

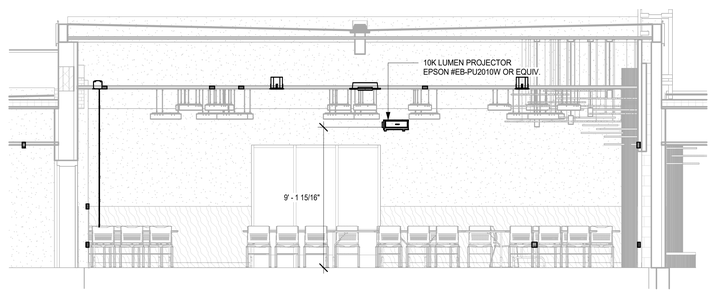


2 GROSS MOTOR #127 - AV RCP VIEW
1/8" = 1'-0"

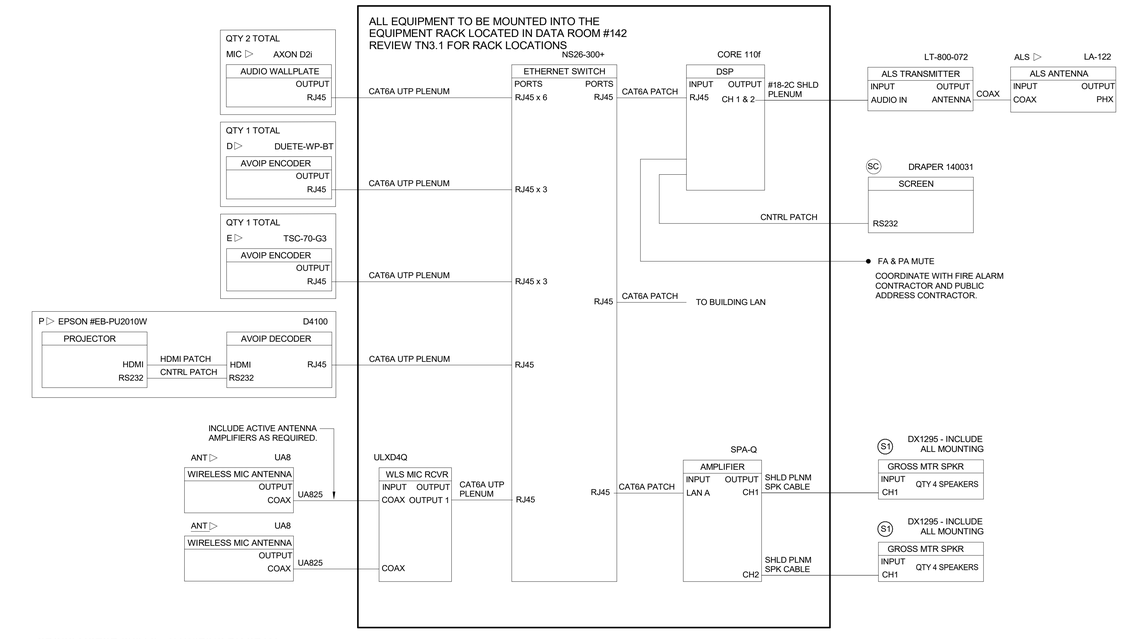




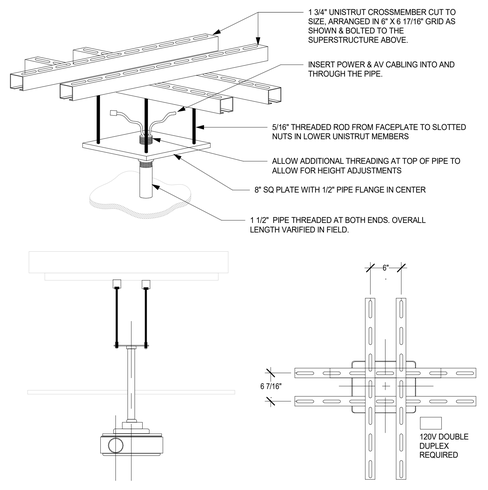
3 GROSS MOTOR #127 - NORTH ELEVATION
1/4" = 1'-0"



4 GROSS MOTOR #127 - EAST ELEVATION
1/4" = 1'-0"



5 GROSS MOTOR SKILLS - AV WIRING DIAGRAM
NTS



6 AV - PROJECTOR CEILING MOUNT TO DECK
NTS

SECURE ATTACHMENT NOTE

To ensure proper attachment of Fixtures, Furnishings & Equipment items, including and Technology items, where "items" are attached to wall, ceiling, overhead structure, and/or floor, Contractor shall provide information adequate for architect to verify items, attached to wall, ceiling, and/or floor are attached securely and per manufacturer's recommendations. Architect's review may be implemented during submittal process.

Contractor shall provide struts, hangers, fasteners, safety harnesses, channels, bolts, screws, rods, etc. to securely attach items to existing structure as required to meet field conditions and meet applicable codes.

QA+M architecture
QuennBerryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

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STATE OF CONNECTICUT
KEVIN MALIK
No. 21827
REGISTERED ARCHITECT

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

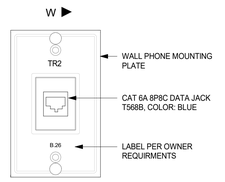
Revisions

100% CONSTRUCTION DOCUMENTS
JUNE 5, 2026

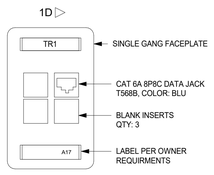
AV - OT / OP ROOM DETAILS

TN3.2

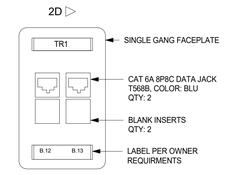
6/4/2026 11:09:36 AM Autodesk Docs://Bristol Edgewood Pre-K Academy/Edgewood Tech New R26.rvt



1 WALL PHONE MTG PLATE
NTS



2 DATA OUTLET DETAIL - 1D
NTS



3 DATA OUTLET DETAIL - 2D
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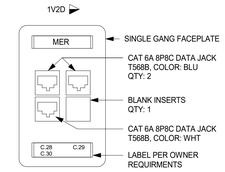
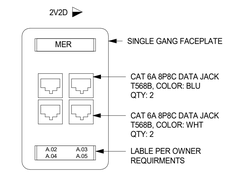
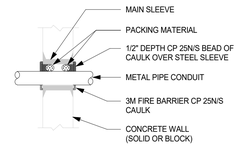


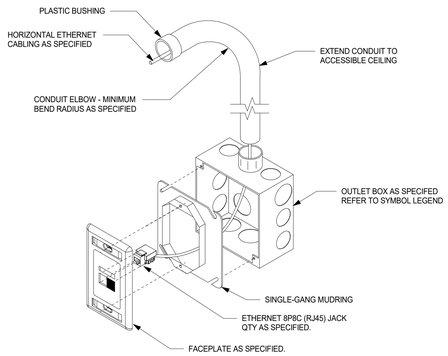
4 DATA OUTLET DETAIL - 1V2D
NTS



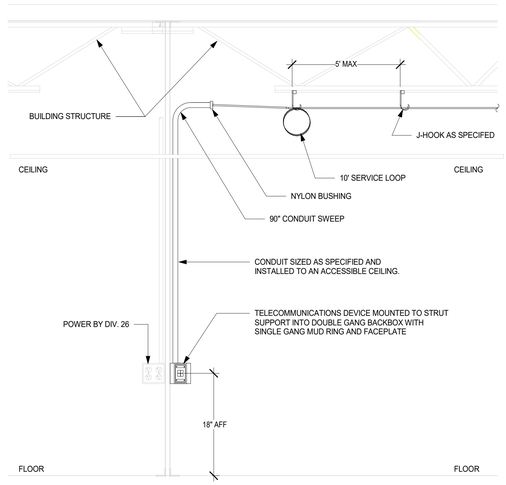
5 DATA OUTLET DETAIL - 2V2D
NTS



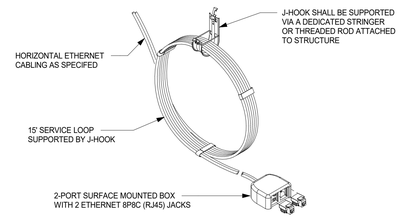
6 FIRE STOP DETAIL
NTS



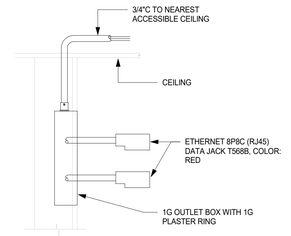
7 TELECOMMUNICATIONS DEVICE OUTLET ASSEMBLY
NTS



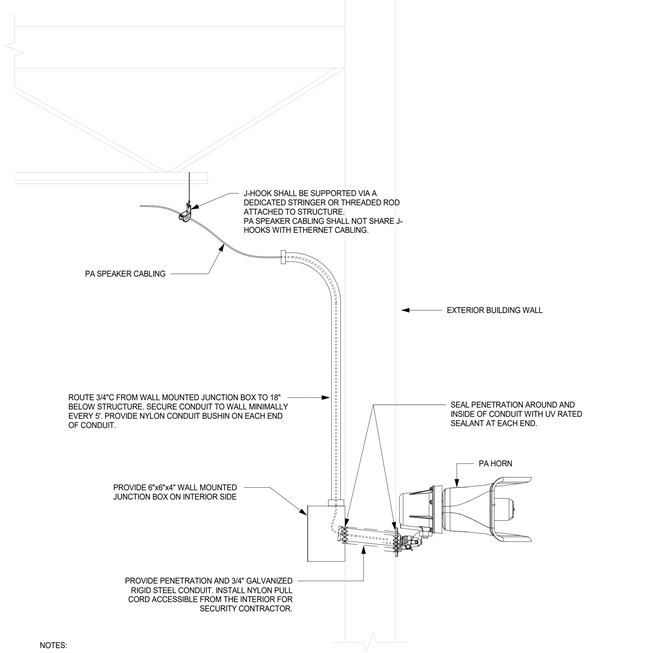
8 TELECOMMUNICATIONS DEVICE MOUNTING TO STRUT SUPPORT
NTS



9 WAP - CEILING MOUNTED CABLING 2
NTS



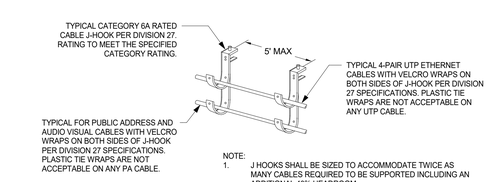
10 WAP - WALL MOUNTED CABLING
NTS



NOTES:

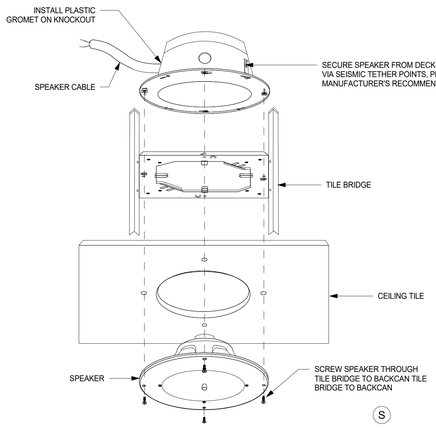
1. CONFIRM EXACT HORN AND MOUNT STYLE ON-SITE WITH THE OWNER PRIOR TO BEGINNING INSTALLATION. CABLING TO THE HORN MUST BE COMPLETELY ENCLOSED WITHIN THE HORN MOUNT AND PROTECTED FROM THE ELEMENTS.
2. LOCATION OF THE PENETRATION AND JUNCTION BOX SHALL BE COORDINATED BY THE TELECOMMUNICATIONS CONTRACTOR AND PROVIDED BY THE GENERAL CONTRACTOR. CONDUIT SHALL BE INSTALLED AT AN ANGLE, THE TOP OF THE CONDUIT (EXTERIOR) SHALL BE BELOW THE BOTTOM OF THE CONDUIT (INTERIOR) AS SHOWN ABOVE. PROVIDE A WATERTIGHT SEAL IN CONDUIT AFTER INSTALLATION.
3. NOT ALL PARTS SHOWN. CONTRACTOR SHALL ENSURE A COMPLETE WORKING INSTALLATION INCLUDING MISCELLANEOUS APPURTENANCES

13 PA- EXTERIOR HORN
NTS

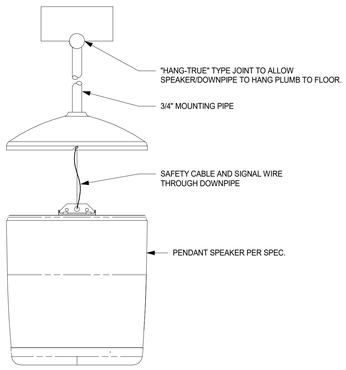


NOTE:
1. J-HOOKS SHALL BE SIZED TO ACCOMMODATE TWICE AS MANY CABLES REQUIRED TO BE SUPPORTED INCLUDING AN ADDITIONAL 40% HEADROOM.

