

**Maine Department of Education  
Career and Technical Education**

Welding; CIP: 48.0508  
National Center for Construction Education & Research (NCCER): Welding 1 and 2  
Intersections with  
Maine College and Career Readiness-Mathematics Standards

<b>Framework, Duties and Tasks</b>	<b>Mathematics Content Standards and The Eight Mathematical Practices (CCSS)</b>	<b>Demonstration of Proficiency</b> (Possible Evidence, Project, Performance Assessment, Certification etc.)	<b>Maine Learning Results-Guiding Principles, and Career and Education Development</b>
<b>1. Welding Safety</b>			
<ul style="list-style-type: none"> <li>a. Identify some common hazards in welding.</li> <li>b. Explain and identify proper personal protection used in welding.</li> <li>c. Describe how to avoid welding fumes.</li> <li>d. Explain some of the causes of accidents.</li> <li>e. Identify and explain uses for material safety data sheets.</li> <li>f. Explain safety techniques for storing and handling cylinders.</li> <li>g. Explain how to avoid electric shock when welding.</li> <li>h. Describe proper material handling methods.</li> </ul>	<b>NA</b>		<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>A. A clear and effective communicator who:</b></p> <ul style="list-style-type: none"> <li>2. Uses evidence and logic appropriately in communication</li> <li>3. Adjusts communication based on the audience</li> <li>4. Uses a variety of modes of expression (spoken, written and visual and performing including the use of technology to create and share the expressions)</li> </ul> <p><b>B. A self-directed and lifelong learner who:</b></p> <ul style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and</li> </ul>

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			<p>independence</p> <p>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</p> <p>6. Demonstrates reliability and concern for quality</p> <p>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</p> <p><b>C. A creative and practical problem solver who:</b></p> <p>1. Observes and evaluates situations to define problems</p> <p>3. Identifies patterns, trends and relationships that apply to solutions</p> <p>4. Generates a variety of solutions, builds a case for a best response and critically evaluates the effectiveness of the response</p> <p>5. Sees opportunities, finds resources and seeks results</p> <p>6. Uses information and technology to solve problems</p> <p><b>D. A responsible and involved citizen who:</b></p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>3. Demonstrates ethical behavior and the moral courage to sustain it</p> <p>6. Demonstrates awareness of</p>

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			personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources 3. Applies ideas across disciplines 4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes
<b>2. Oxy-fuel Cutting</b>			
a. Identify and explain the use of Oxyfuel cutting equipment. b. Set up oxy-fuel equipment. c. Light and adjust an oxy-fuel torch. d. Shut down oxy-fuel cutting equipment. e. Disassemble oxy-fuel equipment. f. Change cylinders. g. Perform oxy-fuel cutting: <ul style="list-style-type: none"> <li>• Straight line and square shapes</li> <li>• Piercing and slot cutting</li> </ul>	<b>Math.G-CO.D.12 (g)</b> Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).  <b>Math.G-MG.A.1 (g)</b> Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder,	Evaluate the oxy-fuel cut.	<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and

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<ul style="list-style-type: none"> <li>• Bevels</li> <li>• Washing</li> <li>• Gouging</li> </ul> <p>h. Operate a motorized, portable oxy-fuel cutting machine.</p>	<p>pyramid, and cone.</p> <p><b>Math.G-MG.A.3 (g)</b>            Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).</p>		<p>relearn</p> <p>6. Demonstrates reliability and concern for quality</p> <p>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</p> <p><b>C. A creative and practical problem solver who:</b></p> <p>1. Observes and evaluates situations to define problems</p> <p>6. Uses information and technology to solve problems</p> <p>7. Perseveres in challenging situations</p> <p><b>D. A responsible and involved citizen who:</b></p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>6. Demonstrates awareness of personal and community health and wellness</p> <p><b>E. An integrative and informed thinker who:</b></p> <p>1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology</p> <p>2. Evaluates and synthesizes information from multiple sources</p>
<b>3. Plasma Arc Cutting</b>			

