

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

Welding; CIP: 48.0508
American Welding Society AWS: Framework, Duties and Tasks
Intersections with
Maine College and Career Readiness-Mathematics Standards

<p align="center">Welder: Duties, Skills, and Tasks</p>	<p align="center">Mathematics Content Standards and The Eight Mathematical Practices (CCSS)</p>	<p align="center">Demonstration of Proficiency (Possible Evidence, Project, Performance Assessment, Certification etc.)</p>	<p align="center">Maine Learning Results- Guiding Principles, and Career and Education Development</p>
<p>1. Occupational Orientation</p>			
<p>a. Prepare time or job cards, reports or records. b. Perform house keeping duties. c. Follow verbal instructions to complete work assignments. d. Follow written instructions to complete work assignments.</p>	<p>(a) Math.F-BF.A.1a: Determine an explicit expression, a recursive process, or steps for calculation from a context.</p>	<p>Worksheet, journal, report</p>	<p align="center">Guiding Principles</p> <p>A. A clear and effective communicator who: 2. Uses evidence and logic appropriately in communication. 4. Adjusts communication based on the audience</p> <p>B. A self-directed and lifelong learner who: 1. Recognizes the need for information and locates and evaluates resources 4. Demonstrates initiative and independence 6. Demonstrates reliability and concern for quality</p> <p>C. A creative and practical problem solver who: 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems</p> <p>D. A responsible and involved citizen who: 2. Accepts responsibility for personal decisions and actions 3. Demonstrates ethical behavior and the moral courage to sustain it.</p>

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			<p align="center">Career and Education Development</p> <p>A3 Interpersonal Skills A4 Career and Life Roles B2 Skills for Individual/Personal Success in the 21st Century B3 Education and Career Information C1 The Planning Process C2 Decision-Making C3 Influences on Decision-Making C4 Societal Needs and Changes that Influence Workplace Success</p>
<p>2. Safety and Health of Welders</p>			
<p>a. Demonstrate proper use and inspection of Personal Protection Equipment (PPE).</p> <p>b. Demonstrate proper safe operation practices in the work area.</p> <p>c. Demonstrate proper use and inspection of ventilation equipment.</p> <p>d. Demonstrate proper Hot Zone operation.</p> <p>e. Demonstrate proper work actions for working in confined spaces.</p> <p>f. Demonstrate proper use of precautionary labeling and MSDS information.</p> <p>g. Demonstrate proper</p>	<p align="center">NA</p>		<p align="center">Guiding Principles</p> <p>A. A clear and effective communicator who:</p> <ol style="list-style-type: none"> 2. Uses evidence and logic appropriately in communication 3. Adjusts communication based on the audience 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) <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 1. Recognizes the need for information and locates and evaluates resources 2. Applies knowledge to set goals and make informed decisions 4. Demonstrates initiative and independence 5. Demonstrates flexibility including the ability to learn, unlearn and relearn 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with

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<p>inspection and operation of equipment used for each required welding and thermal cutting process (This is best done as a part of the process module/unit for each of the required welding and thermal cutting processes).</p>			<p>individuals from diverse backgrounds</p> <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 5. Sees opportunities, finds resources and seeks results 6. Uses information and technology to solve problems <p>D. A responsible and involved citizen who:</p> <ol style="list-style-type: none"> 2. Frames questions, makes predictions and designs data/information collection and analysis strategies 3. Identifies patterns, trends and relationships that apply to solutions 6. Uses information and technology to solve problems <p>E. An integrative and informed thinker who:</p> <ol style="list-style-type: none"> 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 <hr/> <p align="center">Career and Education Development</p> <p>A1 Self-Knowledge and Self-Concept A2 Beliefs and Behaviors that Lead to Success A3 Interpersonal Skills A4 Career and Life Roles B2 Skills for Individual/Personal Success in the 21st Century B3 Education and Career Information C1 The Planning Process</p>

