

**CTE Standards Unpacking
Ag Metal Fabrication**

Course: Ag Metal Fabrication

Course Description: The Ag Metal Fabrication Technology course provides students with advanced metal fabrication skills, which include Shielded Metal Arc Welding (SMAW), Metal Inert Gas (MIG) welding/Gas Metal Arc Welding (GMAW), oxyacetylene fuel welding, brazing and cutting, Gas Tungsten Arc Welding (GTAW)/Tungsten Inert Welding (TIG), and plasma cutting. This course will also incorporate soft skills necessary for careers in the Power, Structural, and Technical Systems career pathway. Classroom and laboratory content will be enhanced by utilizing appropriate equipment and technology. Geometry, physical science, physics, English and human relations skills will be reinforced throughout this course. Work-based learning opportunities appropriate for this course are school-based enterprises and field trips. Opportunities for application of clinical and leadership skills are provided by participation in FFA activities, conferences, and Career Development Events. Each student will be expected to maintain a Supervised Agricultural Experience (SAE).

Career Cluster: Agriculture, Food and Natural Resources

Prerequisites: Fundamental Ag Mechanical Technologies, Recommended: Introduction to AFNR

Program of Study Application: Ag Metal Fabrication is a second pathway course in the Agriculture, Food and Natural Resources Program of Study, Power Systems pathway. Ag Metal Fabrication is preceded by Fundamental Ag Mechanical Technologies and would be followed by a capstone experience.

INDICATOR #AMF 1: Demonstrate the basics of metal fabrication.		
SUB-INDICATOR 1.1 (Webb Level: 2 Skill/Concept): Demonstrate knowledge of metal fabrication techniques and related technologies.		
SUB-INDICATOR 1.2 (Webb Level: 2 Skill/Concept): Prepare various metals for welding.		
SUB-INDICATOR 1.3 (Webb Level: 3 Strategic Thinking): Create plans for metal project construction.		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Basic principles of metal fabrication -Shop design and safety -Knowledge of metal properties and use in ag -Know costs of materials -Read blueprints and develop a bill of 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Compare possible metals to use for a project based on their properties -Realize potential dangers of metal working tools 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Reading a tape measure -Measure, mark, cutting, and squaring metal -Bend, shape, file, grind metal -Drill holes -Drawing to scale

materials		
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Show mastery of safety procedures. • Compile a bill of materials for a welding project. • Completion of welding project. • Estimate the cost of materials for a specific project. 		
Academic Connections		
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>Math:</p> <p>1) MG.A.3 - Apply geometric methods to solve design problems.</p> <p>2) CO.D.12 - Make formal geometric constructions with a variety of tools and methods</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Determine correct angles for bracing for maximum strength of project design.</p> <p>-Create and plan a properly measured geometric shape out of metal. Demonstrate the properties of the geometric shape through the construction and planning process.</p>	

<p>INDICATOR #AMF 2: Demonstrate the principles of Shielded Metal Arc Welding (SMAW) and the correct operation of SMAW equipment.</p>		
<p>SUB-INDICATOR 2.1 (Webb Level: 2 Skill/Concept): Perform Shielded Metal Arc Welding (SMAW) techniques.</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Identify welding positions and welding joints -Safety equipment and practices with SMAW -Know what makes a quality weld 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Understand possible hazardous situations -Understand the differences between AC and DC SMAW -Proper method for striking and maintaining an arc to produce a quality weld 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Troubleshooting SMAW welders -Perform proper welding positions for welding joints -Select proper electrodes and welder settings -Properly laying a bead -Evaluating beads for defects

<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Demonstrate how to properly set the welder for a specific job. • Complete a SMAW welding project. • Compare and contrast MIG and SMAW welding techniques. 	
<p><i>Academic Connections</i></p>	
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>Science: HS-PS3-4 – Investigate the transfer of thermal energy</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Demonstrate how quenching transfers heat from the metal to the water.</p>

<p><i>INDICATOR #AMF 3: Demonstrate the principles of Metal Inert Gas (MIG) welding, also known as Gas Metal Arc Welding (GMAW), and the correct operation of MIG equipment.</i></p>		
<p><i>SUB-INDICATOR 3.1 (Webb Level: 2 Skill/Concept):</i> Perform metal inert gas (MIG) welding techniques.</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Safety equipment and practices with MIG -Correct wire speed and amperage -Know welder parts -Identify possible hazardous situations 	<p>Understand (Conceptual)</p> <ul style="list-style-type: none"> -Importance of routine maintenance -Selection and application of Inert Gasses 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Troubleshooting MIG welders -Perform proper welding positions for welding joints -Select proper wire size and welder settings -Properly laying a bead -Evaluating beads for defects
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p>		

<ul style="list-style-type: none"> • Demonstrate MIG welding. • Complete MIG welding project. • Compare and contrast MIG and SMAW welding techniques. 	
Academic Connections	
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): Science: 1) HS-PS1-1 – Use the periodic table to predict the properties of gasses.	Sample Performance Task Aligned to the Academic Standard(s): -Operate welder with and without Argon activated and compare quality of resulting welds.

