



Agricultural Fabrication: Structures

Course Number	491410
Grade Level	10-12
Career Cluster	Agriculture
Pathway	Agriculture Power, Structural & Technical Systems
Course Sequence	Level 3
CTSO	FFA
Industry Recognized Credential	https://forms.act.org/certificate/pdf/NCRC-InformationFlyer.pdf OR https://www.aws.org/Certification-and-Education/
Minimum Equipment List	LINK
Course Description	

CIP Codes	CIP Title
1.0201	Agricultural Mechanization, General
1.0204	Agricultural Power Machinery Operation
46.0000	Construction Trades, General
46.0201	Carpentry/Carpenter
46.0401	Building/Property Maintenance
15.0000	Engineering Technologies and Engineering-Related Fields, General

SOC Codes	SOC Title
47-2031	Carpenters
47-2111	Electricians
47-2152	Plumbers, Pipefitters, and Steamfitters
47-2051	Cement Masons and Concrete Finishers
47-2181	Roofers
49-9071	Maintenance and Repair Workers, General
47-2061	Construction Laborers
17-3031	Surveying and Mapping Technicians
17-2021	Agricultural Engineers
45-2011	Agricultural Inspectors



Course Standards

Agricultural Fabrication: Structures

Domain 1

Analyze career and CTSO opportunities in Agricultural Structural Systems

Standard 1.1 Evaluate and implement steps to pursue career opportunities in Agricultural Structural Systems.

Performance Indicators

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| 1.1.1 | Examine educational, training, and experiential requirements for careers in Agricultural Structural Systems (e.g., degrees, certifications, apprenticeships, internships). |
| 1.1.2 | Analyze personal skillset and create a plan for obtaining the required education, training and experiences to obtain a career in Agricultural Structures. |

Standard 1.2 Assess the opportunities in Agricultural Structural Systems available through Career Development Events, Supervised Agricultural Experiences and other FFA activities.

Performance Indicators

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| 1.2.1 | Evaluate the Agricultural Mechanics and Agricultural Electricity Career Development Events for opportunities to exhibit skills needed in Agricultural Structures. |
| 1.2.2 | Research and implement Agricultural Structural Systems projects as Supervised Agricultural Experience opportunities and investigate other similar FFA activities. |

Domain 2

Apply safety standards for structural systems

Standard 2.1 Implement comprehensive safety protocols.

Performance Indicators

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| 2.1.1 | Identify and assess safety hazards associated with construction equipment and materials, applying proper safety procedures and precautions to prevent accidents and ensure a safe working environment in agricultural construction projects. |
| 2.1.2 | Apply safety principles and regulations during construction operations by following safe work practices and complying with OSHA and local standards to protect workers and maintain a safe agricultural worksite. |



2.1.3	Select and use personal protective equipment (PPE) appropriate for various construction tasks, ensuring proper fit and application to protect against hazards and maintain safety in agricultural construction environments.
2.1.4	Demonstrate safe working procedures with powered tools in structural work environments by selecting the appropriate tool, utilizing safe work practices, and maintaining a safe and compliant agricultural construction site.
Domain 3 Analyze structural requirements and project estimates	
Standard 3.1 Determine structural requirements and estimate project costs.	
Performance Indicators	
3.1.1	Analyze project specifications to prepare Bills of Materials, accurately identifying required materials, quantities, and resources to support efficient planning and construction of agricultural projects.
3.1.2	Calculate material costs and labor estimates for structural projects by determining quantities, applying current pricing, and factoring in labor requirements to develop accurate project budgets for agricultural construction.
3.1.3	Assess and apply local building codes and regulations to plan, design, and construct agricultural structures, ensuring compliance with safety, zoning, and legal requirements.
3.1.4	Evaluate environmental factors—such as soil type, weather conditions, and site topography—to make informed structural design decisions that ensure durability, safety, and functionality of agricultural structures.
Domain 4 Perform basic surveying and land measurement operations	
Standard 4.1 Perform basic surveying and land measurement operations.	
Performance Indicators	
4.1.1	Calculate land area for agricultural planning by interpreting topographical maps and applying appropriate mathematical equations, demonstrating accuracy in measurements and the ability to relate terrain features to practical land-use decisions.
4.1.2	Demonstrate proper use of basic surveying instruments—such as levels, transits, and measuring tapes—to accurately measure distances, elevations, and angles, ensuring precise layout and planning for agricultural construction and land management projects.
4.1.3	Create accurate field notes and survey reports by documenting measurements, procedures, and observations, demonstrating attention to detail and the ability to communicate technical information clearly for agricultural construction and land management projects.