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			C2 Decision-Making C3 Influences on Decision-Making
3. Drawing and Welding Symbol Interpretation			
<p>a. Interpret basic elements of a drawing or sketch.</p> <p>b. Interpret welding symbols information.</p> <p>c. Fabricate parts from a drawing or sketch.</p>	<p>(a, c) Math.G-MG.A.1: Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*</p> <p>(a, c) Math.G-MG.A.3: Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize costs; working with typographic grid systems based on ratios).*</p> <p>(a, c) Math.MP.1-8 : (1) Make sense of problems and persevere in solving them. (2) Reason abstractly</p>	<p>Worksheets on blueprint and symbol readings.</p> <p>Evaluate the fabrication. (weldment)</p>	<p style="text-align: center;">Guiding Principles</p> <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 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 concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds learner <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <p>D. A responsible and involved citizen who:</p> <ol style="list-style-type: none"> 2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <p>E. An integrative and informed thinker who:</p> <ol style="list-style-type: none"> 1. Gains and applies knowledge across disciplines

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	and quantitatively (3) Construct viable arguments and critique the reasoning of others. (4) Model with mathematics. (5) Use appropriate tools strategically. (6) Attend to precision. (7) Look for and make use of structure. (8) Look for and express regularity in repeated reasoning.		and learning contexts and to real-life situations with and without technology 2. Evaluates and synthesizes information from multiple sources <hr/> Career and Education Development A2 Beliefs and Behaviors that Lead to Success A3 Interpersonal Skills A4 Career and Life Roles B2 Skills for Individual/Personal Success in the 21 st Century B3 Education and Career Information C1 The Planning Process C2 Decision-Making C3 Influences on Decision-Making
4. Shielded Metal Arc Welding (SMAW)			
a. Perform safety inspections of SMAW equipment and accessories. b. Make minor external repairs to SMAW equipment and accessories. c. Set up for SMAW operations on carbon steel. d. Operate SMAW equipment on carbon steel. e. Make fillet welds in all positions on carbon steel. f. Make groove welds in all positions on carbon steel.	NA		Guiding Principles B. A self-directed and lifelong learner who: 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 concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds

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<p>g. Pass SMAW welder performance qualification test (2G and 3G, uphill, limited thickness test plates) on carbon steel.</p>			<p>C. A creative and practical problem solver who: 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems 7. Perseveres in challenging situations</p> <p>D. A responsible and involved citizen who: 2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness</p> <p>E. An integrative and informed thinker who: 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</p> <hr/> <p align="center">Career and Education Development</p> <p>A2 Beliefs and Behaviors that Lead to Success A3 Interpersonal Skills A4 Career and Life Roles B2 Skills for Individual/Personal Success in the 21st Century B3 Education and Career Information C1 The Planning Process C2 Decision-Making C3 Influences on Decision-Making</p>

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5. Gas Metal Arc Welding (GMAW-S, SMAW Spray Transfer)			
<ul style="list-style-type: none"> a. Perform safety inspections of GMAW equipment and accessories. b. Make minor external repairs to GMAW equipment and accessories. c. Short Circuiting Transfer: Set up for GMAW-S operations on carbon steel. d. Short Circuiting Transfer: Operate GMAW-S equipment on carbon steel. e. Short Circuiting Transfer: Make fillet welds in all positions on carbon steel. f. Short Circuiting Transfer: Make groove welds in all positions on carbon steel. g. Short Circuiting Transfer: Pass GMAW-S welder performance qualification test on carbon steel. h. Spray Transfer: Set up for GMAW (spray) operations on carbon steel. i. Spray Transfer: Operate GMAW (spray) 	NA		<p style="text-align: center;">Guiding Principles</p> <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 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 concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve problems 7. Perseveres in challenging situations <p>D. A responsible and involved citizen who:</p> <ol style="list-style-type: none"> 2. Accepts responsibility for personal decisions and actions 6. Demonstrates awareness of personal and community health and wellness <p>E. An integrative and informed thinker who:</p> <ol style="list-style-type: none"> 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