INDICATOR #AMF 4: Understand the correct operation of oxyacetylene equipment.		
SUB-INDICATOR 4.1 (Webb Level: 2 Skill/Concept): Explore oxyacetylene welding, cutting, and brazing.		
Knowledge (Factual): -Know proper safety equipment and practices -Safe startup and shutdown of oxyacetylene equipment -Know the properties of oxygen and fuel gases.	Understand (Conceptual): -Realize the importance of proper gas pressures for oxyfuel equipment -Understand importance of routine maintenance -Understand possible hazardous situations	Do (Application): -Cut metal with oxyfuel torch -Obtain correct flame setting and types of flames -Join metal by brazing -Weld mild steel
Benchmarks: <i>Students will be assessed on their ability to:</i> <ul style="list-style-type: none"> • Demonstrate proper and safe operation with PPE (personal protective equipment). • Perform weld or cut with oxyacetylene equipment. 		
Academic Connections		
ELA Literacy and/or Math Standard	Sample Performance Task Aligned to	

<p>(if applicable, Science and/or Social Studies Standard):</p> <p>Science: 1) HS-PS1-1 – Use the periodic table to predict the properties of gasses.</p>	<p>the Academic Standard(s):</p> <p>-Demonstrate the difference between and properties of oxygen and fuel gasses.</p> <p>-Develop an experiment to demonstrate how oxygen facilitates the combustion of the fuel gas.</p>
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<p>INDICATOR #AMF 5: Explore advanced welding processes.</p>		
<p>SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Investigate and explain principles of advanced welding processes (e.g. Tungsten Inert Gas (TIG) welding, plasma cutting)</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Identify appropriate safety equipment -Correct operation procedures -Identify parts and functions of equipment -Explain the use of TIG shielding gases 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Compare TIG advantages and disadvantages -Demonstrate correct equipment setup -Demonstrate correct procedures for cutting different thicknesses 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Compare and contrast various advanced welding processes
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Use a plasma cutting torch to cut metal. • Use a TIG welder to weld aluminum or stainless steel. 		
<p>Academic Connections</p>		
<p>ELA Literacy and/or Math Standard</p>	<p>Sample Performance Task Aligned to</p>	

<p>(if applicable, Science and/or Social Studies Standard):</p> <p>English: 1) 9-12 W.6 – Use technology, including the internet, to produce an individual writing product.</p>	<p>the Academic Standard(s):</p> <p>-Create a research paper exploring unique or innovative metal fabrication processes.</p>
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<p>INDICATOR #AMF 6: Develop employability skills related to the Power, Structural, and Technical Systems Pathway.</p>		
<p>SUB-INDICATOR 6.1 (Webb Level: 2 Skill/Concept): Develop soft skills to enhance employability.</p>		
<p>SUB-INDICATOR 6.2 (Webb Level: 2 Skill/Concept): Investigate careers related to metal fabrication.</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Knowledge of employability skills -Personality Assessments -Careers in metal fabrication 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Develop interviewing skills -Understand importance of punctuality and attendance -Proper verbal and nonverbal communication skills -Conflict resolution 	<p>Do (Application):</p> <ul style="list-style-type: none"> -Design resumes -Write cover letters -Job shadow industry professionals -Complete job application -Work as a team to solve problems
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Participate in a mock job interview. • Evaluate student's cover letter and resume. 		
<p>Academic Connections</p>		
<p>ELA Literacy and/or Math Standard</p>	<p>Sample Performance Task Aligned to</p>	

<p>(if applicable, Science and/or Social Studies Standard):</p> <p>English-</p> <p>1) 9-12 W.4 - Produce writing that is appropriate for the task or audience.</p>	<p>the Academic Standard(s):</p> <p>Create a cover letter and resume.</p>
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Additional Resources:

- CASE Ag Power Certification
- OSHA Safety Certification Training
- www.rulergame.net
- American Welding Society (AWS)
- Lincoln Welding Resources
- Tour industry welding facilities
- Lincoln Electric Education Portal
- Modern Marvels: Welding
- YouTube: Extinguishing Fires
- Modern Marvels: Metal
- Modern Marvels: Welding
- www.sketchup.com
- SDDMyLife
- AgExplorer