



Agricultural Fabrication: Metals

Course Number	491380
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
48.0508	Welding Technology/Welder
15.0614	Welding Engineering Technology/Technician

SOC Codes	SOC Title
51-4121	Welders, Cutters, Solderers, and Brazers
49-3041	Farm Equipment Mechanics and Service Technicians
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic



Course Standards

Agricultural Fabrication: Metals Domain 1 Examine Career and FFA Opportunities associated with Agricultural Metal Fabrication	
Standard 1.1 Evaluate and implement steps to pursue career opportunities in Agricultural Metal Fabrication.	
Performance Indicators	
1.1.1	Examine educational, training, and experiential requirements for careers in Agricultural Metal Fabrication (e.g., degrees, welding 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 welding, fabrication, and agricultural equipment manufacturing.
Standard 1.2 Assess opportunities through Career Development Events and Supervised Agricultural Experiences.	
Performance Indicators	
1.2.1	Examine Agricultural Mechanics Career Development Events for welding and fabrication skill exhibition opportunities.
1.2.2	Research and implement Agricultural Metal Fabrication projects as Supervised Agricultural Experience opportunities, and identify other related FFA activities.
Domain 2 Apply safety protocols and quality assurance measures	
Standard 2.1 Implement advanced safety practices in fabrication operations.	
Performance Indicators	
2.1.1	Identify and mitigate safety hazards associated with various welding and cutting processes.
2.1.2	Apply proper personal protective equipment for all fabrication operations.



2.1.3	Construct ventilation and fume extraction systems in fabrication environments.
2.1.4	Conduct safety inspections of equipment, tools, and work environments.
2.1.5	Develop and implement safety protocols for fabrication shop operations.
Domain 3 Apply physical science principles to understand and select metals for agricultural applications	
Standard 3.1 Analyze properties and characteristics of metals used in Agriculture systems.	
Performance Indicators	
3.1.1	Compare and contrast properties of different metals (e.g., malleability, conductivity, corrosion resistance, chemical composition).
3.1.2	Evaluate thermal expansion, tensile strength, and fatigue characteristics of agricultural metals.
3.1.3	Assess environmental factors affecting metal selection in agricultural applications.
3.1.4	Calculate costs associated with material selection for repair and replacement projects.
3.1.5	Select appropriate metals based on application requirements and environmental conditions.
Standard 3.2 Apply metallurgy principles to welding and fabrication processes.	
Performance Indicators	
3.2.1	Analyze heat-affected zones and their impact on metal properties.
3.2.2	Evaluate pre-heating and post-weld heat treatment requirements.
3.2.3	Assess weld joint design and stress distribution in fabricated components.



Domain 4	
Master multiple welding processes for agricultural metal fabrication	
Standard 4.1 Apply Shielded Metal Arc Welding (SMAW) techniques.	
Performance Indicators	
4.1.1	Compare and contrast different electrode types and their agricultural applications.
4.1.2	Assess and select proper electrodes for various SMAW situations and base metals.
4.1.3	Demonstrate proper SMAW techniques for flat, horizontal, vertical, and overhead positions.
4.1.4	Evaluate weld quality using visual inspection and destructive testing procedures.
4.1.5	Construct and repair agricultural equipment and structures using SMAW processes.
Standard 4.2 Apply Gas Metal Arc Welding (GMAW/MIG) techniques.	
Performance Indicators	
4.2.1	Analyze wire selection, shielding gases, and machine settings for various applications.
4.2.2	Demonstrate GMAW techniques for different joint configurations and positions.
4.2.3	Troubleshoot common GMAW problems and implement corrective measures.
4.2.4	Fabricate thin-gauge agricultural components using precision GMAW techniques.
4.2.5	Evaluate weld quality using visual inspection and destructive testing procedures.
Standard 4.3 Apply Gas Tungsten Arc Welding (GTAW/TIG) techniques.	
Performance Indicators	
4.3.1	Select appropriate tungsten electrodes and filler metals for various base materials.



4.3.2	Demonstrate GTAW techniques for mild steel and/or aluminum.
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4.3.3	Apply proper gas coverage and heat input control for quality welds.
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<p>Domain 5</p> <p>Apply various cutting processes and material preparation techniques</p>
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<p>Standard 5.1 Apply oxy-acetylene cutting and welding processes.</p>

Performance Indicators

5.1.1	Demonstrate safe setup and operation of oxy-acetylene equipment.
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5.1.2	Apply proper cutting techniques for various thicknesses and materials.
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5.1.3	Perform oxy-acetylene welding, cutting, and heat treatment for repair and fabrication applications.
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5.1.4	Execute brazing and soldering operations for specialized agricultural equipment.
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5.1.5	Using the oxy-acetylene torch apply metal forming techniques.
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<p>Standard 5.2 Apply plasma arc cutting technology.</p>

Performance Indicators

5.2.1	Compare plasma cutting capabilities with traditional cutting methods.
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5.2.2	Demonstrate plasma cutting techniques for various materials and thicknesses.
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5.2.3	Evaluate cut quality and implement techniques for improved edge preparation.
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Domain 6
Interpret technical drawings and plan fabrication projects

Standard 6.1 Read and interpret welding and fabrication blueprints.

Performance Indicators

6.1.1	Interpret welding symbols, joint configurations, and specification callouts.
6.1.2	Analyze dimensional tolerances and fit-up requirements from drawings.
6.1.3	Calculate material requirements and cut lists from technical drawings.

Standard 6.2 Design and construct custom agricultural fabrication projects.

Performance Indicators

6.1.1	Create sketches and technical drawings for custom agricultural equipment.
6.1.2	Develop comprehensive project plans including timelines and resource requirements.
6.1.3	Estimate costs for materials, labor, and overhead in fabrication projects.
6.1.4	Plan, fabricate, assemble, and maintain structural and functional components for a variety of agricultural projects, applying appropriate materials, tools, and construction techniques to meet project goals and environmental conditions.



Domain 7	
Apply modern technologies to enhance fabrication efficiency and precision	
Standard 7.1 Integrate and apply CNC and automated fabrication technologies.	
Performance Indicators	
7.1.1	Evaluate emerging technologies for agricultural metal fabrication applications.
7.1.2	Apply computer numerical control principles to plasma cutting operations.
7.1.3	Program and operate CNC equipment for precision fabrication work.
7.1.4	Use CAD/CAM software for fabrication planning and material optimization.

Contributors

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