

# ***Welding Technology Program of Study and Complementary Course Standards***



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*All Nevada students are equipped and feel empowered to attain their vision of success*

**Mission**

*To improve student achievement and educator effectiveness by ensuring opportunities, facilitating learning, and promoting excellence*



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## Acknowledgements

The development of Nevada career and technical education (CTE) standards and assessments is a collaborative effort sponsored by the Nevada Department of Education (NDE) Office of Career Readiness, Adult Learning, and Education Options. The Nevada Department of Education relies on educators and industry representatives who have the technical expertise and teaching experience to develop standards and performance indicators that truly measure student skill attainment. More importantly, the NDE would like to recognize the time and commitment of the writing team members in developing the career and technical standards for Welding Technology.

## Standards Development Members

Name	Occupation/Title	Stakeholder Affiliation	School/Organization
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Richard Samanich	Instructor	Postsecondary Educator	College of Southern Nevada, Henderson, NV

## Business and Industry Validation

All CTE standards developed through the Nevada Department of Education are validated by business and industry through one or more of the following processes: (1) the standards are developed by a team consisting of business and industry representatives, or (2) a separate review panel is coordinated with industry experts to ensure the standards include the proper content, or (3) nationally recognized standards currently endorsed by business and industry.

The Welding Technology standards were validated through active participation of business and industry representatives on the development team.

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## Introduction

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of a high school Welding Technology program of study. These standards are designed for a two-credit course sequence that prepares the student for a technical assessment directly aligned to the standards.

These exit-level standards are designed for the student to complete all standards through their completion of a program of study. These standards are intended to guide curriculum objectives for a program of study.

The standards are organized as follows:

- **Content Standards** are general statements that identify major areas of knowledge, understanding, and the skills students are expected to learn in key subjects and career areas by the end of the program.
- **Performance Standards** follow each content standard. Performance standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.
- **Performance Indicators** are very specific criteria statements for determining whether a student meets the performance standard. Performance indicators may also be used as learning outcomes, which teachers can identify as they plan their program learning objectives. The indicators are followed by designations that reflect the course sequence (e.g., 12 for the first-year course of a two-year program and 22 for the second-year course, C is to designate the indicators to be taught in the complementary courses) as referenced in the Core Course Sequence table.

The crosswalks and alignments are located in the Program Supplemental Program Resources document. These will show where the performance indicators support the Nevada Academic Content Standards. For individual course descriptions, please reference the Supplemental Program Resource or the Nevada CTE Catalog.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to the Welding Technology program. CTSOs are co-curricular national organizations that directly reinforce learning in the CTE classroom through curriculum resources, competitive events, and leadership development. CTSOs provide students the ability to apply academic and technical knowledge, develop communication and teamwork skills, and cultivate leadership skills to ensure college and career readiness.

The Employability Skills for Career Readiness identify the skills needed to be successful in all careers and must be taught as an integrated component of all CTE course sequences. These standards are available in a separate document.

The **Standards Reference Code** is only used to identify or align performance indicators listed in the standards to daily lesson plans, curriculum documents, or national standards. The Standards Reference Code is an abbreviated name for the program, and the content standard, performance standard and performance indicator are referenced in the program standards. This abbreviated code for identifying standards uses each of these items. For example, WELD is the Standards Reference Code for Welding Technology. For Content Standard 2, Performance Standard 3 and Performance Indicator 4 the Standards Reference Code would be WELD.2.3.4.



## Welding Technology

### Program Information

**Program of Study:** Welding Technology

**Standards Reference Code:** WELD

**Career Cluster:** Manufacturing

**Career Pathway(s):** Production

**Program Length:** 2-year, completed sequentially

**CTSO:** SkillsUSA

### Program Structure Required Program of Study Courses

The core course sequencing is provided in the following table. Complementary Courses are available and provided later in this document. The following courses provide a completed program of study. The Lab is a complementary course available concurrently with the Welding II course.