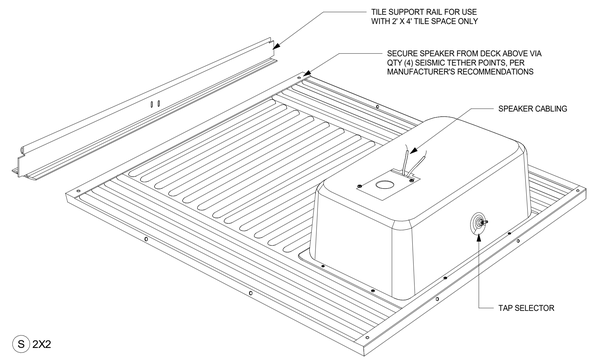
11 J-HOOK INSTALLATION - CABLING SUPPORT
NTS



14 PA CEILING SPEAKER ROUND
NTS



12 PENDANT SPEAKER DETAIL
NTS



15 PA TILE INLAY SPEAKER 2x2
NTS

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TECH-AV DETAILS

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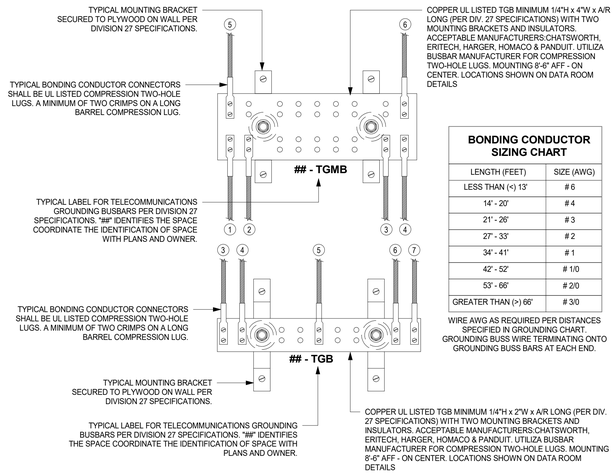


BONDING CONDUCTOR SIZING CHART	
LENGTH (FEET)	SIZE (AWG)
LESS THAN (<) 13'	# 6
14' - 20'	# 4
21' - 26'	# 3
27' - 33'	# 2
34' - 41'	# 1
42' - 52'	# 1/0
53' - 66'	# 2/0
GREATER THAN (>) 66'	# 3/0

WIRE AWG AS REQUIRED PER DISTANCES SPECIFIED IN GROUNDING CHART. GROUNDING BUSS WIRE TERMINATING ONTO GROUNDING BUSS BARS AT EACH END.

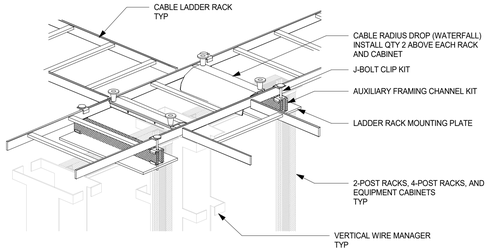
GROUNDING AND BONDING KEYNOTES

1. BONDING CONDUCTOR FOR TELECOMMUNICATIONS (BCT) TO BUILDING GROUNDING ELECTRODE. REFER TO RISER DIAGRAM.
2. BCT TO NEAREST BUILDING STEEL STRUCTURE. IF APPLICABLE. UTILIZE EXOTHERMIC WELDING CONNECTION TO BUILDING STEEL.
3. BCT TO NEAREST BUILDING ELECTRICAL PANELBOARD GROUND BAR. UTILIZE LISTED CONNECTOR TO PANELBOARD GROUND BUS.
4. TELECOMMUNICATION BONDING BACKBONE (TBB) FOR GROUNDING EQUALIZER (GE), IF APPLICABLE. REFER TO RISER DIAGRAM.
5. TYPICAL TBB(S) THAT INTERCONNECTS ALL TGB(S) WITH THE TMGB. REFER TO RISER DIAGRAM.
6. BCT TO TELECOMMUNICATIONS CABLE RUNWAY(S), RACK(S), CABINET(S) AND APPLICABLE EQUIPMENT. DAISY CHAINING OF BCT AT RELAY IS NOT ACCEPTABLE. EACH RACK IS TO HAVE A BCT TO A COMPRESSION LUG TAP TO THE DEDICATED HOMERUN BCT BACK TO THE TGB. SEE DETAILS.

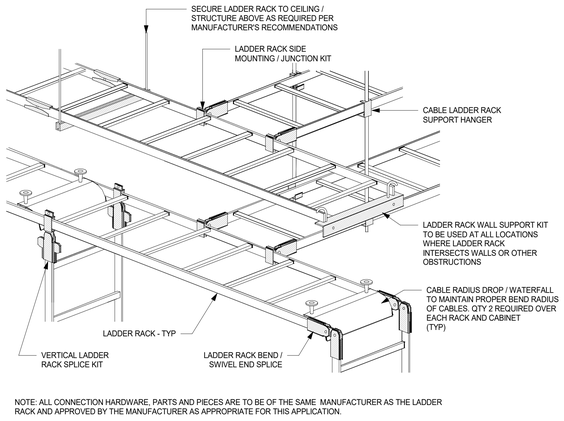
GROUNDING AND BONDING GENERAL NOTES

A. REFER TO GROUNDING AND BONDING DIVISION 27 SPECIFICATIONS FOR ADDITIONAL INFORMATION.
B. REFER TO GROUNDING AND BONDING RISER DIAGRAM FOR ADDITIONAL INFORMATION.
C. PROVIDED 2"C SLEEVE PATHWAY AT EACH FLOOR AND WALL PENETRATIONS FOR THE TELECOMMUNICATION BONDING BACKBONE (TBB). COORDINATE PROPER METHODS FOR PENETRATIONS WITH FIRESTOPPING AS REQUIRED PER DIVISION 07 SPECIFICATIONS.
D. BONDING CONDUCTORS SHALL BE #3/0 AWG COLOR GREEN INSULATED COPPER CONDUCTOR OR SIZED PER "BONDING CONDUCTOR SIZING CHART" (ANSI J-STD-607-A) IN PATHWAY.
E. FASTENING BONDING CONNECTOR TWO-HOLE LUGS TO ALL BUSBARS SHALL BE CLEANED AND APPLY A COPPER ANTI-OXIDANT TO THE CONTACT AREA OF BOTH THE CONNECTOR LUG AND THE BUSBAR.
F. BONDING CONDUCTORS AND BUSBARS SHALL BE LABELED WITH IDENTIFICATION IN ACCORDANCE WITH THE REQUIREMENTS OF ANSI/TIA/EIA-606-A.
G. BONDING CONDUCTORS SHALL BE LABELED WITH IDENTIFICATION LABEL NOTED BELOW AND SECURED WITH CABLE TIE TO EACH CONDUCTOR. (ANSI J-STD-607-A). "IF THIS CONNECTOR OR CABLE IS LOOSE OR MUST BE REMOVED, PLEASE CALL THE BUILDING TELECOMMUNICATIONS MANAGER".
H. CONTINUITY TESTING MEASUREMENTS OF THE GROUNDING RESISTANCE TO NOT EXCEED 0.1 OHM BETWEEN:
H.1 THE TMGB AND THE NEAREST GROUNDING ELECTRODE.
H.2 EACH TGB AND THE NEAREST GROUNDING ELECTRODE.
H.3 EACH TGB AND PATHWAY(S), RACK(S), CABINET(S) AND APPLICABLE EQUIPMENT.

1 DATA ROOM - GROUNDING BUSS BAR TMGB & TGB
NTS

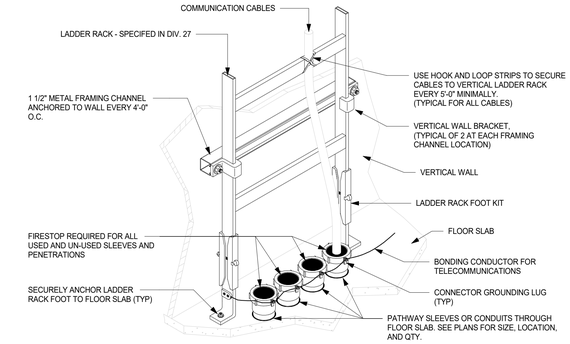


2 DATA ROOM - LADDER RACK INSTALL ABOVE RACKS
NTS

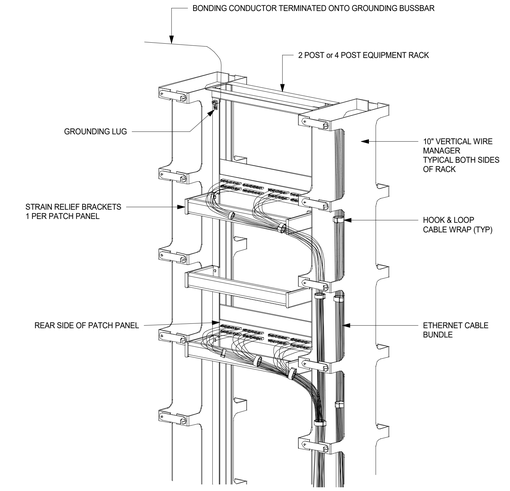


NOTE: ALL CONNECTION HARDWARE, PARTS AND PIECES ARE TO BE OF THE SAME MANUFACTURER AS THE LADDER RACK AND APPROVED BY THE MANUFACTURER AS APPROPRIATE FOR THIS APPLICATION.

