

CONTENT STANDARD 1.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES**Performance Standard 1.1: Demonstrate General Lab Safety Rules and Procedures**

- 1.1.1 Describe general shop safety rules and procedures (i.e., safety test).
- 1.1.2 Describe OSHA in workplace safety.
- 1.1.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (i.e., personal protection equipment – PPE).
- 1.1.4 Operate lab equipment according to safety guidelines.
- 1.1.5 Identify and use proper lifting procedures and proper use of support equipment (i.e., rigging, chains, straps, cables).
- 1.1.6 Utilize proper ventilation procedures for working within the lab/shop area.
- 1.1.7 Identify marked safety areas.
- 1.1.8 Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
- 1.1.9 Identify the location and use of eye wash stations.
- 1.1.10 Identify the location of the posted evacuation routes.
- 1.1.11 Identify and wear appropriate clothing for lab/shop activities.
- 1.1.12 Secure hair and jewelry for lab/shop activities.
- 1.1.13 Demonstrate knowledge of the safety aspects of high voltage circuits.
- 1.1.14 Locate and interpret safety data sheets (SDS).
- 1.1.15 Perform housekeeping duties.
- 1.1.16 Follow verbal instructions to complete work assignments.
- 1.1.17 Follow written instructions to complete work assignments.
- 1.1.18 Identify requirements for Hot Work Permits.
- 1.1.19 Identify what constitutes a confined space.

Performance Standard 1.2: Identify and Utilize Hand Tools

- 1.2.1 Identify hand tools and their appropriate usage.
- 1.2.2 Identify standard and metric designation.
- 1.2.3 Demonstrate safe handling and use of appropriate tools.
- 1.2.4 Demonstrate proper cleaning, storage, and maintenance of tools.

Performance Standard 1.3: Identify and Utilize Power Tools and Equipment

- 1.3.1 Identify power tools and equipment, and their appropriate usage.
- 1.3.2 Demonstrate safe handling and use of appropriate power tools and equipment.
- 1.3.3 Demonstrate proper cleaning, storage, and maintenance of power tools and equipment.

CONTENT STANDARD 2.0: APPLY FUNDAMENTAL PRINT READING, MEASUREMENT AND LAYOUT/FIT-UP TECHNIQUES**Performance Standard 2.1: Demonstrate Print Reading and Sketching Practices**

- 2.1.1 Interpret basic elements of a technical drawing (i.e., title block information, dimensions, line types).
- 2.1.2 Identify and explain industry standard welding symbols.
- 2.1.3 Prepare a materials list from a technical drawing (i.e., bill of material).

- 2.1.4 Describe various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, and schematic).
- 2.1.5 Understand dimensioning, sectional drawings, fasteners, tables, charts, and assembly drawings.
- 2.1.6 Sketch or draw a basic welding drawing.
- 2.1.7 Fabricate parts from a drawing or sketch.

Performance Standard 2.2: Demonstrate Measuring and Scaling Techniques

- 2.2.1 Identify industry standard units of measure.
- 2.2.2 Convert between customary (i.e., SAE, Imperial) and metric systems.
- 2.2.3 Measure and calculate size, area, and volume.
- 2.2.4 Determine and apply the equivalence between fractions and decimals.
- 2.2.5 Identify measuring tools.

Performance Standards 2.3: Utilize Layout Principles and Practices

- 2.3.1 Interpret drawing, sketch or specification information.
- 2.3.2 Prepare work area for layout.
- 2.3.3 Select appropriate materials to complete work assignment.
- 2.3.4 Use layout and marking tools as required.
- 2.3.5 Layout parts using measurement practices.

Performance Standards 2.4: Demonstrate Preparation and Fit-Up Practices

- 2.4.1 Identify and explain job specifications.
- 2.4.2 Use fit-up gauges and measuring devices to check joint fit-up.
- 2.4.3 Identify and explain distortion and how it is controlled.
- 2.4.4 Fit-up joints using plate and pipe fit-up tools.
- 2.4.5 Check for joint misalignment and poor fit-up before and after welding.

CONTENT STANDARD 3.0: IDENTIFY PROPERTIES OF METALS

Performance Standard 3.1: Identify Material Properties and Science

- 3.1.1 Identify the difference between ferrous and non-ferrous metals.
- 3.1.2 Identify and explain forms and shapes of structural metals.