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<p>j. equipment on carbon steel. Spray Transfer: Make fillet welds in the 1F and 2F positions on carbon steel.</p> <p>k. Spray Transfer: Make groove welds in the 1G position on carbon steel.</p> <p>l. Spray Transfer: Pass GMAW (spray) welder performance qualification test on carbon steel.</p>			<p>multiple sources</p> <hr/> <p align="center">Career and Education Development</p> <p>A2 Beliefs and Behaviors that Lead to Success A3 Interpersonal Skills A4 Career and Life Roles B2 Skills for Individual/Personal Success in the 21st Century B3 Education and Career Information C1 The Planning Process C2 Decision-Making C3 Influences on Decision-Making</p>
<p>6. Flux Cored Arc Welding (FCAW-G/GM, FCAW-S)</p>			
<p>a. Perform safety inspections of FCAW equipment and accessories.</p> <p>b. Make minor external repairs to FCAW equipment and accessories.</p> <p>c. <i>Gas Shielded</i>: Set up for FCAW-G/GM operations on carbon steel.</p> <p>d. <i>Gas Shielded</i>: Operate FCAW-G/GM equipment on carbon steel.</p> <p>e. <i>Gas Shielded</i>: Make fillet welds in all positions on carbon steel.</p> <p>f. <i>Gas Shielded</i>: Make groove welds in all positions on carbon steel.</p> <p>g. <i>Gas Shielded</i>: Pass FCAW-</p>	<p>NA</p>		<p align="center">Guiding Principles</p> <p>B. A self-directed and lifelong learner who:</p> <ol style="list-style-type: none"> 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 concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds <p>C. A creative and practical problem solver who:</p> <ol style="list-style-type: none"> 1. Observes and evaluates situations to define problems 6. Uses information and technology to solve

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<p>G/GM welder performance qualification test on carbon steel.</p> <p>h. <i>Self-Shielded</i>: Set up for FCAW-S operations on carbon steel.</p> <p>i. <i>Self-Shielded</i>: Operate FCAW-S equipment on carbon steel.</p> <p>j. <i>Self-Shielded</i>: Make fillet welds in all positions on carbon steel.</p> <p>k. <i>Self-Shielded</i>: Make groove welds in all positions on carbon steel.</p> <p>l. <i>Self-Shielded</i>: Pass FCAW-S welder performance qualification test on carbon steel.</p>			<p>problems</p> <p>7. Perseveres in challenging situations</p> <p>D. A responsible and involved citizen who:</p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>6. Demonstrates awareness of personal and community health and wellness</p> <p>E. An integrative and informed thinker who:</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> <hr/> <p>Career and Education Development</p> <p>A2 Beliefs and Behaviors that Lead to Success</p> <p>A3 Interpersonal Skills</p> <p>A4 Career and Life Roles</p> <p>B2 Skills for Individual/Personal Success in the 21st Century</p> <p>B3 Education and Career Information</p> <p>C1 The Planning Process</p> <p>C2 Decision-Making</p> <p>C3 Influences on Decision-Making</p>
7. Gas Tungsten Arc Welding (GTAW)			
<p>a. Perform safety inspections of GTAW equipment and accessories.</p> <p>b. Make minor external repairs to GTAW equipment and accessories.</p>	<p>NA</p>		<p>Guiding Principles</p> <p>B. A self-directed and lifelong learner who:</p> <p>1. Recognizes the need for information and locates and evaluates resources</p> <p>2. Applies knowledge to set goals and make informed decisions</p>