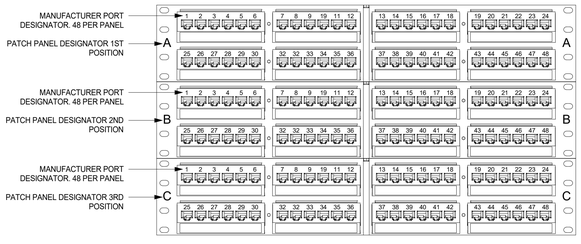
3 DATA ROOM - LADDER RACK INSTALLATION
NTS



4 DATA ROOM - VERTICAL LADDER RACK DETAIL
NTS

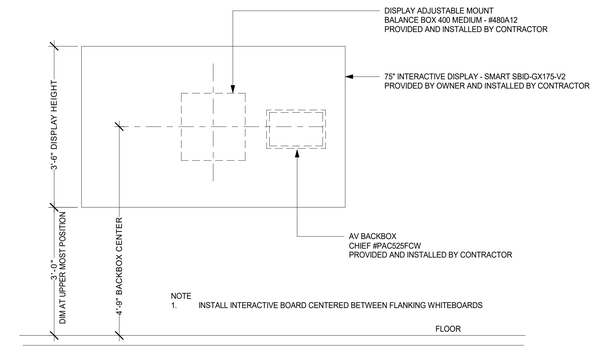


5 TYP RACK ASSEMBLY DETAIL
NTS



NOTE: CONTINUE LETTERING PATCH PANELS ALPHABETICALLY FOR EACH ADDITIONAL PATCH PANEL.

6 PATCH PANEL LABELING
NTS



7 75" INTERACTIVE DISPLAY MOUNTING DETAIL
NTS

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STATE OF CONNECTICUT
KEVIN MALIK
REG. 21827
REG. 9109
LICENSED ARCHITECT

RENOVATE AS NEW:
EDGEWOOD PRE-K ACADEMY
345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
Project #:25064

Revisions

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TECH-AV DETAILS

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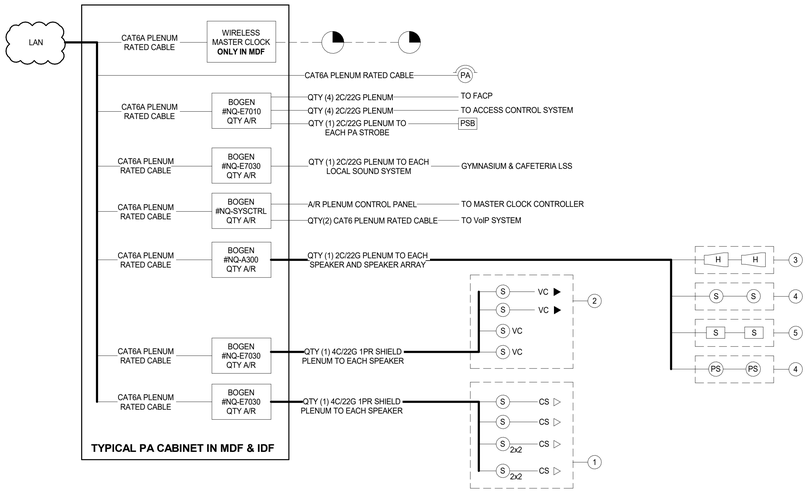


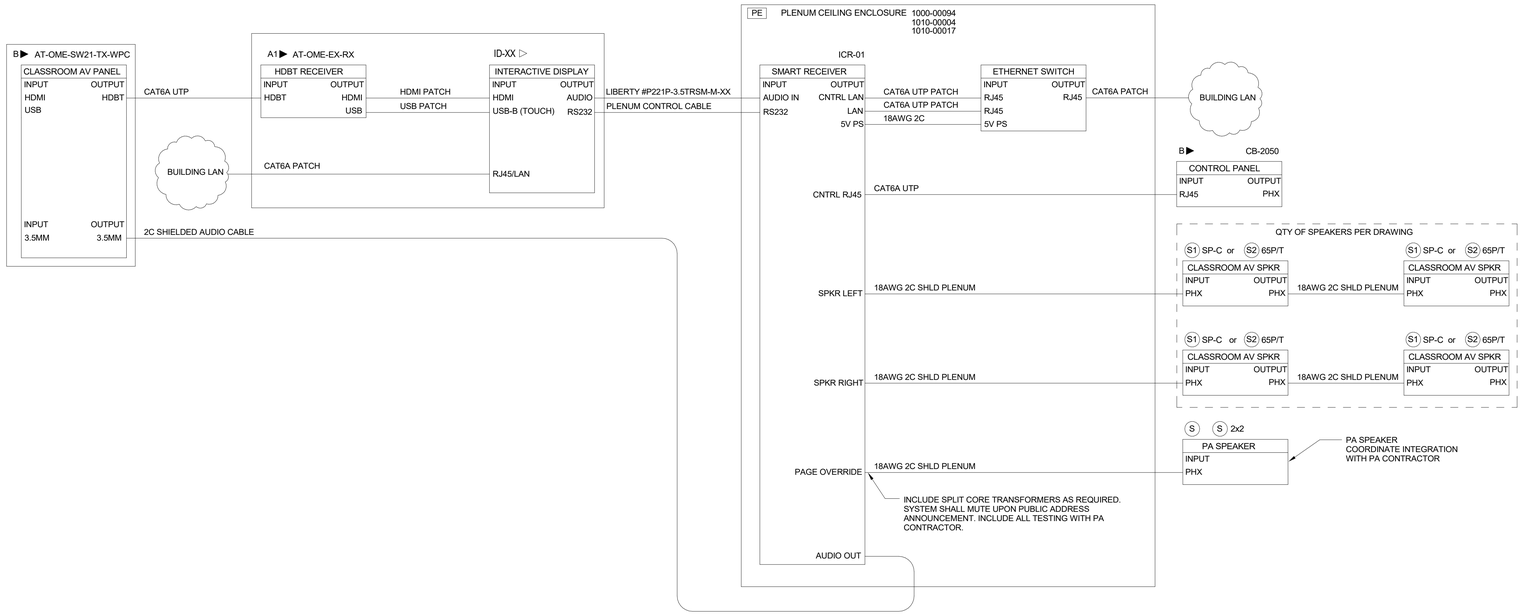
NOTES

1. **CABLING REQUIREMENTS:** ALL PUBLIC ADDRESS SYSTEM CABLING FOR DEVICES SHALL TERMINATE IN THE DATA ROOMS AS SPECIFIED IN THE LOW-VOLTAGE CABLING SCHEMATICS.
2. **RISER DIAGRAM:** THE RISER DIAGRAM PROVIDED IS FOR DESIGN PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR CREATING A COMPLETE RISER DIAGRAM REFLECTING THE ACTUAL FIELD WIRING.
3. **SPECIFICATIONS REFERENCE:** REFER TO PROJECT SPECIFICATIONS FOR THE SYSTEM DESCRIPTION, SEQUENCE OF OPERATION, AND WIRING DETAILS.
4. **MICROPHONE CABLE CLEARANCE:** MAINTAIN A MINIMUM CLEARANCE OF 12 INCHES BETWEEN MICROPHONE CABLE RUNS AND CONDUITS OR CABLES USED FOR ELECTRICAL POWER DISTRIBUTION. WHERE 12-INCH CLEARANCE IS NOT FEASIBLE, CROSS HIGHER VOLTAGE LINES PERPENDICULARLY.
5. **FIRE-RATED WALL PENETRATIONS:** ALL PENETRATIONS THROUGH FIRE-RATED WALLS SHALL BE SEALED USING APPROVED FIRE-STOPPING MATERIALS.
6. **SPEAKER CONDUCTORS:** SPEAKER CONDUCTORS INSTALLED IN INSTRUCTIONAL ROOMS AND OFFICES SHALL RUN AS A CONTINUOUS HOME RUN TO THE CENTRAL CONTROL RACK WITHOUT SPLICES.
7. **RISER DIAGRAM VALIDATION:** THE RISER DIAGRAM INCLUDED IN THE DRAWINGS INDICATES GENERAL LOOPING AND ZONING REQUIREMENTS. THE CONTRACTOR MUST CONFIRM ACTUAL QUANTITIES FROM ARCHITECTURAL DRAWINGS (T-SERIES).
8. **INSTALLATION STANDARDS:** THE PUBLIC ADDRESS SYSTEM SHALL BE INSTALLED IN COMPLIANCE WITH NFPA 72 (2010 EDITION) OR THE MOST CURRENT FIRE CODE STANDARD ADOPTED BY THE STATE OF CONNECTICUT.
9. **FIRE ALARM INTEGRATION:** COORDINATE THE CONNECTION BETWEEN THE PUBLIC ADDRESS SYSTEM AND THE FIRE ALARM SYSTEM WITH THE OWNER, FIRE ALARM INSTALLER, SECURITY CONSULTANT, AND PUBLIC ADDRESS SYSTEM DESIGNER.
10. **PRIORITY OVERRIDE LOADS:** ENSURE PRIORITY OVERRIDE LOADS AT INTERACTIVE DISPLAY LOCATIONS ARE CALCULATED INTO THE PUBLIC ADDRESS AMPLIFIER LOADS.
11. **WIRELESS CLOCK SYSTEM:** INCLUDE A 1-WATT REPEATER IN EACH DATA CLOSET FOR THE WIRELESS CLOCK SYSTEM.
12. **EXTERIOR HORNS:** ALL EXTERIOR HORNS SHALL BE ON AN ISOLATED ZONE AND PROGRAMMABLE TO ENGAGE ONLY DURING BUS OR EMERGENCY ANNOUNCEMENTS.
13. **LAN CONNECTIONS:** LAN CONNECTIONS INDICATED IN THE WIRING DIAGRAM SHALL TERMINATE ON THE REAR OF 19" CATEGORY 6A-RATED PATCH PANELS MOUNTED IN THE MDF/IDF RACKS AS SHOWN IN THE TECHNOLOGY DETAILS.
14. **REQUIRED LICENSES:** REFER TO THE PUBLIC ADDRESS SYSTEM SPECIFICATION FOR ALL REQUIRED LICENSES.
15. **NETWORK ELECTRONICS AND SYSTEM CONFIGURATION:**
    - A. NETWORK SWITCHES WILL BE FURNISHED BY THE OWNER IN A LATER PHASE.
    - B. THE CONTRACTOR SHALL ADVISE THE OWNER ON IP ADDRESSING, VLAN CREATION, AND FURNISH THE CONFIGURATION FOR A FULLY FUNCTIONAL PUBLIC ADDRESS SYSTEM ON THE OWNER'S LAN.
    - C. INCLUDE WORK HOURS FOR SYSTEM CONFIGURATION WITH THE OWNER AFTER SUBSTANTIAL COMPLETION OF THE PROJECT, ONCE SWITCHES ARE INSTALLED.