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<ul style="list-style-type: none"> <li>a. Explain the plasma arc cutting processes.</li> <li>b. Identify plasma arc cutting equipment.</li> <li>c. Prepare and set up plasma arc cutting equipment.</li> <li>d. Use plasma arc cutting equipment to make various types of cuts.</li> <li>e. Store equipment and properly clean the work area after use.</li> </ul>	<p><b>Math.G-CO.D.12</b> (d)  Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).</p> <p><b>Math.G-MG.A.1</b> (d)  Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.</p> <p><b>Math.G-MG.A.3</b> (d)  Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).</p>	<p>Evaluate the plasma arc cut.</p>	<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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<b>4. Air Carbon Arc Cutting and Gouging</b>			
a. Identify and explain the air carbon arc cutting (CAC-A) process and equipment. b. Select and install CAC-A electrodes. c. Prepare the work area and CAC-A equipment for safe operation. d. Use CAC-A equipment for washing and gouging activities. e. Perform storage and housekeeping activities for CAC-A equipment. f. Make minor repairs to CAC-A equipment.	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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<b>5. Base Metal Preparation</b>			

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<ul style="list-style-type: none"> <li>a. Clean base metal for welding or cutting.</li> <li>b. Identify and explain joint design.</li> <li>c. Explain joint design considerations.</li> <li>d. Mechanically bevel the edge of a mild steel plate.</li> <li>e. Thermally bevel the end of a mild steel plate.</li> <li>f. Select the proper joint design based on a welding procedure specification (WPS) or instructor direction.</li> </ul>	<p><b>Math.G-CO.D.12</b> (b-f)  Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).</p> <p><b>Math.G-MG.A.3</b> (b-f)  Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).</p>	<p>Evaluate performance on d &amp; e.</p> <p>Worksheet on b, c, and f.</p>	<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>



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<b>6. Weld Quality</b>			
a. Identify and explain codes governing welding. b. Identify and explain weld imperfections and their causes. c. Identify and explain nondestructive examination practices. d. Identify and explain welder qualification tests. e. Explain the importance of quality workmanship. f. Identify common destructive testing methods. g. Perform a visual inspection of fillet welds.	<b>NA</b>		<b>Guiding Principles</b> <b>A. A clear and effective communicator who:</b> 2. Uses evidence and logic appropriately in communication 4. Uses a variety of modes of expression (spoken, written and visual and performing including the use of technology to create and share the expressions) <b>B. A self-directed and lifelong learner who:</b> 2. Applies knowledge to set goals and make informed decisions 4. Demonstrates initiative and independence

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<b>7. Shielded Metal Arc Welding (SMAW) – Equipment and Setup</b>			

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<ul style="list-style-type: none"> <li>a. Identify and explain shielded metal arc welding (SMAW) safety.</li> <li>b. Explain welding electrical current.</li> <li>c. Identify welding power supplies and their characteristics.</li> <li>d. Explain how to set up welding power supplies.</li> <li>e. Set up a machine for welding.</li> <li>f. Identify tools used for weld cleaning.</li> </ul>	<p style="text-align: center;"><b>NA</b></p>		<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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<b>8. SMAW - Electrodes</b>			
a. Identify factors that affect electrode selection. b. Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system. c. Identify different types of filler metals. d. Explain the storage and control of filler metals. e. Explain filler metal traceability requirements and how to use applicable code requirements. f. Identify and select the proper	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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electrode for an identified welding task.			concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <b>C. A creative and practical problem solver who:</b> 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <b>D. A responsible and involved citizen who:</b> 2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources
<b>9. SMAW – Beads and Fillet Welds</b>			

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a. Set up shielded metal arc welding (SMAW) equipment. b. Describe methods of striking an arc. c. Properly strike and extinguish an arc. d. Describe causes of arc blow and wander. e. Make stringer, weave, and overlapping beads. f. Make fillet welds in the following positions: <ul style="list-style-type: none"> <li>• Horizontal (2F)</li> <li>• Vertical (3F)</li> <li>• Overhead (4F)</li> </ul>	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <b>C. A creative and practical problem solver who:</b> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <b>D. A responsible and involved citizen who:</b>

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			2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources
<b>10. Joint Fit-Up and Alignment</b>			
a. Identify and explain job code specifications. b. Use fit-up gauges and measuring devices to check joint fit-up. c. Identify and explain distortion and how it is controlled. d. Fit up joints using plate and pipe fit-up tools. e. Check for joint misalignment and poor fit-up before and after welding.	<b>Mathematical Practices 6</b> (b, e) Attend to precision.  <b>Math.N-Q.A.2</b> (b, e) Define appropriate quantities for the purpose of descriptive modeling.	Use of V-WAC gauge to assess performance.  Assess performance within tolerances.	<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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<b>11. SMAW - Groove Welds with Backing</b>			



