**Student’s Name __________ ADVANCED WELDING AG 211**

**Directions:** Evaluate the trainee using the rating scale below and check the appropriate number to indicate the degree of competency achieved. The numerical rating of 3, 2, 1 and 0 are not intended to represent the traditional school grading system of A, B, C, D and F. The descriptions associated with each of the numbers focus on level of student performance for each of the tasks listed below.

**Rating Scale:**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No exposure – no information nor practice provided during training program, complete training required.</td>
</tr>
<tr>
<td>1</td>
<td>Exposure only – general information provided with no practice time, close supervision needed and additional training required.</td>
</tr>
<tr>
<td>2</td>
<td>Moderately Skilled – has performed independently during training program, limited additional training may be required.</td>
</tr>
<tr>
<td>3</td>
<td>Skilled – can perform independently with no additional training.</td>
</tr>
</tbody>
</table>

1. **Number of Competencies Evaluated** ______
2. **Number of Competencies Rated 2 or 3** ______
3. **Percent of Competencies Attained (2/1)** ______

**Grade**

______

Instructor Signature Date

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### 01.0 Introduction

The student will be able to:

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Task Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.01</td>
<td>Discuss the role welding plays in the manufacture of modern products today.</td>
</tr>
<tr>
<td>01.02</td>
<td>Explain the primary steps used in welding fabrications.</td>
</tr>
<tr>
<td>01.03</td>
<td>Describe the most popular welding and cutting processes.</td>
</tr>
<tr>
<td>01.04</td>
<td>Discuss the importance of careful and accurate part assembly for welding fabrication.</td>
</tr>
<tr>
<td>01.05</td>
<td>List the types of jobs available in the welding industry.</td>
</tr>
<tr>
<td>01.06</td>
<td>Convert from standard units to metric (SI) units and from SI units to standard units.</td>
</tr>
</tbody>
</table>

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### 02.0 Welding Safety

The student will be able to:

<table>
<thead>
<tr>
<th>Task Number</th>
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</tr>
</thead>
<tbody>
<tr>
<td>02.01</td>
<td>Explain how to work safely.</td>
</tr>
<tr>
<td>02.02</td>
<td>Identify each degree of burn and describe how to provide first aid.</td>
</tr>
<tr>
<td>02.03</td>
<td>List the types of protective clothing a welder should wear.</td>
</tr>
<tr>
<td>02.04</td>
<td>Explain the importance of proper ventilation and respiratory protection.</td>
</tr>
<tr>
<td>02.05</td>
<td>Describe how to safely lift, climb, and handle materials.</td>
</tr>
<tr>
<td>02.06</td>
<td>Demonstrate electrical safety.</td>
</tr>
</tbody>
</table>
03.0 Shop Math
The student will be able to:
0 1 2 3
03.01 Solve basic welding fabrication math problems
03.02 Round numbers
03.03 Convert mixed units, fractions, and decimal fractions
03.04 Reduce fractions and decimal fractions

04.0 Reading Technical Drawings
The student will be able to:
0 1 2 3
04.01 Explain the purpose of a set of drawings and what information is contained on them
04.02 Identify 10 types of lines used on mechanical drawings
04.03 Describe what mechanical and pictorial drawings are
04.04 Name the various special views that can be shown on drawings
04.05 Explain dimensioning on drawings
04.06 Discuss how a drawing can be scaled
04.07 Compare sketches and mechanical drawings
04.08 Demonstrate the ability to make a sketched mechanical drawing
04.09 Illustrate how to use graph paper to make a scaled mechanical drawing
04.10 List the advantages of using computer-aided drafting software to make mechanical drawings

05.0 Welding Joint Design, Welding Symbols
The student will be able to:
0 1 2 3
05.01 Sketch the five basic welding joints
05.02 Explain the factors that must be considered when choosing a weld joint design
05.03 List and explain five ways that forces cause stress in welds
05.04 Discuss the factors to consider when selecting a weld joint design
05.05 List and explain the information that can be included on a welding symbol
05.06 Describe the various types of welds
05.07 Sketch a welding symbol and identify the components

07.0 Welding Shop Practices
The student will be able to:
0 1 2 3
07.01 Discuss job skills that will help ensure that a welder will be a more valuable employee
07.02 Explain why materials should be used efficiently
07.03 Give examples of ways to conserve metal
07.04 Tell how to conserve electrical energy in a welding shop
07.05 Explain why welding shops should recycle scrap metal
07.06 Tell what can be done to ensure the safe operation of equipment in the shop
07.07 Recognize hand signals used to communicate with crane operators