KEY NOTES

KEY	NOTE
1	CLASSROOM SPEAKERS: UP TO 24 CLASSROOM SPEAKERS AND ANALOG CALL SWITCHES CAN BE POWERED VIA QTY (1) #NQ-E7030. EACH CLASSROOM SPEAKER ASSEMBLY SHALL TERMINATE ONTO A #NQ-E7030.
2	OFFICE SPEAKERS: UP TO 24 OFFICE SPEAKERS AND ANALOG VOLUME CONTROL PANELS CAN BE POWERED VIA QTY (1) #NQ-E7030. EACH OFFICE SPEAKER ASSEMBLY SHALL TERMINATE ONTO A #NQ-E7030.
3	HORNS: EXTERIOR HORNS SHALL BE LOOPED ONTO AN ISOLATED ZONE. GYMNASIUM HORNS SHALL BE ON AN ISOLATED ZONE. UP TO 20 EXTERIOR HORNS MAY BE ON ONE ZONE AND DAISY-CHAINED. HORNS SHALL TERMINATE ONTO #NQ-A300
4	CORRIDOR SPEAKERS: MAY BE LOOPED ONTO AN ISOLATED ZONE. UP TO 20 CORRIDOR SPEAKERS MAY BE ON ONE ZONE AND DAISY-CHAINED. CORRIDOR SPEAKERS SHALLTERMINATE ONTO #NQ-A300
5	METAL WALL SPEAKERS MAY BE LOOPED ONTO AN ISOLATED ZONE. UP TO 20 METAL WALL SPEAKERS MAY BE ON ONE ZONE AND DAISY-CHAINED. METAL WALL SPEAKERS SHALL TERMINATE ONTO #NQ-A300
6	PENDANT SPEAKERS MAY BE LOOPED ONTO AN ISOLATED ZONE. UP TO 20 PENDANT SPEAKERS MAY BE ON ONE ZONE AND DAISY-CHAINED. PENDANT SPEAKERS SHALL TERMINATE ONTO #NQ-A300

1 AV - WIRING DIAGRAM - PUBLIC ADDRESS
NTS



2 AV - WIRING DIAGRAM - CLASSROOM w-Control Panel
NTS

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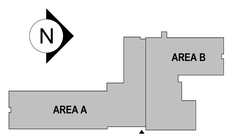

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JUNE 5, 2026

TECH-AV WIRING DIAGRAMS

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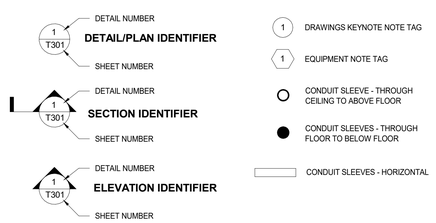
SECURITY

REFER TO SPECIFICATION 28 1300 FOR DEVICES

SYMBOL	DESCRIPTION	MOUNTING AFF UNLESS OTHERWISE NOTED	1G - 2-1/2" DP	4 x 4" x 2-1/8" DP	1G DEVICE RING	2G DEVICE RING	3/4" C	1" C	1/2" FLEX	SURFACE MOUNTED BOX	CAT 6A - CABLE TO NETWORK	CAT 6A - 6 in. LONG PATCH CORD / CABLE	CAT 6A - 5 ft. LONG PATCH CORD / CABLE	#22 - 2C	#22 - 4C	#18 - 4C	#18 - 6C	#18 - 6C SHL'D	PLENUM CABLE A/R	BELDEN #6584FJ COMPOSITE CABLE #6584FJ (2) #18-4C SHLD, (2) 22-2C, 22-4C, 18-4C	COMMMENTS
	FIXED DOME CAMERA - WALL MTG	As Noted										1									REFER TO CAMERA SCHEDULE FOR ADDITIONAL INFORMATION.
	FIXED DOME CAMERA - CEILING MTG - INTERIOR											1									REFER TO CAMERA SCHEDULE FOR ADDITIONAL INFORMATION.
	MULTI-SENSOR CAMERA	As Noted										1									REFER TO CAMERA SCHEDULE FOR ADDITIONAL INFORMATION.
CR	ACCESS CONTROL CARD READER HID MULTICLASS SE #RP10 of SE #RP40	46" AFF	1															1			
DC	DOOR POSITION SWITCH								1						1						SPECIFIED IN DIV 08 0671. DPS SHALL BE DPDT SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
JB	JUNCTION BOX		1					1	A/R											1	REFER TO DETALS FOR OUTLET AND CONDUIT INSTALLATION.
EL STK	ELECTRIC DOOR HARDWARE															1					SPECIFIED IN DIV 08 0671. SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
PS	POWER SUPPLY FOR DOOR HARDWARE															1					SPECIFIED IN DIV 08 0671. SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
ICD	VIDEO INTERCOM DOOR STATION	46" AFF		1				1			1								1		INTERCOM DOOR RELEASE SHALL RELEASE LOCKED DOOR FROM THE ACCESS CONTROL PANEL.
ICM	VIDEO MASTER STATION - INTERCOM - DOOR RELEASE										1										CONTRACTOR TO CONFIRM ROUTING OF ICD TO ICM'S, AND ROLLOVER, FROM THE OWNER PRIOR TO CONFIGURATION.
KPD	INTRUSION DETECTION KEYPAD	48" AFF		1			1											1			
M	MOTION SENSOR, CEILING MOUNTED - 360 DEGREE			1			1									1					
M	MOTION SENSOR - CORNER / WALL MOUNT	108" AFF		1			1									1					
DB	DURESS BUTTON SENTROL UL RATED #3050	*	1		1			1	1							2					* MOUNT BELOW DESKS. REFER TO DETAILS FOR ADDITIONAL INFORMATION. COORDINATE WITH FURNITURE INSTALLATION.
LD	EMERGENCY LOCK DOWN BUTTON	48" AFF	1				1									2					STI BOX SHALL BE GREEN - CUSTOM LABEL "LOCKDOWN". CONFIRM LOCATION WITH CONSULTANT PRIOR TO INSTALLATION.
DR	DOOR RELEASE BUTTON - DORTRONICS #5276-HD29 1 GANG, FSR #DSKB_385 TABLE BOX			1		1			1	1	1					1					MOUNT SWITCH TO TABLE BOX. LABEL SWITCH "DOOR # PUSH TO RELEASE". LABEL SHALL BE ENGRAVED CONFIRM LOCATION ON DESK WITH OWNER AND FURNITURE CONTRACTOR.
SBE	BLUE SECURITY STROBE - EXTERIOR	As Noted	1				1												1		COORDINATE 120V POWER WITH ELECTRICIAN. REFER TO DETAILS AND WIRING DIAGRAMS FOR ADDITIONAL INFORMATION.
SBI	BLUE SECURITY STROBE - INTERIOR	As Noted	1				1												1		COORDINATE 120V POWER WITH ELECTRICIAN. REFER TO DETAILS AND WIRING DIAGRAMS FOR ADDITIONAL INFORMATION.
SM	SPOT MONITOR & MICRO PC	6' AFF	1				1				1		1								WORKSTATION BY OWNER. ALL CONNECTIONS BY CONTRACTOR AWARDED THIS PROJECT.
REX	INTERNAL REQUEST TO EXIT SWITCH								1						1						SPECIFIED IN DIV 08 0671. SHOWN ON THESE PLANS FOR FINAL CABLING CONNECTIONS.
DA	LOCAL DOOR ALARM DSI #ES4200-K1-T1 DSI #ES450-K1	6' AFF		1			1												1		COORDINATE MTG HEIGHT OF ALARM WITH OWNER PRIOR TO ROUGH-IN. KEYED ALARM AND DPS SHALL BE FLUSH MOUNTED. COORDINATE WITH DOOR CONTRACTOR. REFER TO SECURITY DETAILS FOR ADDITIONAL INFO.
MP	LOCAL DOOR ALARM REMOTE MONITORING PLATE			1			1												1		COORDINATE MTG HEIGHT OF ALARM WITH OWNER PRIOR TO ROUGH-IN. REFER TO SECURITY DETAILS FOR ADDITIONAL INFO.
CPU	COMPUTER LOCATION FOR "SM" - TOWER WORKSTATION & DISPLAYS																				

GENERAL PLAN SYMBOLS



TECHNOLOGY ABBREVIATIONS

(NOTE: NOT ALL ABBREVIATIONS APPLICABLE)

AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISHED GRADE
A/C	ABOVE COUNTER
ACS	ACCESS CONTROL SYSTEM
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
A/R	AS REQUIRED
AWG	AMERICAN WIRE GAUGE
BICSI	BUILDING INDUSTRY CONSULTING SERVICE INTERNATIONAL
BNC	BAYONET NEIL-CONCELMAN
C	CONDUIT(S)
DEMARC	DEMARCATION
DPDT	DOUBLE THROW DOUBLE PULL
EIA	ELECTRONICS INDUSTRIES ALLIANCE
EMT	ELECTRICAL METALLIC TUBING
FACP	FIRE ALARM CONTROL PANEL
F	FACSIMILE (FAX)
IDS	INTRUSION DETECTION SYSTEM
LAN	LOCAL AREA NETWORK
MER	MAIN EQUIPMENT ROOM
NEC	NATIONAL ELECTRIC CODE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OFE	OWNER FURNISHED EQUIPMENT
PA	PUBLIC ADDRESS
PBX	PRIVATE BRANCH EXCHANGE
PC	PERSONAL COMPUTER
PoE	POWER OVER ETHERNET
PP	PATCH PANEL
PVC	POLYVINYL CHLORIDE CONDUIT
QYT	QUANTITY
STP	SHIELDED TWISTED PAIR
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TGB	TELECOMMUNICATIONS GROUNDING BUSBAR
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATIONS
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUSBAR
TR	TELECOMMUNICATIONS ROOM
TV	TELEVISION
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
VGA	VIDEO GRAPHICS ARRAY
VoIP	VOICE OVER INTERNET PROTOCOL
VSS	VIDEO SURVEILLANCE SYSTEM
W	WALL TELEPHONE (VOICE)
WAN	WIDE AREA NETWORK
WAO	WORK AREA OUTLET
WAP	WIRELESS (DATA) ACCESS POINT
WG	WIRE GUARD
WP	WEATHERPROOF