**Core Course Sequence (R) with Lab Course(s) (C)**

Required/ Complementary	Course Title	Abbreviated Name
R	Welding Technology I	WELD TECH I
R	Welding Technology II	WELD TECH II
C	Welding Technology II LAB	WELD TECH II L

**CONTENT STANDARD 1.0: INTEGRATE CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOs)****Performance Standard 1.1: Explore the History and Organization of CTSOs**

- 1.1.1 Discuss the requirements of CTSO participation/involvement as described in Carl D. Perkins Law (12, 22, C)
- 1.1.2 Research nationally recognized CTSOs (12, 22, C)
- 1.1.3 Investigate the impact of federal and state government regarding the progression and operation of CTSOs (e.g., Federal Statutes and Regulations, Nevada Administrative Code [NAC], Nevada Revised Statutes [NRS]) (12, 22, C)

**Performance Standard 1.2: Develop Leadership Skills**

- 1.2.1 Discuss the purpose of parliamentary procedure (12, 22, C)
- 1.2.2 Demonstrate the proper use of parliamentary procedure (12, 22, C)
- 1.2.3 Differentiate between an office and a committee (12, 22, C)
- 1.2.4 Discuss the importance of participation in local, regional, state, and national conferences, events, and competitions (12, 22, C)
- 1.2.5 Participate in local, regional, state, or national conferences, events, or competitions (12, 22, C)
- 1.2.6 Describe the importance of a constitution and bylaws to the operation of a CTSO chapter (12, 22, C)

**Performance Standard 1.3: Participate in Community Service**

- 1.3.1 Explore opportunities in community service-related work-based learning (WBL) (12, 22, C)
- 1.3.2 Participate in a service learning (program related) and/or community service project or activity (12, 22, C)
- 1.3.3 Engage with business and industry partners for community service (12, 22, C)

**Performance Standard 1.4: Develop Professional and Career Skills**

- 1.4.1 Demonstrate college and career readiness (e.g., applications, resumes, interview skills, presentation skills) (12, 22, C)
- 1.4.2 Describe the appropriate professional/workplace attire and its importance (12, 22, C)
- 1.4.3 Investigate industry-standard credentials/certifications available within this Career Cluster™ (12, 22, C)
- 1.4.4 Participate in authentic contextualized instructional activities (12, 22, C)
- 1.4.5 Demonstrate technical skills in various student organization activities/events (12, 22, C)

**Performance Standard 1.5: Understand the Relevance of Career and Technical Education (CTE)**

- 1.5.1 Make a connection between program standards to career pathway(s) (12, 22, C)
- 1.5.2 Explain the importance of participation and completion of a program of study (12, 22, C)
- 1.5.3 Promote community awareness of local student organizations associated with CTE programs (12, 22, C)

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**CONTENT STANDARD 2.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES****Performance Standard 2.1: Demonstrate General Lab Safety Rules and Procedures**

- 2.1.1 Describe general shop safety rules and procedures (i.e., safety test) (12)
- 2.1.2 Describe the roles of OSHA in workplace safety (12)
- 2.1.3 Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities (i.e., personal protection equipment – PPE) (12)
- 2.1.4 Utilize safe procedures for handling of tools and equipment (12)
- 2.1.5 Operate lab equipment according to safety guidelines (12)
- 2.1.6 Identify and use proper lifting procedures and proper use of support equipment (12)
- 2.1.7 Utilize proper ventilation procedures for working within the lab/shop area (12)
- 2.1.8 Identify marked safety areas (12)
- 2.1.9 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 (12)
- 2.1.10 Identify the location and use of eye wash stations (12)
- 2.1.11 Identify the location of the posted evacuation routes (12)
- 2.1.12 Identify and wear appropriate clothing for lab/shop activities (12)
- 2.1.13 Secure hair and jewelry for lab/shop activities (12)
- 2.1.14 Demonstrate knowledge of the safety aspects of high voltage circuits (12)
- 2.1.15 Locate and interpret safety data sheets (SDS) (12)
- 2.1.16 Perform housekeeping duties (12)
- 2.1.17 Follow verbal instructions to complete work assignments (12)
- 2.1.18 Follow written instructions to complete work assignments (12)

**Performance Standard 2.2: Identify and Utilize Hand Tools**

- 2.2.1 Identify hand tools and their appropriate usage (12)
- 2.2.2 Identify standard and metric designation (12)
- 2.2.3 Demonstrate the proper techniques when using hand tools (12)
- 2.2.4 Demonstrate safe handling and use of appropriate tools (12)
- 2.2.5 Demonstrate proper cleaning, storage, and maintenance of tools (12)

**Performance Standard 2.3: Identify and Utilize Power Tools and Equipment**

- 2.3.1 Identify power tools and their appropriate usage (12)
- 2.3.2 Identify equipment and their appropriate usage (12)
- 2.3.3 Demonstrate the proper techniques when using power tools and equipment (12)
- 2.3.4 Demonstrate safe handling and use of appropriate power tools and equipment (12)
- 2.3.5 Demonstrate proper cleaning, storage, and maintenance of power tools and equipment (12)