Performance Standard 3.2: Identify Filler Metals

- 3.2.1 Explain AWS filler metal classifications systems.
- 3.2.2 Identify different types of filler metals.
- 3.2.3 Explain the storage and control of filler metals.

CONTENT STANDARD 4.0: APPLY SHIELDED METAL ARC WELDING (SMAW) TECHNIQUES

Performance Standard 4.1: Safety Procedures

- 4.1.1 Identify and explain different types of welding current and polarity.
- 4.1.2 Perform safety inspections of SMAW equipment and accessories.
- 4.1.3 Maintain SMAW equipment and accessories.

Performance Standard 4.2: Produce Welds using SMAW on Carbon Steel

- 4.2.1 Set up for SMAW operations.
- 4.2.2 Operate SMAW equipment.

- 4.2.3 Perform welds in the 1F position.
- 4.2.4 Perform welds in the 2F position.
- 4.2.5 Perform welds in the 3F position.
- 4.2.6 Perform welds in the 4F position.
- 4.2.7 Perform welds in the 1G position.
- 4.2.8 Perform welds in the 2G position.
- 4.2.9 Perform welds in the 3G position.
- 4.2.10 Perform welds in the 4G position.
- 4.2.11 Describe 2G, 5G and 6G welding positions.

CONTENT STANDARD 5.0: APPLY GAS METAL ARC WELDING (GMAW-S, GMAW) TECHNIQUES

Performance Standard 5.1: Utilize Safety Procedures

- 5.1.1 Identify and explain the use of GMAW equipment (i.e., spray transfer, globular, short circuit, pulse).
- 5.1.2 Perform safety inspections of GMAW equipment and accessories.
- 5.1.3 Maintain GMAW equipment and accessories.
- 5.1.4 Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of GMAW equipment.

Performance Standard 5.2: Produce Welds using GMAW-S on Carbon Steel

- 5.2.1 Set up for GMAW-S operations.
- 5.2.2 Operate GMAW-S equipment.
- 5.2.3 Perform welds in the 1F position.
- 5.2.4 Perform welds in the 2F position.
- 5.2.5 Perform welds in the 3F position.
- 5.2.6 Perform welds in the 4F position.
- 5.2.7 Perform welds in the 1G position.
- 5.2.8 Perform welds in the 2G position.
- 5.2.9 Perform welds in the 3G position.

CONTENT STANDARD 6.0: APPLY FLUX CORED ARC WELDING (FCAW-G) TECHNIQUE

Performance Standard 6.1: Utilize Safety Procedures

- 6.1.1 Identify and explain the use of FCAW-G equipment.
- 6.1.2 Perform safety inspections of FCAW-G equipment and accessories.
- 6.1.3 Maintain FCAW-G equipment and accessories.
- 6.1.4 Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of FCAW-G equipment.

Performance Standard: 6.2: Produce Welds using FCAW-G on Carbon Steel

- 6.2.1 Set up for FCAW-G operations.
- 6.2.2 Operate FCAW-G equipment.
- 6.2.3 Perform welds in the 1F position.
- 6.2.4 Perform welds in the 2F position.
- 6.2.5 Perform welds in the 3F position.
- 6.2.6 Perform welds in the 4F position.

- 6.2.7 Perform welds in the 1G position.
- 6.2.8 Perform welds in the 2G position.
- 6.2.9 Perform welds in the 3G position.

CONTENT STANDARD 7.0: APPLY GAS TUNGSTEN ARC WELDING (GTAW) TECHNIQUES**Performance Standard 7.1: Utilize Safety Procedures**

- 7.1.1 Perform safety inspections of GTAW equipment and accessories.
- 7.1.2 Maintain GTAW equipment and accessories.
- 7.1.3 Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of GTAW equipment.

Performance Standard 7.2: Produce Welds using GTAW on Carbon Steel

- 7.2.1 Set up for GTAW operations
- 7.2.2 Operate GTAW equipment.
- 7.2.3 Perform welds in the 1F position.
- 7.2.4 Perform welds in the 2F position
- 7.2.5 Perform welds in the 3F position
- 7.2.6 Perform welds in the 1G position
- 7.2.7 Perform welds in the 2G position.
- 7.2.8 Perform welds in the 3G position.