GENERAL NOTES

1. DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED IN THE CONTRACT.
2. ALL SECURITY DEVICES AND OUTLETS MUST COINCIDE WITH ELECTRICAL POWER DRAWINGS AND TECHNOLOGY DRAWINGS. THE CONTRACTOR MUST COORDINATE ALL LOCATIONS OF THE ELECTRICAL OUTLETS WITH THE SECURITY DEVICES.
3. REQUIRED CABLE: SUBMIT ALL CABLE AND TERMINATION DEVICES WITH PRODUCT SUBMITTALS PRIOR TO PROCUREMENT
4. LABEL ALL CABLES WITHIN 12" OF FINAL TERMINATION.
5. ALL CABLES RUN IN CEILING AREAS SHALL BE PROPERLY SUPPORTED WITH CONDUIT OR J-HOOKS MOUNTED TO SLAT AT MINIMUM OF 5' INTERVALS. NO CABLE SHALL REST OR TOUCH CEILING ASSEMBLIES. CABLES SHALL NOT BE INSTALLED EXPOSED IN OPEN CEILING AREAS.
6. ALL LABELS SHALL BE MACHINE PRINTED. NO HAND LETTERED CABLES SHALL BE USED.
7. USE ONLY PLENUM RATED CABLES.
8. DO NOT RUN ETHERNET CABLES PARALLEL TO POWER CABLES. CROSS POWER CABLES ONLY AT RIGHT ANGLES.
9. MAINTAIN 8" DISTANCE FROM ALL LIGHTING TRANSFORMERS.
10. SPLICING CABLES IS NOT PERMITTED EXCEPT AS SPECIFICALLY NOTED.
11. LOCATIONS OF EQUIPMENT FOR ALL OTHER TRADES SHALL BE COORDINATED BEFORE CONSTRUCTION.
12. CONTRACTOR SHALL COORDINATE LAYOUT LOCATIONS AND CLEARANCE OF ALL EQUIPMENT WITH OTHER TRADES AND ATTAIN OWNER'S APPROVAL PRIOR TO INSTALLATION.
13. CONTRACTOR SHALL COORDINATE ALL RACEWAYS, LOCATIONS, AND POWER REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR.
14. ALL DEVICES SHOWN ON THESE PLANS MUST BE COORDINATED AND APPROVED BY THE ARCHITECT. THE INSTALLATION CONTRACTOR SHALL DEPICT ALL DEVICES ONTO ELEVATION SUBMITTALS BEFORE INSTALLATION. ANY DEVICE THAT IS NOT APPROVED BY THE ARCHITECT PRIOR TO INSTALLATION MAY BE REQUIRED TO BE RELOCATED AS DIRECTED BY THE ARCHITECT AND CORRECTED BY THE CONTRACTOR WITH NO ADDITIONAL CHARGE TO THIS PROJECT.
15. ALL PATHWAYS, INCLUDING ALL WALL AND CEILING PENETRATIONS ARE REQUIRED TO INSTALL CABLING TO THE END DEVICE AND SHALL BE COORDINATED BETWEEN THE LOW VOLTAGE AND ELECTRICAL CONTRACTOR AND SHALL BE INCLUDED AS PART OF THIS SECTION.
16. SECURE ATTACHMENT OF TECHNOLOGY AND SECURITY DEVICES:
    A. TO ENSURE PROPER ATTACHMENT OF FIXTURES, FURNISHINGS & EQUIPMENT ITEMS, INCLUDING AND TECHNOLOGY ITEMS, WHERE "ITEMS" ARE ATTACHED TO WALL, CEILING, OVERHEAD STRUCTURE, AND/OR FLOOR, CONTRACTOR SHALL PROVIDE INFORMATION ADEQUATE FOR ARCHITECT TO VERIFY ITEMS, ATTACHED TO WALL, CEILING, AND/OR FLOOR ARE ATTACHED SECURELY AND PER MANUFACTURER'S RECOMMENDATIONS. ARCHITECT'S REVIEW MAY BE IMPLEMENTED DURING SUBMITTAL PROCESS.
    B. CONTRACTOR SHALL PROVIDE STRUTS, HANGERS, FASTENERS, SAFETY HARNESSES, CHANNELS, BOLTS, SCREWS, RODS, ETC. TO SECURELY ATTACH ITEMS TO EXISTING STRUCTURE AS REQUIRED TO MEET FIELD CONDITIONS AND MEET APPLICABLE CODES.
17. ALL CONDUIT IS TO ABOVE ACCESSIBLE CEILING UNLESS OTHERWISE NOTED.
18. PLACEMENT OF ALL SECURITY VIDEO SURVEILLANCE CAMERAS MUST BE APPROVED BY THE SECURITY CONSULTANT AND/OR OWNER PRIOR TO CONSTRUCTION.

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STATE OF CONNECTICUT — KEVIN MALIK — REG. NO. 21967 — REG. 9109 — LICENSED ARCHITECT

RENOVATE AS NEW:
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345 MIX STREET
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State Project #: 017-0090 RNV
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SECURITY SYMBOL LEGEND & GENERAL NOTES

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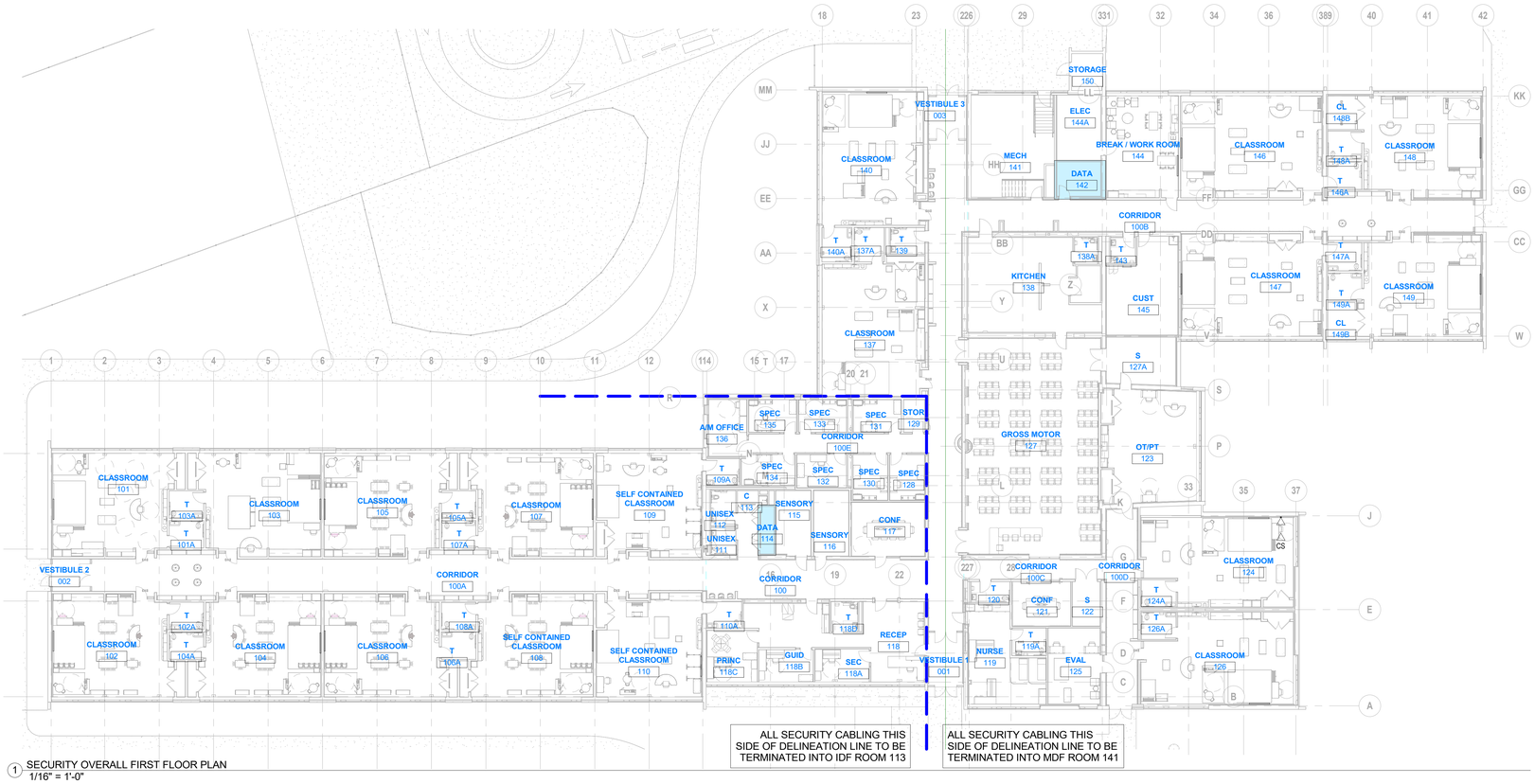

1 SECURITY OVERALL FIRST FLOOR PLAN
1/16" = 1'-0"

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AREA B
AREA A

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SECURITY OVERALL FIRST FLOOR PLAN

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1 Sec - FIRST FLOOR PLAN - AREA A
1/8" = 1'-0"

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STATE OF CONNECTICUT
ARTHUR MALIK
REG. 9109
LICENSED ARCHITECT

RENOVATE AS NEW:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT

State Project #: 017-0090 RNV
Project #:25064

Revisions

AREA A

100% CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SECURITY FIRST FLOOR PLAN - AREA A

TY1.1A

1 Sec - FIRST FLOOR PLAN - AREA B
1/8" = 1'-0"

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Quisenberry Arcan Malik
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Farmington, CT 06032
qamarch.com

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STATE OF CONNECTICUT
NO. 9199
LICENSED ARCHITECT

RENOVATE AS NEW:

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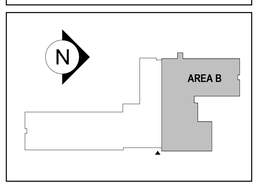
Revisions



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JUNE 5, 2026

SECURITY FIRST FLOOR PLAN - AREA B

TY1.1B

6/4/2026 11:09:02 AM Autodesk Docs://Bristol Edgewood Pre-K Academy/Edgewood Tech New R26.rvt

1 SEC OVERALL RCP PLAN
1/16" = 1'-0"

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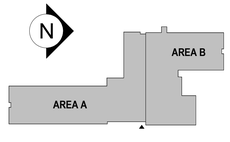

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SECURITY OVERALL RCP PLAN

TY2.1

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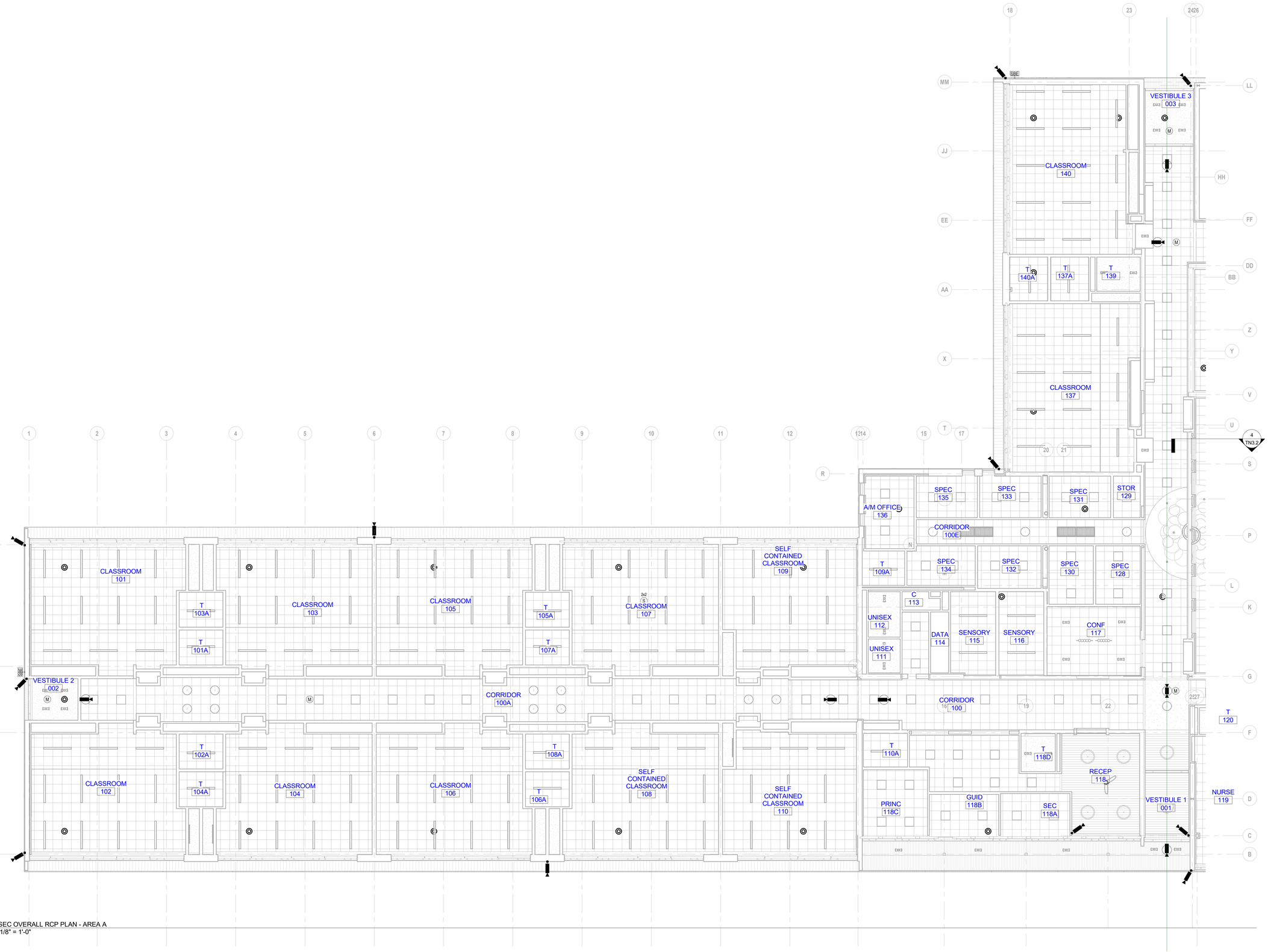