**CONTENT STANDARD 3.0: APPLY FUNDAMENTAL PRINT READING, MEASUREMENT, AND LAYOUT/FIT-UP TECHNIQUES****Performance Standard 3.1: Demonstrate Print Reading and Sketching Practices**

- 3.1.1 Interpret basic elements of a technical drawing (i.e., title block information, dimensions, line types) (12)
- 3.1.2 Identify and explain industry standard welding symbols (12)
- 3.1.3 Prepare a materials list from a technical drawing (i.e., bill of material) (12)
- 3.1.4 Describe various types of drawings (i.e., part, assembly, pictorial, orthographic, isometric, schematic) (12)
- 3.1.5 Understand dimensioning, sectional drawings, fasteners, tables, charts, assembly drawings, and revisions (22)
- 3.1.6 Sketch or draw a basic welding drawing (22)

**Performance Standard 3.2: Demonstrate Measuring and Scaling Techniques**

- 3.2.1 Identify industry standard units of measure (12)
- 3.2.2 Convert between customary (i.e., SAE, Imperial) and metric systems (12)
- 3.2.3 Determine appropriate engineering and metric scales (12)
- 3.2.4 Measure and calculate size, area, and volume (12)
- 3.2.5 Determine and apply the equivalence between fractions and decimals (12)
- 3.2.6 Demonstrate proper use of appropriate measuring tools (12)

**Performance Standard 3.3: Utilize Layout Principles and Practices**

- 3.3.1 Interpret drawing, sketch, or specification information (12)
- 3.3.2 Select appropriate materials to complete work assignment (12)
- 3.3.3 Use layout and marking tools as required (12)
- 3.3.4 Layout parts using measurement practices (12)

**Performance Standard 3.4: Demonstrate Preparation and Fit-Up Practices**

- 3.4.1 Identify and explain job specifications (12)
- 3.4.2 Identify industry codes (i.e., American Welding Society, American Society of Mechanical Engineers, American Petroleum Institute) (22)
- 3.4.3 Check joint misalignment and poor fit-up before and after welding (22)

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## **CONTENT STANDARD 4.0: IDENTIFY PROPERTIES OF METALS**

### **Performance Standard 4.1: Identify Material Properties**

- 4.1.1 Identify base metals (e.g., aluminum, carbon steel, exotic steels, stainless) (12)
- 4.1.2 Identify and explain forms and shapes of structural metals (12)
- 4.1.3 Explain and demonstrate field identification methods for base metals (i.e., mill certificate, stamp) (22)
- 4.1.4 Explain metallurgical considerations for welding metals (i.e., base metal prep, heat treatment) (22)

### **Performance Standard 4.2: Identify Filler Metals**

- 4.2.1 Explain filler metal classifications systems (i.e., American Welding Society, American Society of Mechanical Engineers) (12)
- 4.2.2 Identify different types of filler metals (12)
- 4.2.3 Explain the storage and control of filler metals (12)

**CONTENT STANDARD 5.0: APPLY SHIELDED METAL ARC WELDING (SMAW) TECHNIQUES****Performance Standard 5.1: Safety Procedures**

- 5.1.1 Identify and explain different types of welding current and polarity (12)
- 5.1.2 Perform safety inspections of SMAW equipment and accessories (12)
- 5.1.3 Make minor external repairs to SMAW equipment and accessories (12)

**Performance Standard 5.2: Procedure Welds Using SMAW on Carbon Steel**

- 5.2.1 Set up for SMAW operations (12)
- 5.2.2 Operate SMAW equipment (12)
- 5.2.3 Perform welds in the 1F position (12)
- 5.2.4 Perform welds in the 2F position (12)
- 5.2.5 Perform welds in the 3F position (22)
- 5.2.6 Perform welds in the 1G position (22)
- 5.2.7 Perform welds in the 2G position (22)
- 5.2.8 Perform welds in the 3G position (22)