4.1.4	Apply precision surveying processes—such as using total stations, GPS equipment, and geometric calculations—to accurately calculate the acreage of specific property plots, ensuring reliable measurements for agricultural planning, construction, and land management.
Standard 4.2 Construct concrete and masonry foundation systems.	
Performance Indicators	
4.2.1	Analyze the characteristics and applications of concrete components—such as cement, aggregates, and mixtures—to select and use materials effectively in constructing durable and functional agricultural structures.
4.2.2	Calculate concrete volumes for various foundation types by applying geometric formulas and measurement techniques to ensure accurate material estimates for agricultural construction projects.
4.2.3	Construct concrete foundations by applying proper mixing, pouring, finishing, and curing techniques to ensure durability, stability, and safety in agricultural structures.
4.2.4	Install masonry components—such as brick, stone, and concrete block systems—by applying proper layout, bonding, leveling, and finishing techniques to ensure strong and durable agricultural structures.
4.2.5	Apply proper curing and finishing techniques to concrete work—such as troweling, floating, and curing methods—to achieve durable, level, and high-quality surfaces in agricultural structures.
Domain 5	
Select, install, and maintain structural materials and systems	
Standard 5.1 Work with wood and metal structural components.	
Performance Indicators	
5.1.1	Compare characteristics and applications of wood products in agricultural structures.
5.1.2	Compare characteristics and applications of metal products in structural systems.
5.1.3	Calculate costs for the repair and replacement of structural components by determining material quantities, labor requirements, and current pricing to develop accurate project budgets for agricultural maintenance and construction.
5.1.4	Construct agricultural structures by selecting and using appropriate wood and metal materials, applying proper cutting, joining, and assembly techniques to ensure durability, safety, and functionality.
5.1.5	Apply proper fastening techniques—such as nails, screws, and bolts—based on material type and application to securely assemble agricultural structures and equipment.



Standard 5.2 Install and maintain building insulation systems.	
Performance Indicators	
5.2.1	Select and install appropriate roofing materials for agricultural structures by evaluating durability, weather resistance, and application requirements, and applying proper installation techniques to ensure long-lasting, functional roofs.
5.2.2	Install siding and exterior wall systems on agricultural structures by applying proper weatherproofing techniques, ensuring protection from moisture, wind, and environmental damage while maintaining structural integrity.
5.2.3	Evaluate, compare, and select insulation materials for agricultural structures, and calculate thermal efficiency to implement energy-efficient and comfortable building designs.
5.2.4	Install doors, windows, and ventilation systems in agricultural structures by selecting appropriate materials and applying proper installation techniques to ensure functionality, energy efficiency, and structural integrity.
Domain 6 Install and maintain plumbing, electrical, and HVAC systems in agricultural structures	
Standard 6.1 Design and install plumbing and water systems.	
Performance Indicators	
6.1.1	Evaluate and compare characteristics of plumbing materials—such as copper, PVC, and PEX—and select the appropriate material for agricultural water systems based on durability, cost, and application requirements.
6.1.2	Calculate material and labor costs for installing water systems in agricultural structures, using accurate measurements and pricing to develop reliable project budgets.
6.1.3	Install and repair pipes, fixtures, and plumbing equipment in agricultural structures by applying proper layout, joining, and maintenance techniques to ensure functional and code-compliant water systems.
Standard 6.2 Apply electrical systems in agricultural structures.	
Performance Indicators	
6.2.1	Analyze and determine electrical requirements for agricultural structures by evaluating load demands, circuit needs, and power sources to ensure safe, efficient, and code-compliant electrical systems.
6.2.2	Design electrical circuits for agricultural structures by applying knowledge of basic electrical units—such as volts, amps, watts, and ohms—and using calculations to ensure proper circuit function, safety, and efficiency.
6.2.3	Install electrical fixtures, outlets, and control systems in agricultural structures by applying proper wiring techniques and following applicable codes to ensure safe, functional, and code-compliant electrical systems.



6.2.4	Troubleshoot and repair electrical components and systems in agricultural structures and equipment by using diagnostic tools, identifying faults, and applying proper repair techniques to restore safe and efficient operation.
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Domain 7
Apply advanced technologies to enhance structural systems efficiency

Standard 7.1 Integrate modern construction technologies.

Performance Indicators

7.1.1	Research and apply computer technologies for structural design and analysis.
7.1.2	Use digital tools—such as spreadsheets, project management software, and cost-estimating programs—to plan, organize, and manage agricultural construction projects efficiently and accurately.
7.1.3	Apply Building Information Modeling (BIM) concepts to agricultural structures by creating digital representations of designs, coordinating project components, and analyzing construction processes to improve efficiency, accuracy, and collaboration. (Free software is available through FreeCAD BIM and BIMvision)
7.1.4	Assess and apply emerging construction technologies—such as automation, advanced materials, and digital tools—to improve efficiency, accuracy, and productivity in agricultural construction projects.
7.1.5	Implement monitoring systems—such as sensors, data loggers, and inspections—to evaluate the performance and integrity of agricultural structures, using collected data to identify issues and guide maintenance or improvements.

Contributors

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