

# WELDING BLUEPRINT

This Blueprint contains the subject matter content of this Skill Connect Assessment. This Blueprint does **NOT** contain the information one would need to fully prepare for a SkillsUSA Championships contest. Please refer to the *SkillsUSA Championships Technical Standards* CD-ROM for the current year or purchase and download the relevant "Contest Singles." Both are available through [www.skillsusa.org](http://www.skillsusa.org) > Shop > Educational Materials Catalog.

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## Standards and Competencies

### Identify safety standards on a test and demonstrate safety and health practices of welders in accordance to ANSI Z49

- Demonstrate proper use of equipment used for protection of personnel
- Demonstrate proper use and inspection of equipment used for ventilation
- Demonstrate Hot Work operation
- Demonstrate working in confined spaces properly
- Understand precautionary labeling

### Demonstrate an understanding of practical measurement

- Identify basic metal-working tools used in measuring
- Use visual measuring tools to accuracy of 1/64"
- Employ the components of a combination square set
- Use layout and marking tools as required
- Determine wire feed speed

### Read and interpret blueprints

- Apply information found in the information block of the drawing
- Identify the basic views used in blueprints including assembly, detail and fit-up drawings
- Identify common types of lines, abbreviations and symbols in accordance with national drawing standards (ANSI)
- Identify basic welding symbols and components of a symbol (such as arrow, reference line, tail, size or length) in accordance with the current national welding symbol standard AWS A 2.4 current edition

### Produce welds using a Shielded Metal Arc Welding (SMAW) process to AWS QC10 standards

- Demonstrate safety procedures for SMAW
- Demonstrate ability to correctly set up SMAW power sources, related welding equipment and do basic process and equipment troubleshooting for welding of carbon steel and/or stainless steel
- Select correct type of electrode based on carbon steel and/or stainless steel plate (1/4" to 1/2" thickness)
- Prepare carbon steel and/or stainless steel for welding

### Produce welds using a Gas Metal Arc Welding (GMAW) process to AWS QC10 standards

- Demonstrate correct safety procedures for GMAW
- Demonstrate ability to correctly set up GMAW power sources, related welding equipment and do basic process and equipment troubleshooting
- Identify short circuiting, globular, spray and pulsed transfer welding of carbon steel, stainless steel and/or aluminum
- Select correct type of filler metal, type of shielding gas, amperage and voltage based on carbon steel, stainless steel and/or aluminum sheet and/or plate (1/16" to 3/8" thickness)
- Prepare the carbon steel, stainless steel and/or aluminum for welding

**Produce welds using a Fluxed Cored Arc Welding (FCAW) process to AWS QC10 standards**

- Demonstrate correct safety procedures for FCAW
- Demonstrate ability to correctly set up FCAW power sources, related welding equipment and do basic process and equipment troubleshooting
- Select correct type of filler metal, type of shielding gas, amperage and voltage based upon carbon steel and/or stainless steel sheet and/or plate (1/16" to 3/8" thickness)
- Prepare stainless steel and/or carbon steel for welding

**Produce welds using a Gas Tungsten Arc Welding (GTAW) process to AWS QC10 standards**

- Demonstrate safety procedures for GTAW
- Demonstrate ability to correctly set up GTAW power sources, related welding equipment and do basic process and equipment troubleshooting for regular and pulsed welding of aluminum, stainless steel and/or carbon steel
- Select the correct type of tungsten and/or filler metal based on aluminum, stainless steel or carbon steel sheet and/or plate (1/16" to 1/4" thickness)
- Prepare aluminum, stainless steel and/or carbon steel for welding

**Produce cut materials using an Oxygen Fuel Cutting (OFC) process to AWS QC10 standards**

- Demonstrate safety procedures for OFC
- Demonstrate ability to correctly set up the OFC equipment for cutting and do basic process troubleshooting

**Produce cut materials using a Plasma Arc Cutting (PAC) process to AWS QC10 standards**

- Demonstrate safety procedures for PAC
- Demonstrate ability to correctly set up the PAC power sources, related cutting equipment and do basic process and equipment troubleshooting
- Set up and shut down equipment for cutting carbon steel, stainless steel and/or aluminum

**Demonstrate knowledge of visual inspection**

- Examine and measure undercut
- Examine and measure porosity
- Measure fillet size
- Examine and measure weld reinforcement
- Determine acceptability of welded samples in accordance with provided acceptance criteria

**Demonstrate knowledge of welding positions and terminology**

- Start, stop and restart stringer beads in the flat, horizontal, vertical up and down and overhead positions
- Weld a pad with a multiple pass weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a lap joint with a single pass, fillet weld in flat, horizontal, vertical up and down and overhead positions
- Weld a lap joint with a multiple pass, fillet weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a T-joint with a single pass, fillet weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a T-joint with a multiple pass, fillet weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a butt joint with a single pass square groove weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a butt joint with a partial joint penetration, single pass, double V-groove weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a butt joint with a multiple pass V-groove weld in the flat, horizontal, vertical up and down and overhead positions

- Weld a butt joint with complete joint penetration, multiple pass, double groove weld in the flat, horizontal, vertical up and down and overhead positions
- Weld a 2" to 8" diameter, schedules 40 to 80 pipe, single/multiple pass V-groove weld in the 2G, 5G and 6G positions
- Lay out, weld, cut and prepare coupons for evaluation

**Demonstrate professional development skills in a simulated customer-service or employment situation. Examples may include:**

- Job interview
- Customer service scenario
- Communications
- Decision making, problem solving and/or critical thinking

**Committee Identified Academic Skills**

The SkillsUSA national technical committee has identified that the following academic skills are embedded in the welding training program and assessment:

**Math Skills**

- Use fractions to solve practical problems
- Measure angles
- Construct three-dimensional models

**Science Skills**

- Describe and recognize solids, liquids and gases
- Use knowledge of principles of electricity and magnetism

**Language Arts Skills**

- Provide information in conversations and in group discussions
- Provide information in oral presentations
- Demonstrate use of verbal communication skills, such as word choice, pitch, feeling, tone and voice
- Demonstrate use of nonverbal communication skills: eye contact, posture, and gestures using interviewing techniques to gain information
- Demonstrate comprehension of a variety of informational texts
- Understand source, viewpoint and purpose of texts
- Demonstrate knowledge of appropriate reference materials
- Use print, electronic databases, and online resources to access information in books and articles
- Demonstrate informational writing
- Edit writing for correct grammar, capitalization, punctuation, spelling, sentence structure and paragraphing

**Connections to National Standards**

State-level academic curriculum specialists identified the following connections to national academic standards.

**Math Standards**

- Geometry
- Measurement
- Problem solving
- Communication
- Connections
- Representation

**Source:** NCTM Principles and Standards for School Mathematics. To view high school standards, visit: [standards.nctm.org/document/chapter7/index.htm](http://standards.nctm.org/document/chapter7/index.htm). Select “Standards” from menu.

#### **Science Standards**

- Understands the structure and properties of matter
- Understands the sources and properties of energy
- Understands forces and motion
- Understands the nature of scientific inquiry

**Source:** McREL compendium of national science standards. To view and search the compendium, visit: [www.mcrel.org/standards-benchmarks/](http://www.mcrel.org/standards-benchmarks/).

#### **Language Arts Standards**

- Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)

**Source:** IRA/NCTE Standards for the English Language Arts. To view the standards, visit: [www.readwritethink.org/standards/index.html](http://www.readwritethink.org/standards/index.html).