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## **CONTENT STANDARD 6.0: APPLY THERMAL CUTTING PROCESSES**

### **Performance Standard 6.1: Demonstrate Oxy-Fuel Gas Cutting (OFC)**

- 6.1.1 Perform safety inspections of OFC equipment and accessories (12)
- 6.1.2 Make minor external maintenance to OFC equipment and accessories (12)
- 6.1.3 Demonstrate safe startup, shutdown, disassembly, and connect and bleed regulator procedures of OFC equipment (12)
- 6.1.4 Set up for OFC operations (12)
- 6.1.5 Operate OFC equipment (12)
- 6.1.6 Perform straight, square edge cutting operations in the flat position (12)
- 6.1.7 Perform shape, square edge cutting operations in the flat position (12)
- 6.1.8 Perform straight, bevel edge cutting operations in the flat position (12)
- 6.1.9 Explain scarfing and gouging operations to remove base and weld metal, in flat and horizontal positions (12)

### **Performance Standard 6.2: Demonstrate Plasma Arc Cutting (PAC) on Carbon Steel and/or Aluminum**

- 6.2.1 Explain the PAC process (22)
- 6.2.2 Determine the appropriate PAC settings for the various types of metals (22)
- 6.2.3 Perform safety inspections of PAC equipment and accessories (22)
- 6.2.4 Make minor external repairs to PAC equipment and accessories (22)
- 6.2.5 Set up for PAC operations (handheld and/or Computer Numerical Controller [CNC]) (22)
- 6.2.6 Operate PAC equipment (handheld and/or CNC) (22)
- 6.2.7 Perform straight, square edge cutting operations in the flat position (handheld and/or CNC) (22)
- 6.2.8 Perform shape, square edge cutting operations in the flat position (hand held and/or CNC) (22)

**CONTENT STANDARD 7.0: APPLY FABRICATION FUNDAMENTALS****Performance Standard 7.1: Utilize Base Metal Preparation Fundamentals**

- 7.1.1 Clean base metal for welding or cutting (12)
- 7.1.2 Identify and explain joint design and considerations (12)
- 7.1.3 Identify and explain distortion and how it is controlled (22)
- 7.1.4 Mechanically bevel the edge of a mild steel plate (i.e., hand beveller, grinder) (22)

**Performance Standard 7.2: Demonstrate Part Preparation with Cutting and Forming Techniques**

- 7.2.1 Perform bending or forming operations (22)
- 7.2.2 Perform drilling or boring operations (22)
- 7.2.3 Perform shearing operations (22)

**Performance Standard 7.3: Demonstrate Fabrication Techniques**

- 7.3.1 Demonstrate proper setup of fabrication area, equipment, and materials (22)
- 7.3.2 Construct projects in the proper sequence (22)
- 7.3.3 Produce tack welds to specifications (22)
- 7.3.4 Properly layout and fabricate projects from welding prints (22)
- 7.3.5 Check work for accuracy (22)

**CONTENT STANDARD 8.0: APPLY GAS METAL ARC WELDING (GMAW-S, GMAW) TECHNIQUES****Performance Standard 8.1: Utilize Safety Procedures**

- 8.1.1 Identify and explain the use of GMAW equipment (i.e., spray transfer, globular, short circuit, pulse) (22)
- 8.1.2 Perform safety inspections of GMAW equipment and accessories (22)
- 8.1.3 Make minor external repairs to GMAW equipment and accessories (22)
- 8.1.4 Demonstrate safe startup, shutdown, disassembly, and connect and bleed regulator procedures of GMAW equipment (22)

**Performance Standard 8.2: Produce Welds Using GMAW-S on Carbon Steel**

- 8.2.1 Set up for GMAW-S operations (22)
- 8.2.2 Operate GMAW-S equipment (22)
- 8.2.3 Perform welds in the 1F position (22)
- 8.2.4 Perform welds in the 2F position (22)
- 8.2.5 Perform welds in the 1G position (22)
- 8.2.6 Perform welds in the 2G position (22)

**Performance Standard 8.3: Produce Welds Using GMAW (Spray Transfer) on Carbon Steel**

- 8.3.1 Set up for GMAW (spray) operations (22)
- 8.3.2 Operate GMAW (spray) equipment (22)
- 8.3.3 Perform welds in the 1F position (22)
- 8.3.4 Perform welds in the 2F position (22)
- 8.3.5 Perform welds in the 1G position (22)

**CONTENT STANDARD 9.0: APPLY FLUX CORED ARC WELDING (FCAW-G, FCAW-S) TECHNIQUES****Performance Standard 9.1: Utilize Safety Procedures**

- 9.1.1 Identify and explain the use of FCAW equipment (i.e., spray transfer, globular, pulse) (22)
- 9.1.2 Perform safety inspections of FCAW equipment and accessories (22)
- 9.1.3 Make minor external repairs to FCAW equipment and accessories (22)
- 9.1.4 Demonstrate safe startup, shutdown, disassembly, and connect and bleed regulator procedures of FCAW equipment (22)