1 SEC OVERALL RCP PLAN - AREA A
1/8" = 1'-0"

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AREA A

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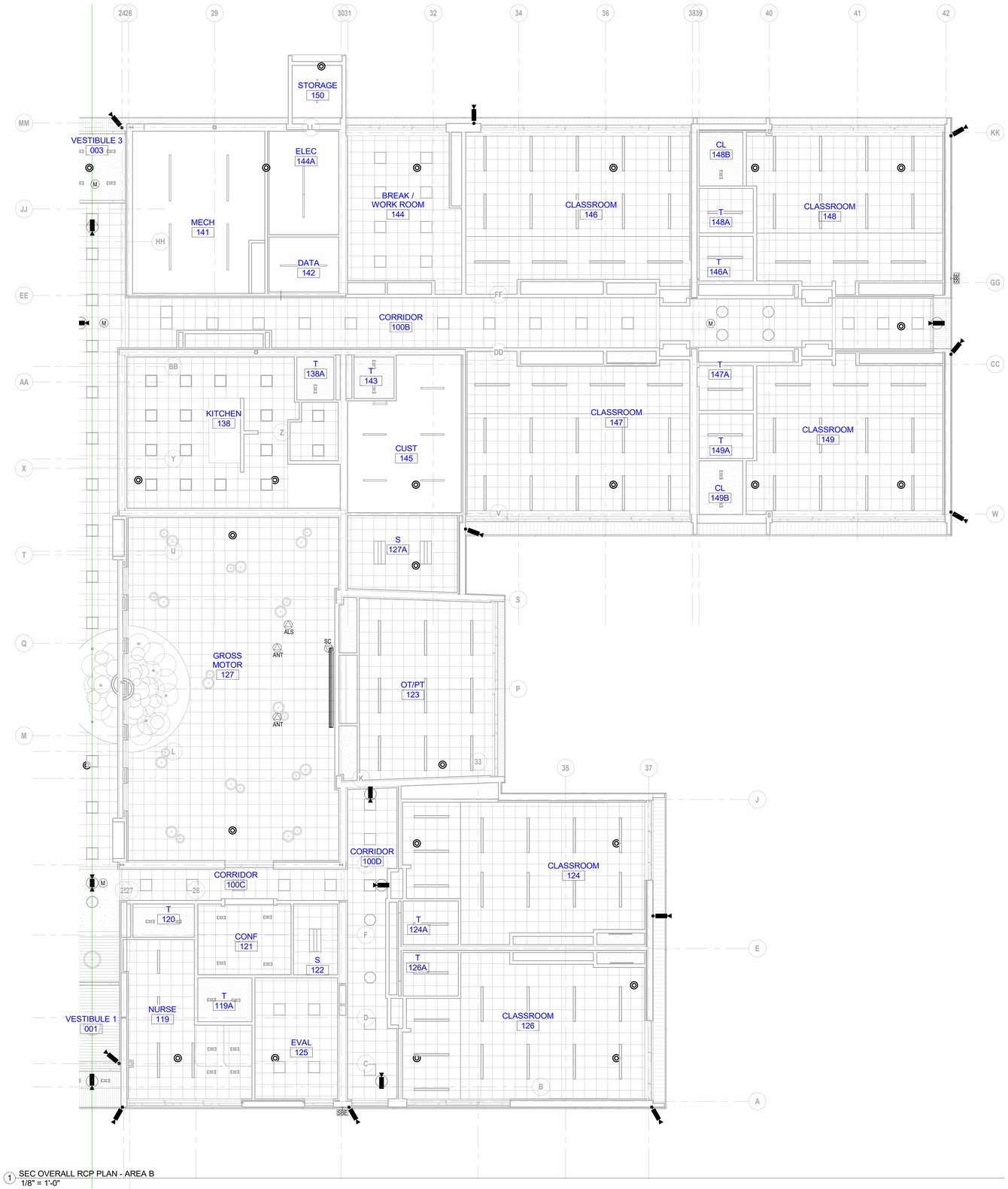
JUNE 5, 2026

SECURITY RCP PLAN - AREA A

TY2.1A



1 SEC OVERALL RCP PLAN - AREA B
1/8" = 1'-0"

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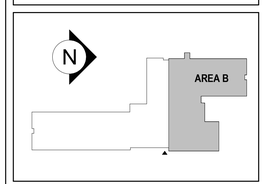
Revisions



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JUNE 5, 2026

SECURITY RCP PLAN - AREA B

TY2.1B

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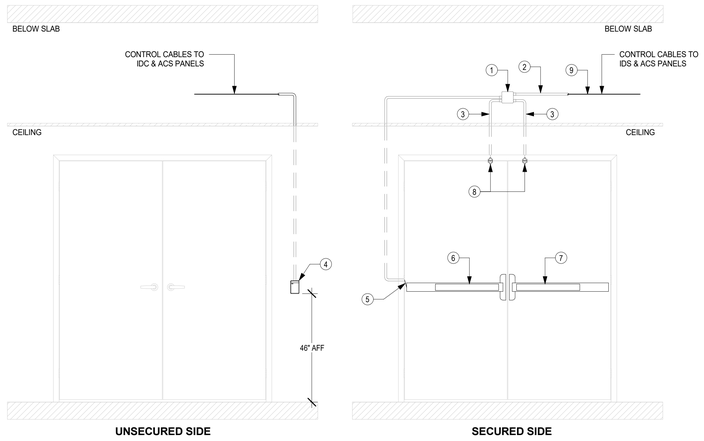
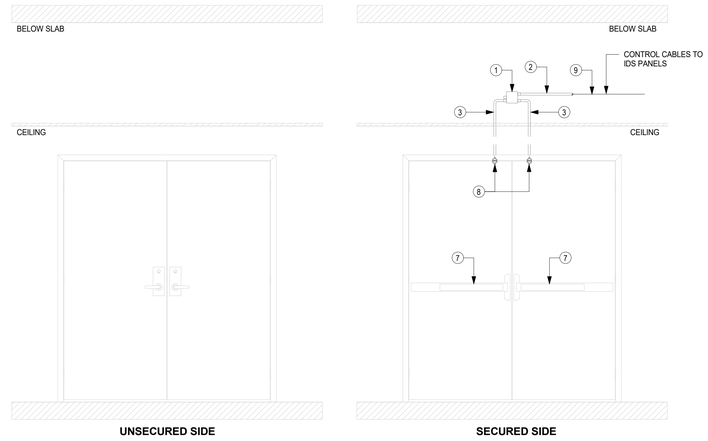
IDS & ACS DOOR KEYNOTES

1. 4"X4"X2-1/8" DEEP JUNCTION BOX (JB) ON SECURE SIDE, ABOVE ACCESSIBLE CEILING FURNISHED AND INSTALLED BY GENERAL CONTRACTOR.
2. 1" CONDUIT TO [JB] FOR SECURITY COMPOSITE CABLE FURNISHED AND INSTALLED BY GENERAL CONTRACTOR.
3. 3/4" CONDUIT TO [JB] FOR SECURITY DEVICES FURNISHED AND INSTALLED BY GENERAL CONTRACTOR. TYPICAL FOR ALL DEVICES.
4. CARD READER [CR] - FURNISHED AND INSTALLED BY SECURITY CONTRACTOR. SINGLE GANG ELECTRICAL BOX FLUSH MOUNTED 46" A.F.F. ON UNSECURED SIDE FURNISHED AND INSTALLED BY GENERAL CONTRACTOR.
5. ELECTRIFIED TRANSFER HINGE (12 CONDUCTOR MINIMUM) AND WIREWAY TO CRASH BAR FURNISHED AND INSTALLED BY DIVISION 08 DOOR HARDWARE.
6. CRASH BAR WITH ELECTRIFIED TRIM AND INTEGRATED REQUEST-TO-EXIT [REX] - CRASH BAR AND TRIM FURNISHED AND INSTALLED BY DIVISION 08 DOOR HARDWARE. CONNECTION TO ELECTRIFIED TRANSFER HINGE FOR LOCK AND REX BY SECURITY CONTRACTOR. DOOR PREP BY GENERAL CONTRACTOR.
7. NON-ELECTRIFIED CRASH BAR AND TRIM LOCK FURNISHED AND INSTALLED BY DIVISION 08 DOOR HARDWARE.
8. DOOR POSITION SWITCH FURNISHED AND INSTALLED BY DIVISION 08 DOOR HARDWARE. CABLED BY SECURITY CONTRACTOR. DOOR AND FRAME PREP BY GENERAL CONTRACTOR.
9. COMPOSITE ACCESS CONTROL CABLE FURNISHED AND INSTALLED BY SECURITY CONTRACTOR.
10. REQUEST TO EXIT [REX] MOTION SENSOR INSTALLED ON SECURED SIDE OF DOOR FURNISHED AND INSTALLED BY SECURITY CONTRACTOR. SINGLE GANG ELECTRICAL BOX FLUSH MOUNTED HORIZONTALLY @ 6'-8"AFF ON UNSECURED SIDE OF DOOR FURNISHED AND INSTALLED BY GENERAL CONTRACTOR.
11. ELECTRIC STRIKE FURNISHED AND INSTALLED BY DIVISION 08 DOOR HARDWARE. CABLE AND CONNECTION BY SECURITY CONTRACTOR



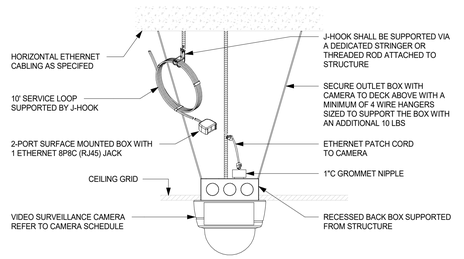
NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

1 ACS - DOUBLE DOOR W/ELECTRIC TRANSFER HINDGE
NTS

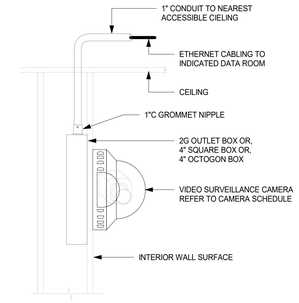


NOTE: REFER TO ACS & IDS DOOR KEYNOTES - THIS SHEET.

