

**COURSE FAB3170: GAS METAL ARC WELDING 2****Level:** Advanced**Theme:** Fabrication Processes**Prerequisite:** FAB2070 Gas Metal Arc Welding 1**Description:** Students develop skills to evaluate and improve the quality of gas metal arc weldings, and they extend their gas metal arc welding (GMAW) skills by performing horizontal and vertical groove welds.**Parameters:** Access to a fabrication work centre complete with gas metal arc welding (GMAW) equipment and supplies, and to instruction from an individual with welding trade qualifications.**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>identify variables that affect the quality of gas metal arc welds, and identify strategies to evaluate and improve weld quality</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>assessment, based on trade standards, of a gas metal arc weld; assessment to focus attention on: <ul style="list-style-type: none"> <li>variables affecting weld quality</li> <li>possible causes of observed defects</li> <li>corrective measures to improve weld quality</li> </ul> </li> </ul> <p><i>Assessment Tools</i>  <i>Fabrication Process: Fillet and Butt Welding on Mild Steel, FAB3170-1</i>  <i>Illustrative Example:</i>  <i>Horizontal Single Vee Butt Joint Weld, FAB3170-2</i></p> <p><i>Standard</i>  <i>Performance rating of 3 for each applicable task</i></p>	10
<ul style="list-style-type: none"> <li>perform safe set-up, maintenance and troubleshooting procedures with GMAW equipment</li> </ul>	<ul style="list-style-type: none"> <li>demonstration of safe start-up, shut-down, maintenance and troubleshooting procedures, using GMAW equipment</li> </ul> <p><i>Assessment Tools</i>  <i>Equipment Checklist: GMAW Start-Up and Shut-Down Procedures, FABEQUIP-6</i></p> <p><i>Standard</i>  <i>All procedures to be performed correctly</i></p>	10



**COURSE FAB3170: GAS METAL ARC WELDING 2 (continued)**

Concept	Specific Outcomes	Notes
<p>Orientation</p> <ul style="list-style-type: none"> <li>• Health and Safety</li> <li>• GMAW Variables</li> <li>• Gas Mixtures</li> <li>• Filler Metals</li> <li>• Arc Control</li> </ul>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• describe safety issues related to:               <ul style="list-style-type: none"> <li>– the use of personal protective equipment</li> <li>– handling and storage of consumables</li> <li>– keeping the welding area free of hazards</li> <li>– insuring adequate ventilation</li> </ul> </li> <li>• describe a safety plan in case of accident</li> <li>• identify the variables that can directly affect weld quality; i.e.:               <ul style="list-style-type: none"> <li>– the welding current and voltage</li> <li>– type of shielding gas/flux</li> <li>– diameter and type of filler metal</li> <li>– type and condition of equipment</li> <li>– welding technique</li> </ul> </li> <li>• select the appropriate shielding gas mixture based on:               <ul style="list-style-type: none"> <li>– mode of metal transfer</li> <li>– base metal type and thickness</li> <li>– joint design</li> <li>– filler material</li> <li>– desired weld quality</li> </ul> </li> <li>• describe how to select the type and size of filler metal</li> <li>• explain how to avoid contamination of filler materials</li> <li>• identify the relationship between:               <ul style="list-style-type: none"> <li>– wire speed and amperage</li> <li>– welding voltage and arc length</li> </ul> </li> <li>• describe the effects of:               <ul style="list-style-type: none"> <li>– backhand or pull welding</li> <li>– forehand or push welding</li> </ul> </li> <li>• describe the effects of torch angle on:               <ul style="list-style-type: none"> <li>– weld penetration</li> <li>– weld appearance</li> </ul> </li> </ul>	<p>Explain how the following affect weld quality:</p> <ul style="list-style-type: none"> <li>• voltage</li> <li>• amperage</li> <li>• polarity</li> <li>• electrode extension.</li> </ul> <p>Discuss the properties and uses of:</p> <ul style="list-style-type: none"> <li>• inert gases; e.g., argon, helium</li> <li>• reactive gases; e.g., carbon dioxide, oxygen, hydrogen, nitrogen</li> <li>• shielding gas mixes; e.g., argon-oxygen, argon-carbon dioxide, argon-helium, argon-helium-carbon dioxide, argon-carbon dioxide-hydrogen.</li> </ul> <p>Demonstrate backhand and forehand welding techniques.</p>

**COURSE FAB3170: GAS METAL ARC WELDING 2 (continued)**

Concept	Specific Outcomes	Notes
<p>Planning and Management</p> <ul style="list-style-type: none"> <li>• Equipment Set-up</li> <li>• Preparation</li> <li>• Equipment Maintenance/Repair</li> </ul>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• apply safe work practices and procedures to:               <ul style="list-style-type: none"> <li>– select and use appropriate personal protective equipment</li> <li>– maintain a clean and tidy work station</li> <li>– demonstrate safe tool/material handling and storage techniques</li> </ul> </li> <li>• for a given type of weld and/or weldment, select the appropriate:               <ul style="list-style-type: none"> <li>– wire type, size and feed rate</li> <li>– current</li> <li>– shielding gas type and flow rate</li> </ul> </li> <li>• select the proper fit-up for a given weld</li> <li>• prepare and clean all surfaces to be welded</li> <li>• properly position metal for welding</li> <li>• perform maintenance required for wire drive systems and gun assemblies</li> <li>• diagnose and demonstrate corrective measures for malfunctioning GMAW equipment</li> </ul>	
<p>Implementation</p> <ul style="list-style-type: none"> <li>• Gas Metal Arc Welding</li> <li>• Troubleshooting</li> </ul>	<ul style="list-style-type: none"> <li>• demonstrate safe GMAW techniques and perform groove welds in the horizontal and vertical positions on mild steel plate</li> <li>• describe corrective actions that can be taken to avoid:               <ul style="list-style-type: none"> <li>– surface porosity</li> <li>– subsurface porosity</li> <li>– lack of fusion</li> <li>– burn through</li> <li>– lack of penetration</li> <li>– coldlapping</li> </ul> </li> <li>• identify problems common to out of position welding</li> </ul>	