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<p>c. <i>Carbon Steel:</i> Set up for GTAW operations on carbon steel.</p> <p>d. <i>Carbon Steel:</i> Operate GTAW equipment on carbon steel.</p> <p>e. <i>Carbon Steel:</i> Make fillet welds in all positions on carbon steel.</p> <p>f. <i>Carbon Steel:</i> Make groove welds in all positions on carbon steel.</p> <p>g. <i>Carbon Steel:</i> Pass GTAW welder performance qualification test on carbon steel.</p> <p>h. <i>Austenitic Stainless Steel:</i> Set up for GTAW operations on austenitic stainless steel.</p> <p>i. <i>Austenitic Stainless Steel:</i> Operate GTAW equipment on austenitic stainless steel.</p> <p>j. <i>Austenitic Stainless Steel:</i> Make fillet welds in the 1F, 2F and 3F positions on austenitic stainless steel.</p> <p>k. <i>Austenitic Stainless Steel:</i> Make groove welds in the 1G and 2G positions on austenitic stainless steel.</p> <p>l. <i>Austenitic Stainless Steel:</i></p>			<p>3. Applies knowledge in new contexts</p> <p>4. Demonstrates initiative and 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>C. A creative and practical problem solver who:</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>D. A responsible and involved citizen who:</p> <p>2. Accepts responsibility for personal decisions and actions</p> <p>6. Demonstrates awareness of personal and community health and wellness</p> <p>E. An integrative and informed thinker who:</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> <hr/> <p style="text-align: center;">Career and Education Development</p> <p>A2 Beliefs and Behaviors that Lead to Success</p> <p>A3 Interpersonal Skills</p> <p>A4 Career and Life Roles</p> <p>B2 Skills for Individual/Personal Success in the 21st Century</p>

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<p>Pass GTAW welder performance qualification test on austenitic stainless steel.</p> <p>m. <i>Aluminum</i>: Set up for GTAW operations on aluminum.</p> <p>n. <i>Aluminum</i>: Operate GTAW equipment on aluminum.</p> <p>o. <i>Aluminum</i>: Make fillet welds in the 1F and 2F positions on aluminum.</p> <p>p. <i>Aluminum</i>: Make groove welds in the 1G position on aluminum.</p> <p>q. <i>Aluminum</i>: Pass GTAW welder performance qualification test on aluminum.</p>			<p>B3 Education and Career Information</p> <p>C1 The Planning Process</p> <p>C2 Decision-Making</p> <p>C3 Influences on Decision-Making</p>
8. Thermal Cutting Processes			
<p>a. <i>Manual Oxyfuel Cutting (OFC)</i>: Perform safety inspections of manual OFC equipment and accessories.</p> <p>b. <i>Manual Oxyfuel Cutting (OFC)</i>: Make minor external repairs to manual OFC equipment and accessories.</p> <p>c. <i>Manual Oxyfuel Cutting (OFC)</i>: Set up for manual OFC operations on carbon steel.</p>	<p>NA</p>		<p>Career and Education Development</p> <p>A2 Beliefs and Behaviors that Lead to Success</p> <p>A3 Interpersonal Skills</p> <p>A4 Career and Life Roles</p> <p>B2 Skills for Individual/Personal Success in the 21st Century</p> <p>B3 Education and Career Information</p> <p>C1 The Planning Process</p> <p>C2 Decision-Making</p> <p>C3 Influences on Decision-Making</p>

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<p>d. <i>Manual Oxyfuel Cutting (OFC)</i>: Operate manual OFC equipment on carbon steel.</p> <p>e. <i>Manual Oxyfuel Cutting (OFC)</i>: Perform straight, square edge cutting operations in the flat and horizontal positions on carbon steel.</p> <p>f. <i>Manual Oxyfuel Cutting (OFC)</i>: Perform shape, square edge cutting operations in the flat and horizontal positions on carbon steel.</p> <p>g. <i>Manual Oxyfuel Cutting (OFC)</i>: Perform straight, bevel edge cutting operations in the flat and horizontal positions on carbon steel.</p> <p>h. <i>Manual Oxyfuel Cutting (OFC)</i>: Perform scarfing and gouging operations to remove base and weld metal, in the flat and horizontal positions on carbon steel.</p> <p>i. <i>Mechanized Oxyfuel Cutting (OFC)</i> (e.g., <i>Track Burner</i>): Perform safety</p>			