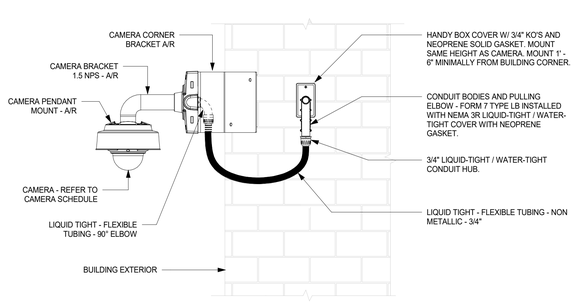
2 IDS DOUBLE DOOR -W/DPS
NTS



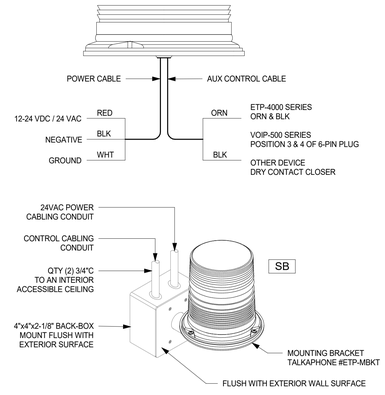
3 CAMERA - INTERIOR CEILING MOUNT
NTS



4 CAMERA - INTERIOR WALL MOUNT
NTS



5 CAMERA - EXTERIOR CORNER MOUNT
NTS



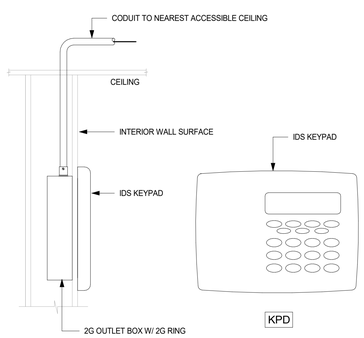
6 SECURITY - EMERGENCY STROBE LIGHT
NTS

NOTES:

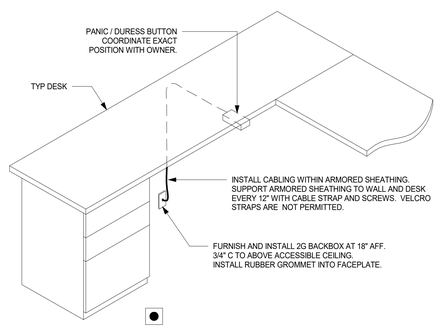
THE LOCKDOWN BUTTONS SHALL CONNECT TO THE ACCESS CONTROL SYSTEM, MASS NOTIFICATION SYSTEM (PUBLIC ADDRESS SYSTEM) AND FIRE ALARM SYSTEM. CONFIGURATION OF FUNCTIONALITY MUST BE COORDINATED WITH THE OWNER AND SECURITY CONSULTANT. AT A MINIMUM,THE FOLLOWING FEATURES SHALL BE OCCUR UPON ACTIVATION:

1. MUST LOCK DOWN ALL ACCESS CONTROLLED DOORS WITH ASSOCIATED THREAT LEVELS CONFIGURED INTO THE ACCESS CONTROLLED SYSTEM FOR ALL CONTROLLED DOORS. THIS THREAT LEVEL ACCESS SHALL BE DESCRIBED BY THE OWNER DURING CONFIGURATION OF THESE SECURITY SYSTEMS. AS AN EXAMPLE: THE PRINCIPAL, FIRE AND POLICE SHALL BE THE ONLY PEOPLE AUTHORIZED PERSONNEL ALLOWED ACCESS THROUGH THE CONTROLLED DOORS.
2. MUST INTERFACE WITH THE FIRE ALARM SYSTEM TO CLOSE SMOKE DOORS.
3. MUST NOTIFY THE SECURITY MONITORING COMPANY OF AN EMERGENCY EVENT.
4. MUST INITIATE AN EMERGENCY BROADCAST OVER THE MASS NOTIFICATION SYSTEM / PUBLIC ADDRESS SYSTEM. THIS PRE-RECORDED MESSAGE SHALL BE CREATED WITH THE OWNER DURING SYSTEM CONFIGURATION OF THE PA SYSTEM.
5. THE LOCKDOWN BUTTON SHALL BE COLORED GREEN.
6. LABEL AS "LOCKDOWN"
7. MOUNT 48" AFF
8. REFER TO WRITTEN SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
9. LOCKDOWN BUTTON MUST IONCLUDE A PROTECTIVE, HINGED, COVER.

7 IDS - LOCKDOWN BUTTON
NTS



8 IDS - KEYPAD DETAIL
NTS



9 ACS - PANIC / DURESS BUTTON MTG DETAIL
NTS

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STATE OF CONNECTICUT
ANTHONY MALIK
REG. 21827
REG. 9109
LICENSED ARCHITECT

RENOVATE AS NEW:
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345 MIX STREET
BRISTOL, CT
State Project #: 017-0090 RNV
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JUNE 5, 2026

SECURITY DETAILS

TY3.1

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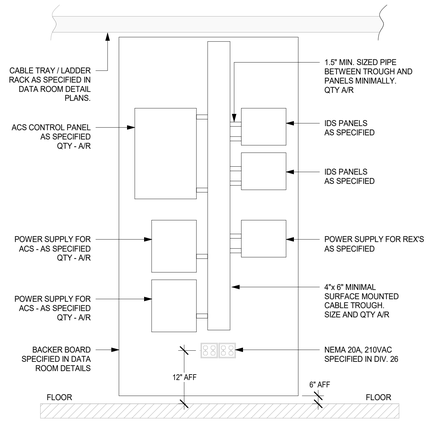
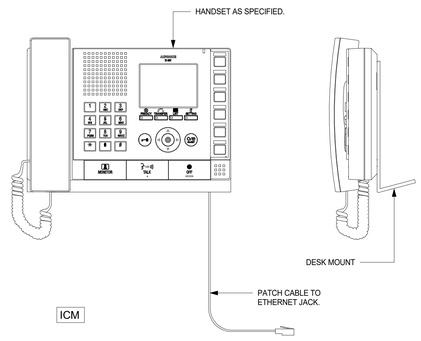
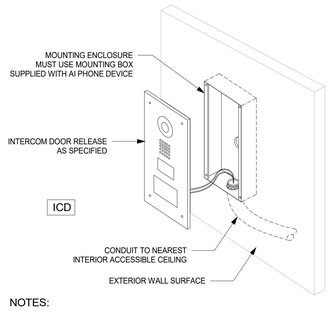


1 ACS & IDC TYP CONTROL PANEL ELEVATION
NTS

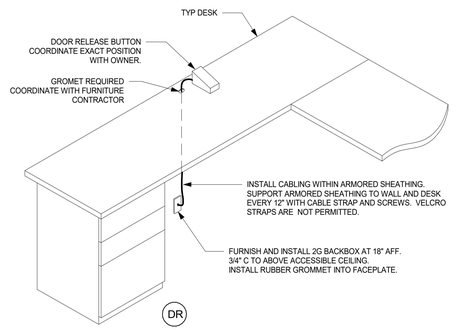


2 ACS - INTERCOM MASTER STATION
NTS

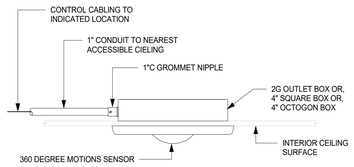


NOTES:
1. CONDUIT LAYOUT MUST BE INCLUDED FOR CARD READER LOCATIONS AS SPECIFIED WITHIN THE ACCESS CONTROL DOOR DETAILS.
2. CABLING AT THE AIPHONE DEVICE SHALL INCLUDE THE FOLLOWING:
   A. 20-2C PLENUM CABLE FOR CONTACT INPUT
   B. 20-4C PLENUM CABLE FOR DOOR RELAY TO ELECTRIC LOCK
   C. PLENUM CAT 6 TO PATCH PANEL
   D. ICLASS READER WIRING TO ACCESS CONTROL PANEL

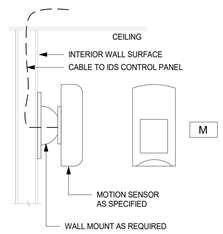
3 ACS - INTERCOM VIDEO DOOR RELEASE
NTS



4 ACS - DOOR RELEASE BUTTON MTG DETAIL
NTS



5 IDS - 360 DEGREE MOTION SENSOR
NTS



6 IDS - MOTION SENSOR WALL MTG
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KEVIN MALIK
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SECURITY DETAILS

TY3.2

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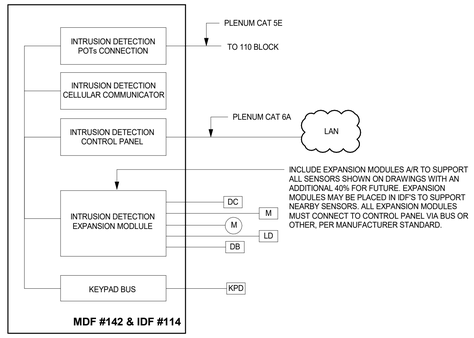
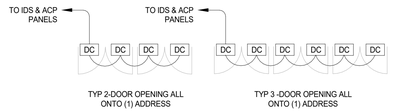
CAMERA SCHEDULE				
CAM #	MANUFACTURER	MODEL	MOUNTING TYPE	NOTES
C-1-001	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-002	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-003	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-004	AVIGILON	6.0C-H5DH-D01-IR	CEILING	
C-1-005	AVIGILON	4.0C-H5A-D1-IR	WALL	
C-1-006	AVIGILON	4.0C-H5A-D1-IR	WALL	
C-1-007	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-008	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-009	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-010	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-011	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-1-012	AVIGILON	4.0C-H5A-D1-IR	CEILING	
C-E-001	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-002	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-003	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-004	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-005	AVIGILON	4.0C-H5A-DO1-IR	CEILING	
C-E-006	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-007	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-008	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-009	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-010	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-011	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-012	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-013	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-014	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-015	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	
C-E-016	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-017	AVIGILON	4.0C-H5A-DO1-IR	WALL	
C-E-018	AVIGILON	6.0C-H5HD-DO1-IR	WALL PENDANT	

4 CAMERA SCHEDULE
NTS



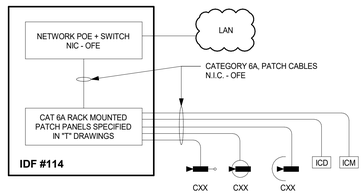
DOOR GANGING DIAGRAMS

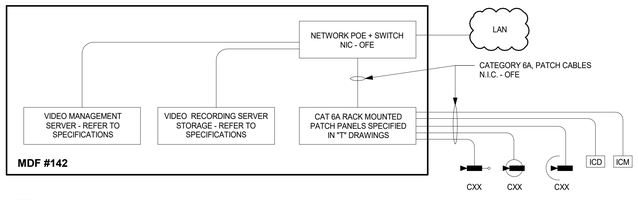


3 IDS- WIRING DIAGRAM
NTS

NOTES:

1. **CONTROL PANEL CAPACITY:** THE IDS CONTROL PANEL SHALL INCLUDE AN ADDITIONAL 40% CAPACITY FOR FUTURE EXPANSION OF SENSORS.
2. ZONING REQUIREMENTS: ZONING DETAILS SHALL BE PROVIDED BY THE OWNER PRIOR TO INSTALLATION. AT A MINIMUM, THE SYSTEM SHALL BE CONFIGURED TO ALLOW SEPARATE ARMING AND DISARMING FOR THE FOLLOWING ZONES:
   A. ENTIRE BUILDING
   B. GYMNASIUM
   C. AUDITORIUM
   D. CENTRAL ADMINISTRATION AREA
   E. EACH GRADE LEVEL
   F. EACH FLOOR
   G. EXTERIOR OF THE BUILDING
3. **COMMUNICATION CAPABILITIES:** THE IDS SHALL BE CAPABLE OF ALERTING CENTRAL MONITORING VIA CELLULAR, POTS (ANALOG), AND IP COMMUNICATION METHODS. ALL THREE TYPES OF COMMUNICATION MUST BE CONFIGURED AND OPERATIONAL IN THE SYSTEM.
4. **DAY-ALARM CONFIGURATION:** THE SYSTEM SHALL INCLUDE A "DAY-ALARM" FEATURE TO NOTIFY SCHOOL ADMINISTRATORS IF DOORS ARE PROPPED OPEN. NOTIFICATIONS SHALL BE CONFIGURABLE TO SEND ALERTS VIA TEXT AND EMAIL AS DIRECTED BY THE OWNER DURING SYSTEM SETUP. THE SYSTEM MUST ALLOW PROGRAMMING OF ALERTS BASED ON THE DURATION THAT DOORS REMAIN PROPPED OPEN.
5. **GRAPHICAL USER INTERFACE:** THE IDS SHALL INCLUDE A GRAPHICAL USER INTERFACE FEATURING A MAP OF THE FACILITY TO VISUALLY INDICATE DOOR PROPPED OPEN SENSORS. ALL NECESSARY LICENSING AND SOFTWARE FOR THIS FEATURE SHALL BE INCLUDED.
6. **COMPLETE SYSTEM INSTALLATION:** ALL ENCLOSURES, CABLING, TERMINATIONS, CONFIGURATION, AND FINAL TESTING ARE REQUIRED TO DELIVER A FULLY FUNCTIONAL SYSTEM.
7. **POWER SUPPLIES:** INCLUDE ALL BATTERIES AND POWER SUPPLIES AS SPECIFIED AND REQUIRED FOR A FULLY OPERATIONAL SYSTEM.
8. **SYSTEM MODULES:** PROVIDE ALL MODULES NECESSARY TO ACHIEVE A FULLY FUNCTIONAL SYSTEM.
9. **DEVICE CABLING:** EACH ENDPOINT SHALL BE CABLED AS A HOMERUN TO THE APPROPRIATE MDF (MAIN DISTRIBUTION FRAME) OR IDF (INTERMEDIATE DISTRIBUTION FRAME).
10. **SENSOR CONFIGURATION:** EACH SENSOR SHALL BE INDIVIDUALLY CONFIGURED TO PROVIDE A UNIQUELY IDENTIFIED POINT FOR CENTRAL MONITORING, ENABLING EXACT IDENTIFICATION OF THE SENSOR IN ALARM CONDITIONS.
11. **SYSTEM INTEGRATION:** THE SYSTEM SHALL OPERATE AS ONE COMPLETE AND INTEGRATED SYSTEM.
12. **WIRE GAUGES AND INSPECTION:** CONFIRM ALL WIRE GAUGES WITH THE MANUFACTURER BEFORE INSTALLATION. INCLUDE ALL EOL (END OF LINE) RESISTORS. DO NOT APPLY POWER TO THE SYSTEM UNTIL AN OSM (OWNER'S SITE MANAGER) REPRESENTATIVE HAS INSPECTED AND APPROVED THE INSTALLATION TO PREVENT POTENTIAL EQUIPMENT DAMAGE.
13. **CABLING STANDARDS:** ALL CABLING USED SHALL BE PLENUM RATED.
14. **SHOP DRAWING SUBMITALS:** THE CONTRACTOR AWARDED THIS PROJECT SHALL SUBMIT A COMPREHENSIVE SET OF SHOP DRAWINGS DURING THE PRODUCT SUBMITTAL PHASE. THESE DRAWINGS MUST DETAIL EACH DEVICE AND ITS INTERCONNECTION, AND THEY MUST BE APPROVED PRIOR TO ROUGH-IN OR CABLE INSTALLATION.

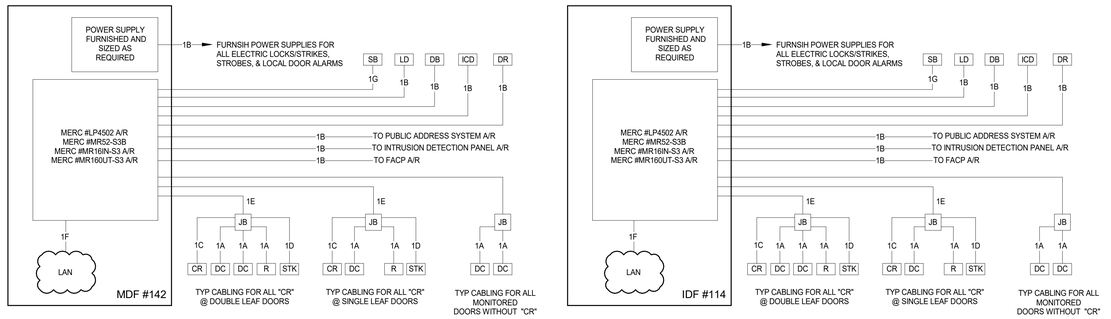




NOTES:

1. **CAMERA TERMINATION:** REFER TO THE SECURITY DRAWINGS TO DETERMINE THE SPECIFIC DATA ROOM WHERE EACH CAMERA IS TERMINATED.
2. **INTERCOM VIDEO STORAGE:** ENSURE THAT VIDEO FROM INTERCOM DOOR RELEASES IS STORED ON THE VIDEO SURVEILLANCE SERVERS. INCLUDE AND CONFIGURE ALL NECESSARY LICENSES.
3. **ACCESS CONTROL INTEGRATION:** CONFIGURE INTERCOM DOOR RELEASES TO UNLOCK THE APPROPRIATE DOORS VIA THE ACCESS CONTROL PANELS.
4. **MASTER STATION ROLL-OVER CONFIGURATION:** SET UP INTERCOM DOOR RELEASES AND MASTER STATIONS TO "ROLL-OVER" TO ALTERNATE MASTER STATIONS IF A CALL IS NOT ANSWERED WITHIN A SPECIFIED TIME FRAME. ENSURE EACH INTERCOM DOOR RELEASE CAN ACTIVATE ANY MASTER STATION IN THE FACILITY. COORDINATE THE ROLL-OVER PROCEDURES AND SEQUENCE OF OPERATIONS WITH THE OWNER DURING THE CONFIGURATION PROCESS.
5. **EQUIPMENT QUANTITIES:** VERIFY AND CONFIRM THE QUANTITIES OF CAMERAS, INTERCOM DOOR RELEASES, AND MASTER STATIONS AS PART OF THE SCOPE OF WORK OUTLINED IN THE SECURITY DRAWINGS.

2 VSS- WIRING DIAGRAM
NTS



ELECTRIC LOCKSETS, REQUEST TO EXIT DEVICES, AND DOOR POSITION SWITCHES REFER TO DIV 08 FOR DOOR HARDWARE

ELECTRIC LOCKSETS, REQUEST TO EXIT DEVICES, AND DOOR POSITION SWITCHES REFER TO DIV 08 FOR DOOR HARDWARE

NOTES:

1. **DOOR CONTROLLERS:** THE QUANTITY OF DOOR CONTROLLERS SHALL CORRESPOND TO THE CARD READER QUANTITIES SPECIFIED ON THE PLANS.
2. **ELEVATOR CONTROL LICENSES AND COORDINATION:**
   A. INCLUDE ALL NECESSARY ELEVATOR CONTROL LICENSES.
   B. COORDINATE ELEVATOR FUNCTIONALITY WITH THE OWNER AND THE ELEVATOR CONTRACTOR.
   C. A CARD READER SHALL BE DEDICATED TO EACH ELEVATOR ON EACH FLOOR. UPON PRESENTATION OF A VALID CREDENTIAL, THE ACCESS CONTROL SYSTEM SHALL ACTIVATE THE ELEVATOR VIA THE ELEVATOR CONTROL PANEL.
   D. PROVIDE ALL REQUIRED LICENSES, CABLING, AND CONFIGURATIONS TO ENSURE A FULLY FUNCTIONAL SYSTEM.
3. **CONTROL CABLING:** ALL CONTROL CABLING FROM DATA ROOMS TO EACH ACCESS CONTROL DEVICE IS REQUIRED AND SHALL BE INCLUDED IN THE BID DOCUMENTATION.
4. **POWER CABLING:** PROVIDE ALL NECESSARY POWER CABLING TO EACH LOW-VOLTAGE DEVICE AT EVERY DOOR EQUIPPED WITH A CARD READER. THIS SHALL ALSO BE INCLUDED IN THE BID DOCUMENTATION.
5. **DOOR HARDWARE AND POWER SUPPLIES:** REFER TO DIVISION 08 – DOOR HARDWARE SPECIFICATIONS. ENSURE ALL REQUIRED POWER SUPPLIES ARE APPROPRIATELY SIZED TO SUPPORT CARD READERS, ELECTRONIC DOOR STRIKES/LOCKS, AND REQUEST-TO-EXIT DEVICES INTEGRATED INTO THE SYSTEM.
6. **SYSTEM TERMINATIONS AND TESTING:** THE CONTRACTOR SHALL PERFORM ALL FINAL TERMINATIONS, CONFIGURATION, AND TESTING.
7. **INTERCOM DOOR RELEASE:** THE INTERCOM DOOR RELEASE AND DOOR RELEASE BUTTONS SHALL RELEASE THE DOORS THROUGH THE ACCESS CONTROL SYSTEM (ACS) PANEL.
8. **FIRE ALARM INTEGRATION:** CONTROL CABLING TO THE FIRE ALARM CONTROL PANEL SHALL ENABLE THE RELEASE OF MAGNETIC HOLD-OPEN DOORS, AS SPECIFIED IN THE DRAWINGS, DURING A LOCKDOWN EVENT.
9. **LOCKDOWN AND DURESS FUNCTIONALITY:** ACTIVATION OF LOCKDOWN OR DURESS BUTTONS SHALL REGISTER AS AN ADDRESSABLE ALARM ON THE INTRUSION DETECTION PANEL AND TRIGGER A DIAL-OUT TO THE CENTRAL MONITORING COMPANY.
10. **MERCURY CONTROLLER CONNECTIONS:**
    A. MERCURY CONTROLLERS SHALL CONNECT TO READER INTERFACE PANELS AND I/O PANELS VIA RS-485 WITHIN THE ENCLOSURE.
    B. MERCURY CONTROLLERS SHALL ALSO CONNECT TO THE BUILDING LAN. NETWORK SWITCHES ARE PROVIDED BY OTHERS. COORDINATE SECURITY VLAN AND IP ADDRESSING WITH THE OWNER'S IT TEAM.

CABLE CHART	
KEY	WIRE TYPE
1A	#22 - 2C, PLENUM
1B	CABLE A/R PER DEVICES & MANUFACTURER RECOMMENDATIONS
1C	#18-6C SHD, PLENUM
1D	#18 - 2C SHL'D, PLENUM
1E	BELDEN #6584AFJ COMPOSITE CABLE PLENUM or Equiv. #18-6C SHL'D, 22-2C, 22-4C, 18-4C
1F	CATEGORY 6A PATCH CORD, PLENUM
1G	#22-4C UNSHIELDED, SOLID, PLENUM

1 ACS - WIRING DIAGRAM - MERC PANELS
NTS

QA+M architecture
QuisenberryArcariMalik
195 Scott Swamp Road
Farmington, CT 06032
qamarch.com

d'agostino & ASSOCIATES
Technology Security Audio Visual
477 Main Street, Suite 210B | Monroe CT 06468
203.497.3064 da-technology.com

STATE OF CONNECTICUT
ARTHUR MALIK
No. 21827
REGISTERED ARCHITECT

RENOVATE AS NEW:

EDGEWOOD PRE-K ACADEMY

345 MIX STREET
BRISTOL, CT

State Project #: 017-0090 RNV
Project #:25064

Revisions

100% CONSTRUCTION DOCUMENTS
JUNE 5, 2026

SECURITY WIRING DIAGRAMS

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