06.0 Fabricating Techniques and Practices
The student will be able to:
0 1 2 3
06.01 Explain the various safety issues related to fabrication
06.02 List the advantages of using preformed parts for fabrications
06.03 List the advantages of using custom fabrication parts
06.04 Demonstrate an understanding of the proper placement of tack welds
06.05 Demonstrate the use of location and alignment points when assembling a project
06.06 Explain how to adjust parts to meet the tolerance
06.07 Describe how to control weld distortion
06.08 Lay out and trace parts
06.09 Identify common sizes and shapes of metals used in weldments
06.10 Describe how to assemble and fit up parts for welding
**08.0 Shielded Metal Arc Equipment, Setup, and Operation**
The student will be able to:

- Describe the shielded metal arc welding process
- List the three units used to describe an electric current and tell how they affect SMA welding
- List the three types of welding current used in SMA welding
- Describe how open-circuit and closed-circuit voltage affect SMA welding
- Describe the force that causes arc blow and explain how it can be controlled
- Explain how each type of welding power source produces the welding current
- Determine the duty cycle for any given welder and amperage setting
- Demonstrate how to set up a welding workstation

**10.0 Shielded Metal Arc Welding Pipe**
The student will be able to:

- Explain the difference between how pipe and tubing are used
- Explain the difference between pipe used for piping systems versus pipe used for structural applications
- Demonstrate welding fabrication skills
- Demonstrate welding skills by making square butt and grooved pipe welds in the 1G, 2G and 5G positions

**09.0 Shielded Metal Arc Welding Plate**
The student will be able to:

- Demonstrate the safe way to set up a welding station
- Explain the differences among F2, F3, and F4 electrodes
- Demonstrate welding fabrication skills
- Demonstrate welding skills by making square butt, outside corner, lap, and tee joints

**11.0 Gas Metal Arc Welding Equipment and Materials**
The student will be able to:

- Explain the gas metal arc (GMA) welding process and discuss its advantages
- Explain the purpose of a shielding gas and how it is delivered to the weld
- Identify the various components that make up a GMA welding station
- Define the common electrical terms associated with a welding power supply
- Describe the path that the electrical current takes in the welding process
- Compare the four major types of wire feed systems
- List the parts of a GMAW gun and describe how it works
- State the most commonly used shielding gases and gas blends and what factors should be considered when choosing one
- Choose the correct gas flow rate using welding guides
- Describe the four modes of metal transfer and what factors should be considered when selecting one
- Discuss the various features of GMAW electrics, including sizes, coatings, cast and helix and the proper handling of the electrodes
- Explain the meaning of the letters and numbers in the American Welding Society (AWS) GMAW electrode classification code
- Demonstrate how to properly set up a GWA welding installation
- Demonstrate how to properly thread an electrode wire through a welding installation

**12.0 Gas Metal Arc Welding**
The student will be able to:

- Explain the relationship between the wire feed space and the amperage when GMA welding
- Demonstrate how to do a wire feed speed test
- Describe the effect that electrode manipulation has on the weld
- Describe how changes in electrode extension affect the weld bead
- Demonstrate the safe way to prepare a GMA welding workstation for welding
- Describe how changing the welding gun angle changes a weld bead
- Demonstrate how to make a tack weld
13.0 Flux Cored Arc Welding Equipment and Materials
The student will be able to:
0 1 2 3
13.01 Describe the two methods of flux cored arc (FCA) welding
13.02 Explain voltage and amperage characteristics of FCA welding machines
13.03 State the advantages and limitations of FCA welding
13.04 Explain the effects of travel speed, gun angle, and electrode extension on FCA welding

14.0 Flux Cored Arc Welding
The student will be able to:
0 1 2 3
14.01 Describe the effect that changing electrode extension, voltage and wire feed speed has on flux core arc (FCA) welding
14.02 Demonstrate how to safely set up and adjust an FCA welder
14.03 Demonstrate how to make FCA welds

15.0 Gas Tungsten Arc Welding Equipment and Materials
The student will be able to:
0 1 2 3
15.01 Demonstrate how to set up a gas tungsten arc welding station
15.02 Identify different types of tungsten electrodes and explain their uses
15.03 List the different GTA welding currents and explain their effects on welding
15.04 List the different GTA welding shielding gases and explain how they are used

16.0 Gas Tungsten Arc Welding
The student will be able to:
0 1 2 3
16.01 Explain how the tungsten tip shape and varying the welding technique affect the weld bead’s width and penetration
16.02 Describe carbide precipitation and explain how it can be controlled
16.03 Describe how the characteristics of aluminum can affect how it is welded
16.04 Demonstrate how to set up a gas tungsten arc welder
16.05 Demonstrate how to make GTA welds on mild steel, stainless steel, and aluminum