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<p>a. Identify and explain groove welds.</p> <p>b. Identify and explain groove welds with backing.</p> <p>c. Set up shielded metal arc welding (SMAW) equipment for making V-groove welds.</p> <p>d. Perform SMAW for V-groove welds with backing in the following positions:</p> <ul style="list-style-type: none"> <li>• Flat (1G)</li> <li>• Horizontal (2G)</li> <li>• Vertical (3G)</li> <li>• Overhead (4G)</li> </ul>	<p><b>NA</b></p>		<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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<b>12. SMAW – Open V-Groove Welds</b>			
a. Prepare shielded metal arc welding (SMAW) equipment for open-root V-groove welds. b. Perform open-root V-groove welds in the following positions: <ul style="list-style-type: none"> <li>• Flat (1G) position</li> <li>• Horizontal (2G) position</li> <li>• Vertical (3G) position</li> <li>• Overhead (4G) position</li> </ul>	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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<b>13. Welding Symbols</b>			

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<ul style="list-style-type: none"> <li>a. Identify and explain the various parts of a welding symbol.</li> <li>b. Identify and explain fillet and groove weld symbols.</li> <li>c. Read welding symbols on drawings, specifications, and welding procedure specifications.</li> <li>d. Interpret welding symbols from a print.</li> </ul>	<p style="text-align: center;"><b>NA</b></p>		<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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			2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources
<b>14. Reading Welding Detail Drawings</b>			
a. Identify and explain a welding detail drawing. b. Identify and explain lines, material fills, and sections. c. Identify and explain object views. d. Identify and explain dimensioning. e. Identify and explain notes and bill of materials. f. Interpret basic elements of a welding detail drawing. g. Sketch or draw basic welding drawings.	<b>Math.G-MG.A.3 (e)</b> Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).	Worksheet or workbook assignment.	<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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			<p>concern for quality</p> <p>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</p> <p><b>C. A creative and practical problem solver who:</b></p> <p>1. Observes and evaluates situations to define problems</p> <p>6. Uses information and technology to solve problems</p> <p>7. Perseveres in challenging situations</p> <p><b>D. A responsible and involved citizen who:</b></p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>6. Demonstrates awareness of personal and community health and wellness</p> <p><b>E. An integrative and informed thinker who:</b></p> <p>1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology</p> <p>2. Evaluates and synthesizes information from multiple sources</p>
<b>15. Physical Characteristics and Mechanical Properties of Metal</b>			

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<ul style="list-style-type: none"> <li>a. Identify and explain the composition and classification of base metals.</li> <li>b. Explain and demonstrate field identification methods for base metals.</li> <li>c. Identify and explain the physical characteristics and mechanical properties of metals.</li> <li>d. Identify and explain forms and shapes of structural metals.</li> <li>e. Explain metallurgical considerations for welding metals.</li> </ul>	<p style="text-align: center;"><b>NA</b></p>		<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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			2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources
<b>16. Pre-heating and Post-heating of Metals</b>			
a. Explain and demonstrate how to preheat metals. b. Describe maintaining interpass temperature. c. Explain postweld heat treatment of metals. d. Explain the effects of pre-heat and post-heat on metals: <ul style="list-style-type: none"> <li>• Heat-affected zone (HAZ)</li> <li>• Cracking</li> <li>• Grain or crystal structure</li> </ul>	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and



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			concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <b>C. A creative and practical problem solver who:</b> 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <b>D. A responsible and involved citizen who:</b> 2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources
<b>17. GMAW and FCAW: Equipment and Filler Metals</b>			