**Performance Standard 9.2: Produce Welds Using FCAW-G on Carbon Steel**

- 9.2.1 Set up for FCAW-G operations (22)
- 9.2.2 Operate FCAW-G equipment (22)
- 9.2.3 Perform welds in the 1F position (22)
- 9.2.4 Perform welds in the 2F position (22)
- 9.2.5 Perform welds in the 1G position (22)
- 9.2.6 Perform welds in the 2G position (22)

**Performance Standard 9.3: Produce Welds Using FCAW-S on Carbon Steel**

- 9.3.1 Set up for FCAW-S operations (22)
- 9.3.2 Operate FCAW-S equipment (22)
- 9.3.3 Perform welds in the 1F position (22)
- 9.3.4 Perform welds in the 2F position (22)
- 9.3.5 Perform welds in the 1G position (22)
- 9.3.6 Perform welds in the 2G position (22)

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## **CONTENT STANDARD 10.0: APPLY GAS TUNGSTEN ARC WELDING (GTAW) TECHNIQUES**

### **Performance Standard 10.1: Utilize Safety Procedures**

- 10.1.1 Perform safety inspections of GTAW equipment and accessories (22)
- 10.1.2 Make minor external repairs to GTAW equipment and accessories (22)
- 10.1.3 Demonstrate safe startup, shutdown, disassembly, and connect and bleed regulator procedures of GTAW equipment (22)

### **Performance Standard 10.2: Produce Welds Using GTAW on Carbon Steel**

- 10.2.1 Set up for GTAW operations (22)
- 10.2.2 Operate GTAW equipment (22)
- 10.2.3 Perform welds in the 1F position (22)
- 10.2.4 Perform welds in the 2F position (22)
- 10.2.5 Perform welds in the 1G position (22)

### **Performance Standard 10.3: Produce Welds Using GTAW on Aluminum**

- 10.3.1 Set up for GTAW operations (22)
- 10.3.2 Operate GTAW equipment (22)

## Complementary Courses

### State Complementary Skill Standards

State complementary skill standards are designed to clearly state what the student should know and be able to do upon completion of a **one-year** complementary course related to their career and technical education (CTE) program of study. **Completion of the qualifying Program of Study is required prior to enrollment in a complementary course.**

### Employability Skills for Career Readiness Standards

Students have completed all program content standards and will pursue advanced study through investigation and in-depth research.

### Complementary Course Standards Contributing Members

Course Contribution(s)	Name	Occupation/Title	Stakeholder Affiliation	School/Organization
Welding Fabrication	Matt Aschoff	Subject Matter Expert	Postsecondary Educator	NCCER/College of Southern Nevada, Henderson, NV
Welding Fabrication	Tim Conley	Instructor	Secondary Educator	Edward C. Reed High School, Sparks, NV
Welding Fabrication	James Cooney	Instructor	Secondary Educator	Academy of Arts, Careers, and Technology, Reno, NV
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The Welding Fabrication complementary standards for Welding Technology program of study were validated through active participation of business and industry representatives on the development team.

## Complementary Course Information for Welding Technology

### Program Information

Qualifying Program of Study: Welding Technology

Career Cluster: Manufacturing

Career Pathway(s): Production

CTSO: SkillsUSA

Grade Level: 11-12

### Program Structure for Complementary Courses

The complementary courses are provided in the following table. **The qualifying program of study must be completed prior to enrolling in the complementary courses** (except labs that are done concurrently with the second-year course). A program does not have to utilize the complementary courses for students to complete their program of study.

#### Complementary Courses

Required/ Complementary	Course Title	Abbreviated Name
C	Welding Fabrication	WELD FAB
C	Welding Technology Advanced Studies	WELD TECH AS
C	Industry-Recognized Credential – Welding Technology	IRC WELD TECH
C	CTE Work Experience – Manufacturing	WORK EXPER MANUF