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<p>inspections of mechanized OFC equipment and accessories.</p> <p>j. <i>Mechanized Oxyfuel Cutting</i>: Make minor external repairs to mechanized OFC equipment and accessories.</p> <p>k. <i>Mechanized Oxyfuel Cutting</i>: Set up for mechanized OFC operations on carbon steel.</p> <p>l. <i>Mechanized Oxyfuel Cutting</i>: Operate mechanized OFC equipment on carbon steel.</p> <p>m. <i>Mechanized Oxyfuel Cutting</i>: Perform straight, square edge cutting operations in the flat position on carbon steel.</p> <p>n. <i>Mechanized Oxyfuel Cutting</i>: Perform straight, bevel edge cutting operations in the flat position on carbon steel.</p> <p>o. <i>Manual Plasma Arc Cutting (PAC)</i>: Perform safety inspections of manual PAC equipment and accessories.</p> <p>p. <i>Manual Plasma Arc Cutting</i>: Make minor external repairs</p>			

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<p>to manual PAC equipment and accessories.</p> <p>q. <i>Manual Plasma Arc Cutting:</i> Set up for manual PAC operations on carbon steel, austenitic stainless steel and aluminum.</p> <p>r. <i>Manual Plasma Arc Cutting:</i> Operate manual PAC equipment on carbon steel, austenitic stainless steel, and aluminum.</p> <p>s. <i>Manual Plasma Arc Cutting:</i> Perform straight, square edge cutting operations in the flat and horizontal positions on carbon steel, austenitic stainless steel and aluminum.</p> <p>t. <i>Manual Plasma Arc Cutting:</i> Perform shape, square edge cutting operations in the flat and horizontal positions on carbon steel, austenitic stainless steel and aluminum.</p> <p>u. <i>Manual Air Carbon Arc Cutting (CAC-A):</i> Perform safety inspections of manual CAC-A equipment and accessories.</p> <p>v. <i>Manual Air Carbon Arc</i></p>			

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<p><i>Cutting:</i> Make minor external repairs to manual CAC-A equipment and accessories.</p> <p>w. <i>Manual Air Carbon Arc Cutting:</i> Set up for manual CAC-A scarfing and gouging operations on carbon steel.</p> <p>x. <i>Manual Air Carbon Arc Cutting:</i> Operate manual CAC-A equipment on carbon steel.</p> <p>y. <i>Manual Air Carbon Arc Cutting:</i> Perform scarfing and gouging operations to remove base and weld metal in the flat and horizontal positions on carbon steel.</p>			
<p>9. Welding Inspection and Testing</p>			
<p>a. Examine cut surfaces and edges of prepared base metal parts.</p> <p>b. Examine tacks, root passes, intermediate layers and completed welds.</p>			<p style="text-align: center;">Guiding Principles</p> <p>A. A clear and effective communicator who:</p> <p>2. Uses evidence and logic appropriately in communication</p> <p>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)</p> <p>B. A self-directed and lifelong learner who:</p> <p>2. Applies knowledge to set goals and make informed decisions</p>

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			<p>4. Demonstrates initiative and independence 6. Demonstrates reliability and concern for quality 7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds</p> <p>C. A creative and practical problem solver who: 1. Observes and evaluates situations to define problems</p> <p>D. A responsible and involved citizen who: 2. Accepts responsibility for personal decisions and actions 3. Demonstrates ethical behavior and the moral courage to sustain it. 6. Demonstrates awareness of personal and community health and wellness</p> <p>E. An integrative and informed thinker who: 2. Evaluates and synthesizes information from multiple sources 4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes</p> <hr/> <p style="text-align: center;">Career and Education Development</p> <p>A2 Beliefs and Behaviors that Lead to Success A3 Interpersonal Skills A4 Career and Life Roles B2 Skills for Individual/Personal Success in the 21st Century B3 Education and Career Information C1 The Planning Process C2 Decision-Making C3 Influences on Decision-Making</p>

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