

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: 0 – No exposure – no information nor practice provided during training program, complete training required.

1 – Exposure only – general information provided with no practice time, close supervision needed and additional training required.

2 – Moderately Skilled – has performed independently during training program, limited additional training may be required

3 – Skilled – can perform independently with no additional training

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

Grade

Instructor Signature

Date

01.0 Introduction

The student will be able to:

0 1 2 3

- 01.01 Discuss the role welding plays in the manufacture of modern products today
- 01.02 Explain the primary steps used in welding fabrications
- 01.03 Describe the most popular welding and cutting processes
- 01.04 Discuss the importance of careful and accurate part assembly for welding fabrication
- 01.05 List the types of jobs available in the welding industry
- 01.06 Convert from standard units to metric (SI) units and from SI units to standard units

02.0 Welding Safety

The student will be able to:

0 1 2 3

- 02.01 Explain how to work safely
- 02.02 Identify each degree of burn and describe how to provide first aid
- 02.03 List the types of protective clothing a welder should wear
- 02.04 Explain the importance of proper ventilation and respiratory protection
- 02.05 Describe how to safely lift, climb, and handle materials
- 02.06 Demonstrate electrical safety

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

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

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

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

08.0Shielded Metal Arc Equipment, Setup, and Operation

The student will be able to:

0 1 2 3

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

10.0Shielded Metal Arc Welding Pipe

The student will be able to:

0 1 2 3

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

12.0Gas Metal Arc Welding

The student will be able to:

0 1 2 3

- 12.01 Explain the relationship between the wire feed space and the amperage when GMA welding
- 12.02 Demonstrate how to do a wire feed speed test
- 12.03 Describe the effect that electrode manipulation has on the weld
- 12.04 Describe how changes in electrode extension affect the weld bead
- 12.05 Demonstrate the safe way to prepare a GMA welding workstation for welding
- 12.06 Describe how changing the welding gun angle changes a weld bead
- 12.07 Demonstrate how to make a tack weld

09.0Shielded Metal Arc Welding Plate

The student will be able to:

0 1 2 3

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

11.0Gas Metal Arc Welding Equipment and Materials

The student will be able to:

0 1 2 3

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

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

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

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

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 cored arc (FCA) welding
- 14.02 Demonstrate how to safely set up and adjust an FCA welder
- 14.03 Demonstrate how to make FCA welds

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

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 weld
- 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:

0 1 2 3

- 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:

0 1 2 3

- 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:

0 1 2 3

- 23.01 Describe the different types of lasers used for cutting,

25.0 Welding Automation and Robotics

The student will be able to:

0 1 2 3

- 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

20.0 Soldering and Brazing

The student will be able to:

0 1 2 3

- 20.01 Compare soldering to brazing processes
- 20.02 State the advantages of soldering and brazing
- 20.03 Demonstrate how to solder
- 20.04 Demonstrate how to braze
- 20.05 Describe techniques for controlling heat from the torch

22.0 Plasma Arc Cutting

The student will be able to:

0 1 2 3

- 22.01 Explain how a plasma arc cutting torch works
- 22.02 Demonstrate how to assemble a plasma arc cutting torch
- 22.03 Demonstrate how to safely set up and use a plasma arc cutting system
- 22.04 Demonstrate how to safely make a variety of cuts using a plasma arc cutting torch
- 22.05 List the common plasma cutting gases and the metals they can be used to cut

24.0 Other Welding Processes

The student will be able to:

0 1 2 3

- 24.01 Describe how resistance, ultrasonic, inertia, laser beam,

26.0 Filler Metal Selection

The student will be able to:

0 1 2 3

- 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

27.0Welding 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

29.0Welder 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

28.0Weldability 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

30.0Testing 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