17.0 Oxyfuel Welding and Cutting Equipment, Setup, and Operation
The student will be able to:
0 1 2 3
17.01 Identify all of the components and equipment found in a typical oxyfuel welding station
17.02 Demonstrate the proper assembly, testing, lighting, adjusting, and disassembling of an oxyfuel system
17.03 List the proper safety procedures for setting up and operating an oxyfuel system

18.0 Oxyacetylene Welding
The student will be able to:
0 1 2 3
18.01 Discuss the uses of oxyacetylene welding and its advantages and disadvantages
18.02 List factors that affect the world
18.03 Discuss some commonly occurring problems associated with oxyacetylene welding
18.04 Explain what factors are affected by adjusting the flame on mild steel
18.05 Tell how changes in the torch angle and torch height affect the molten weld pool
18.06 Demonstrate tack welds and weld beads
18.07 Make welds on outside corner joints, butt joints, lap joints in the horizontal position, tee joints in the flat position, and vertical outside corner joints
19.0 **Soldering, Brazing, and Braze Welding Processes**
The student will be able to:

19.01 Compare the difference between soldering and brazing
19.02 List the advantages of soldering and or brazing
19.03 Explain tensile strength, shear strength, ductility, fatigue resistance, and corrosion resistance as they relate to the strength of a joint
19.04 Explain why flux is used in soldering and brazing
19.05 Discuss the advantages and disadvantages of the five methods of heating material for soldering or brazing
19.06 Describe what factors must be considered when selecting a filler metal
19.07 Discuss the applications for common soldering and brazing alloys
19.08 Describe the preparation needed for a part before it is soldered or brazed

21.0 **Oxyacetylene Cutting**
The student will be able to:

21.01 Demonstrate the proper and safe method of setting up cylinders, regulators, hoses, and the cutting torch
21.02 Demonstrate how to maintain a cutting tip and torch
21.03 Demonstrate how to light a torch, adjust it, and make a cut
21.04 Describe a good oxyacetylene cut
21.05 Discuss safety procedures to be followed when oxyfuel cutting

23.0 **Arc Cutting, Gouging, and Related Cutting Processes**
The student will be able to:

23.01 Describe the different types of lasers used for cutting,

25.0 **Welding Automation and Robotics**
The student will be able to:

25.01 Describe the manual, semiautomatic, machine, automatic, and automated joining processes
25.02 Explain the role that the welder plays in the operation of the manual, semiautomatic, machine, automatic, and automated joining processes
25.03 Give examples of the types of applications the manual, semiautomatic, machine, automatic, and automated joining processes are used for

24.0 **Other Welding Processes**
The student will be able to:

24.01 Describe how resistance, ultrasonic, inertia, laser beam, plasma arc, and stud welding processes work
24.02 Describe the different applications of hardfacing
24.03 List some of the applications or uses for resistance, ultrasonic, inertia, laser beam, plasma arc, and stud welding processes

25.0 **Welding Automation and Robotics**
The student will be able to:

25.01 Describe the manual, semiautomatic, machine, automatic, and automated joining processes
25.02 Explain the role that the welder plays in the operation of the manual, semiautomatic, machine, automatic, and automated joining processes
25.03 Give examples of the types of applications the manual, semiautomatic, machine, automatic, and automated joining processes are used for

26.0 **Filler Metal Selection**
The student will be able to:

26.01 Explain various identification systems for filler metals
26.02 List what technical information is provided by electrode manufacturers and how this information can be used by a welder
26.03 Describe the parts of an shielded metal arc welding electrode and their function
26.04 Name some of the factors to consider when selecting an SMAW filler metal
27.0 Welding Metallurgy
The student will be able to:

0 1 2 3
27.01 Explain why it is important to understand the properties of the materials being welded
27.02 Explain the importance of preheating and post heating
27.03 Describe what happens when metal is cooled too quickly
27.04 Describe the mechanical properties of metals
27.05 Explain the heat-affected zone’s effect on metal

28.0 Weldability of Metals
The student will be able to:

0 1 2 3
28.01 Describe the problems that can occur when metal is not properly preheated and or postheated
28.02 Explain the effect that the amount of carbon in a metal has on its properties and weldability
28.03 Describe the procedure that must be followed to repair cast iron with arc welding and brazing
28.04 Describe the properties of aluminum that make it difficult to weld

29.0 Welder Certification
The student will be able to:

0 1 2 3
29.01 Explain welder qualification and certification
29.02 Outline the steps required to certify a welder
29.03 Make welds that meet a standard
29.04 Explain the information found on a typical welding procedure specification

30.0 Testing and Inspecting Welds
The student will be able to:

0 1 2 3
30.01 Explain the importance of testing and inspecting welds
30.02 Compare mechanical testing to nondestructive testing
30.03 Compare discontinuities and defects
30.04 Describe various weld discontinuities and defects
30.05 List problems caused by the metal being fabricated
30.06 List the various types of tests for weld quality