## Complementary Course Standards

### Welding Fabrication

#### CONTENT STANDARD 1.0: IDENTIFY LAB ORGANIZATION AND SAFETY PROCEDURES

##### Performance Standard 1.1: Demonstrate General Lab Safety Rules and Procedures

- 1.1.1 Prepare time or job cards, reports or records

#### CONTENT STANDARD 2.0: APPLY FUNDAMENTAL PRINT READING, MEASUREMENT, AND LAYOUT FIT-UP TECHNIQUES

##### Performance Standard 2.1: Utilize Layout Principles and Practices

- 2.1.1 Prepare work area for layout

##### Performance Standard 2.2: Demonstrate Preparation and Fit-up Practices

- 2.2.1 Use fit-up gauges and measuring devices to check joint fit-up
- 2.2.1 Fit-up joints using plate and pipe fit-up tools

#### CONTENT STANDARD 3.0: IDENTIFY PROPERTIES OF METALS

##### Performance Standard 3.1: Identify Material Properties

- 3.1.1 Identify and explain the physical characteristics and mechanical properties of metals (e.g., corrosion resistant, toxicity, strength, weight)

##### Performance Standard 3.2: Identify Filler Metals

- 3.2.1 Explain filler metal traceability requirements and how to use applicable code requirements

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

##### Performance Standard 4.1: Produce Welds Using SMAW on Carbon Steel

- 4.1.1 Perform SMAW welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)

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

##### Performance Standard 5.1: Produce Welds Using GMAW-S on Carbon Steel

- 5.1.1 Perform welds in the 3F position
- 5.1.2 Perform welds in the 3G position
- 5.1.3 Perform welds in the 4G position
- 5.1.4 Perform GMAW-S welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)

##### Performance Standard 5.2: Produce Welds Using GMAW (Spray Transfer) on Carbon Steel

- 5.2.1 Perform GMAW welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)



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## **CONTENT STANDARD 6.0: APPLY FLUX CORED ARC WELDING (FCAW-G, FCAW-S) TECHNIQUES**

### **Performance Standard 6.1: Produce Welds Using FCAW-G on Carbon Steel**

- 6.1.1 Perform welds in the 3F position
- 6.1.2 Perform welds in the 4F position
- 6.1.3 Perform welds in the 3G position
- 6.1.4 Perform welds in the 4G position
- 6.1.5 Perform FCAW-G welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)

### **Performance Standard 6.2: Produce Welds Using FCAW-S on Carbon Steel**

- 6.1.1 Perform welds in the 3F position
- 6.1.2 Perform welds in the 4F position
- 6.1.3 Perform welds in the 3G position
- 6.1.4 Perform welds in the 4G position
- 6.1.5 Perform FCAW-S welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)

## **CONTENT STANDARD 7.0: APPLY GAS TUNGSTEN ARC WELDING (GTAW) TECHNIQUES**

### **Performance Standard 7.1: Produce Welds Using GTAW on Carbon Steel**

- 7.1.1 Perform welds in the 2G position
- 7.1.2 Perform welds in the 3G position
- 7.1.5 Perform GTAW welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)

### **Performance Standard 7.2: Produce Welds Using GTAW on Aluminum**

- 7.1.1 Perform welds in the 1F position
- 7.1.2 Perform welds in the 2F position
- 7.1.3 Perform welds in the 1G position
- 7.1.4 Perform welds in the 2G position
- 7.1.5 Perform GTAW welder performance qualifications test (i.e., American Welding Society, American Society of Mechanical Engineers)

## **CONTENT STANDARD 8.0: IDENTIFY WELDING CODES, INSPECTIONS, AND TESTING PRINCIPLES**

### **Performance Standard 8.1: Identify Welding Codes, Qualifications, and Certifications**

- 8.1.1 Identify and explain codes governing welding
- 8.1.2 Identify and explain weld imperfections and their causes
- 8.1.3 Identify and explain nondestructive examination practices
- 8.1.4 Identify and explain welder qualification tests
- 8.1.5 Explain the importance of quality workmanship
- 8.1.6 Identify common destructive testing methods
- 8.1.7 Perform a visual inspection of fillet welds

**Performance Standard 8.2: Demonstrate Welding Inspection and Testing Principles**

- 8.1.1 Research the role of welding inspection/inspector and testing in industry
- 8.1.2 Examine cut surfaces and edges of prepared base metal parts
- 8.1.3 Examine tack, root passes, intermediate layers, and completed welds

**CONTENT STANDARD 9.0: APPLY FABRICATION FUNDAMENTALS****Performance Standard 9.1: Utilize Base Metal Preparation Fundamentals**

- 9.1.1 Select the proper joint design based on a welding procedure specification (WPS) or instructor's direction
- 9.1.2 Explain joint design considerations
- 9.1.3 Thermally bevel the end of a mild steel plate