Performance Standard 7.3: Produce Welds using GTAW on Aluminum

- 7.3.1 Set up for GTAW operations.
- 7.3.2 Operate GTAW equipment.
- 7.3.3 Perform welds in the 1F position.
- 7.3.4 Perform welds in the 2F position.

CONTENT STANDARD 8.0: APPLY THERMAL CUTTING PROCESSES**Performance Standard 8.1: Demonstrate Oxy-Fuel Gas Cutting (OFC)**

- 8.1.1 Perform safety inspections of OFC equipment and accessories.
- 8.1.2 Maintain OFC equipment and accessories.
- 8.1.3 Demonstrate safe startup, shutdown, disassembly, and cylinder exchange procedures of OFC equipment.
- 8.1.4 Set up for OFC operations.
- 8.1.5 Operate OFC equipment.
- 8.1.6 Perform straight, square edge cutting operations in the flat position.
- 8.1.7 Perform shape, square edge cutting operations in the flat position.
- 8.1.8 Perform straight, bevel edge cutting operations in the flat position.
- 8.1.9 Perform scarfing and gouging operations to remove base and weld metal, in flat and horizontal positions.

Performance Standard 8.2: Demonstrate Plasma Arc Cutting (PAC) on Carbon Steel and Aluminum

- 8.2.1 Explain the PAC process.
- 8.2.2 Determine the appropriate PAC settings for the various types of metals.
- 8.2.3 Perform safety inspections of PAC equipment and accessories.
- 8.2.4 Maintain PAC equipment and accessories.

- 8.2.5 Set up for PAC operations.
- 8.2.6 Operate PAC equipment.
- 8.2.7 Perform straight, square edge cutting operations in the flat position.
- 8.2.8 Perform shape, square edge cutting operations in the flat position.

Performance Standard 8.3: Demonstrate Manual Air Carbon Arc Cutting (CAC-A)

- 8.3.1 Performs safety inspections of manual CAC-A equipment and accessories.
- 8.3.2 Maintain CAC-A equipment and accessories.
- 8.3.3 Set up manual CAC-A scarfing and gouging operation on carbon steel.
- 8.3.4 Operate manual CAC-A equipment on carbon steel.
- 8.3.5 Perform scarfing and gouging operations to remove base and weld metal in the flat and horizontal positions on carbon steel.

CONTENT STANDARD 9.0: IDENTIFY WELDING CODES, INSPECTIONS, AND TESTING PRINCIPLES**Performance Standard 9.1: Identify Welding Codes, Qualifications and Certifications**

- 9.1.1 Identify and explain weld imperfections and their causes.
- 9.1.2 Identify and explain welder qualification tests.
- 9.1.3 Explain the importance of quality workmanship.
- 9.1.4 Identify common destructive testing methods.
- 9.1.5 Perform a visual inspection of fillet welds.

Performance Standard 9.2: Demonstrate Welding Inspection and Testing Principles

- 9.2.1 Define the role of welding inspection/inspector and testing in industry.
- 9.2.2 Examine cut surfaces and edges of prepared base metal parts.
- 9.2.3 Examine tack, root passes, intermediate layers, and completed welds.

CONTENT STANDARD 10.0: APPLY FABRICATION FUNDAMENTALS**Performance Standard 10.1: Utilize Base Metal Preparation Fundamentals**

- 10.1.1 Clean base metal for welding or cutting.
- 10.1.2 Identify and explain joint design.
- 10.1.3 Select the proper joint design based on a welding procedure specification (WPS) or instructor's direction.
- 10.1.4 Mechanically bevel the edge of a mild steel plate (i.e., hand beveller, grinder).
- 10.1.5 Thermally bevel the end of a mild steel plate.

Performance Standard 10.2: Demonstrate Fabrication Techniques

- 10.2.1 Demonstrate proper setup of fabrication area, equipment, and materials.
- 10.2.2 Construct projects in the proper sequence.
- 10.2.3 Properly layout projects from welding prints.
- 10.2.4 Check work for accuracy.