<b>Framework, Duties and Tasks</b>	<b>Mathematics Content Standards and The Eight Mathematical Practices (CCSS)</b>	<b>Demonstration of Proficiency</b> (Possible Evidence, Project, Performance Assessment, Certification etc.)	<b>Maine Learning Results-Guiding Principles, and Career and Education Development</b>
<p>a. Explain gas metal arc welding (GMAW) and flux-cored arc welding (FCAW) safety.</p> <p>b. Explain the characteristics of welding current and power sources.</p> <p>c. Identify and explain the use of GMAW and FCAW equipment:</p> <ul style="list-style-type: none"> <li>• Spray transfer</li> <li>• Globular</li> <li>• Short circuiting</li> <li>• Pulse</li> </ul> <p>d. Identify and explain the use of GMAW and FCAW shielding gases and filler metals.</p> <p>e. Set up GMAW and FCAW equipment and identify tools for weld cleaning.</p>	<p><b>NA</b></p>		<p><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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			2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <b>E. An integrative and informed thinker who:</b> 1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources
<b>18. GMAW and FCAW: Plate</b>			
a. Perform GMAW-S (short-circuit) multiple-pass fillet welds on carbon steel plate coupons in multiple positions, using solid or composite wire and shielding gas. b. Perform GMAW-S (short-circuit) multiple-pass V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using solid or composite wire and shielding gas. c. Perform GMAW spray fillet and V-groove welds on carbon steel plate coupons in multiple	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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<p>positions (with or without backing), using solid or composite wire and shielding gas.</p> <p>d. Perform FCAW multiple-pass fillet welds on carbon steel plate coupons in multiple positions, using flux-cored wire and, if required, shielding gas.</p> <p>e. Perform FCAW multiple-pass V-groove welds on carbon steel plate coupons in multiple positions (with or without backing), using flux-cored wire and, if required, shielding gas.</p>			<p>concern for quality</p> <p>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</p> <p><b>C. A creative and practical problem solver who:</b></p> <p>1. Observes and evaluates situations to define problems</p> <p>6. Uses information and technology to solve problems</p> <p>7. Perseveres in challenging situations</p> <p><b>D. A responsible and involved citizen who:</b></p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>6. Demonstrates awareness of personal and community health and wellness</p> <p><b>E. An integrative and informed thinker who:</b></p> <p>1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology</p> <p>2. Evaluates and synthesizes information from multiple sources</p>
<b>19. GTAW: Equipment and Filler Metals</b>			

<b>Framework, Duties and Tasks</b>	<b>Mathematics Content Standards and The Eight Mathematical Practices (CCSS)</b>	<b>Demonstration of Proficiency</b> (Possible Evidence, Project, Performance Assessment, Certification etc.)	<b>Maine Learning Results-Guiding Principles, and Career and Education Development</b>
<ul style="list-style-type: none"> <li>a. Explain gas tungsten arc welding (GTAW) safety.</li> <li>b. Identify and explain the function of GTAW equipment.</li> <li>c. Identify and explain the function of GTAW filler metals.</li> <li>d. Identify and explain the function of GTAW shielding gases.</li> <li>e. Set up GTAW equipment.</li> </ul>	<p style="text-align: center;"><b>NA</b></p>		<p style="text-align: center;"><b>Guiding Principles</b></p> <p><b>B. A self-directed and lifelong learner who:</b></p> <ol style="list-style-type: none"> <li>1. Recognizes the need for information and locates and evaluates resources</li> <li>2. Applies knowledge to set goals and make informed decisions</li> <li>3. Applies knowledge in new contexts</li> <li>4. Demonstrates initiative and independence</li> <li>5. Demonstrates flexibility including the ability to learn, unlearn and relearn</li> <li>6. Demonstrates reliability and concern for quality</li> <li>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</li> </ol> <p><b>C. A creative and practical problem solver who:</b></p> <ol style="list-style-type: none"> <li>1. Observes and evaluates situations to define problems</li> <li>6. Uses information and technology to solve problems</li> <li>7. Perseveres in challenging situations</li> </ol> <p><b>D. A responsible and involved citizen who:</b></p>

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<b>20. GTAW: Plate</b>			
a. Build a pad in the flat position with stringer beads using GTAW and carbon steel filler metal. b. Perform multiple-pass GTAW fillet welds on carbon steel plate coupons in the following positions, using carbon steel filler metal: <ul style="list-style-type: none"> <li>• 1F</li> <li>• 2F</li> <li>• 3F</li> <li>• 4F</li> </ul> c. Perform multiple-pass GTAW V-groove welds on carbon steel plate coupons in the	<b>NA</b>		<b>Guiding Principles</b> <b>B. A self-directed and lifelong learner who:</b> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 3. Applies knowledge in new contexts 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and

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<p>following positions, using carbon steel filler metal:</p> <ul style="list-style-type: none"> <li>• 1G</li> <li>• 2G</li> <li>• 3G</li> <li>• 4G</li> </ul>			<p>concern for quality</p> <p>7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</p> <p><b>C. A creative and practical problem solver who:</b></p> <p>1. Observes and evaluates situations to define problems</p> <p>6. Uses information and technology to solve problems</p> <p>7. Perseveres in challenging situations</p> <p><b>D. A responsible and involved citizen who:</b></p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>6. Demonstrates awareness of personal and community health and wellness</p> <p><b>E. An integrative and informed thinker who:</b></p> <p>1. Gains and applies knowledge across disciplines and learning contexts and to real-life situations with and without technology</p> <p>2. Evaluates and synthesizes information from multiple sources</p>