NYS SkillsUSA Standards

WELDING

PURPOSE

To evaluate each competitor's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of welding.

ELIGIBILITY

Open to active NYS SkillsUSA members enrolled in programs with welding as an occupational objective.

CLOTHING REQUIREMENT

NYS SkillsUSA Weld/Mach Attire:

- White crew neck short- sleeved T-shirt
- work pants
- leather or steel toed work shoes
- safety glasses or goggles, (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.)

Extra

- **Both the pants and shirt must be 100% cotton**

Note: Contestants must wear their contest clothing to the contest orientation meeting. Also bring #2 pencil, resume, and safety assurance form.

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
   a. All necessary welding equipment, filler metals, and base materials
   b. All instructions, Welding Procedure Specifications (WPS), and prints

(a) Supplied by the contestant:
(b) Hearing and/or ear protection
(c) Welding helmet with appropriate filter plate/lens and protective cover plate/lens in a flip or slide front. Auto darkening shields are permissible
(d) Spare spatter and filter lenses/plates for arc welding helmet and oxyacetylene goggles
(e) pocket calculator
(f) Lead pencil and/or ballpoint pen f. Soap stone with holder
(g) Scribe with magnet
(h) Combination square set
(i) .10-foot (3.1 meters) steel tape measure
(j) Fillet weld gauge- standard set
(k) 16-ounce (.45 kilogram) ball peen hammer
(l) Center punch
(m) 11Ror 10 -inch (254 millimeters) vise grips
(n) 6-inch (152 millimeters) side cutting pliers or diagonal cutting pliers
(o) 6-inch (152 millimeters) needle nose pliers- Welpers permissible
(p) Chipping hammer with or without wire brush
(q) Stainless steel wire brush and carbon steel wire brush
(r) Compass
(s) Protractor
(t) Cold chisel
(u) 1 piece of tungsten 3/32" for welding stainless steel. - ends may be prepped before contest.
(v) 1 piece of tungsten 3/32" for welding aluminum. - ends may be prepped before contest.
(w) Friction lighter (striker) and tip cleaner.
(x) All competitors must create a one- page résumé and submit a hard copy at orientation. Failure to do so will result in a 10-point penalty.
(y) **"Note: Your resume may be judged as part of your contest" Check the Contest Guidelines and/or the updates page on the NYS SkillsUSA Web site: https://www.nysskillsusa.org**

RESUME REQUIREMENT

Competitors must create a one-page resume to submit at orientation. Failure to submit a resume will result in a 10-point penalty.

PROHIBITED DEVICES

Cell phones or other electronic devices not approved by the NYS Chairperson will be collected by the contest chair during the competition. Chairpersons will announce their acceptance by listing it on their standard or at the orientation meeting. In case of emergencies advisors should allow the competitors to take their phones to the contest areas.

If the competitor uses their device in a manner which compromises the integrity of the competition, the competitor's score may be penalized.

SCOPE OF THE COMPETITION

The scope of the competition is defined by industry standards as identified by the American Welding Society, ITW Hobart Brothers Co., The Lincoln Electric Co., Miller Electric Co. Inc. All drawings, welding symbols, and welding terms conform to the latest edition of the American Welding Society (AWS) standards.

KNOWLEDGE PERFORMANCE

The competition includes a written knowledge exam that assesses welding and associated topics including, but not limited to, safety, math for welders, and print reading. must be completed Competitors are also required to take the SkillsUSA Professional Development Test online.

SKILL PERFORMANCE

The skill performance assessment may include steel project(s), aluminum project(s), stainless steel project(s) in various positions using a variety of filler metals. Competitors will be involved in a series of stations testing various aspects of welding.

COMPETITION GUIDELINES

1. Competitors must correctly use the welding equipment during the competition. The competition chair and/or any technical committee member may stop a competitor at any section of the competition if they deem a competitor's manner to be hazardous to either themselves or others. Such a stoppage shall be documented as a warning. If the competitor is warned a second time, he or she may be disqualified for that section of the competition.
2. As soon as the competitors enter the competition area — as defined by the surrounding tables — no communication shall occur between the competitors or between the competitors and anyone else, except as directed by the competition chair, technical committee members, or judges. Any such communication may result in the competitor being disqualified from that section of the competition. If any taped lines on the floor within the competition area are present, all competitors shall stay within the taped lines. Failure to stay within the taped lines, except for being escorted to the restroom, will result in penalties as follows: First violation = verbal warning and points deduction of the nearest segment of the competition. Second violation = disqualification of the nearest segment of the competition as a competition participant.
3. Time limits will be established during the competition orientation.
4. Evaluation of the completed project will be judged visually. Nondestructive and/or destructive tests may be used to complete the project evaluation.
5. Welding and cutting instructions will be provided to the competitors and specified on the Welding Procedure Specifications (WPS) and prints provided in the welding booths and near cutting stations.
6. Welding equipment used in the competition may be obtained from a variety of manufacturers and may include transformers, rectifiers, and/or inverters.
7. Filler metals will be detailed on the Welding Procedure Specification (WPS) and/or the prints.
8. Welds will be evaluated visually using a scoring system as established by the SkillsUSA technical committee. Nondestructive and/or destructive tests may be used to complete the project evaluation.
9. Final judging of the welded projects will be evaluated according to the difficulty of the assigned task and by using the following visual inspection criteria: dimensional accuracy, including distortion; conformity to drawing requirements, including determination of whether all welds have been completed and whether the finished welds conform to the required size and contour; and visual examination of the welds for cracks, undercut, overlap, crater fill, spatter, arc strikes, porosity, convexity, and reinforcement.
10. Print assembly tolerance will be +/- $\frac{1}{16}$" unless otherwise noted.
11. If no print assembly dimensions are given to orient any project part, the part is to be approximately located based on the print's isometric view.

STANDARDS AND COMPETENCIES

W 1.0 — Identify safety standards and demonstrate safety and health practices of welders in accordance with ANSI Z49.1

1.1. Demonstrate proper use of equipment used for protection of personnel.
1.2. Demonstrate proper use and inspection of equipment used for ventilation.
1.3. Demonstrate Hot Work operation.
1.4. Demonstrate working in confined spaces properly.
1.5. Understand precautionary labeling.

W 2.0 — Demonstrate an understanding of practical measurement.

2.1. Identify basic metal-working tools used in measuring.
2.2. Use visual measuring tools to accuracy of 1⁄32".
2.3. Use layout and marking tools as required.

W 3.0 — Read and interpret prints.

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

W 4.0 — Produce welds using a Shielded Metal Arc Welding (SMAW) process to AWS QC10 standards.

4.1. Demonstrate safety procedures for SMAW.
4.2. 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.
4.3. Select the correct type of electrode based on carbon steel and/or stainless-steel plate (¼" to ½" thickness).
4.4. Prepare carbon steel and/or stainless steel for welding.

W 5.0 — Produce welds using a Gas Metal Arc Welding (GMAW) process to AWS QC10 standards.

5.1. Demonstrate correct safety procedures for GMAW.
5.2. Demonstrate ability to correctly set up GMAW power sources, related welding equipment and do basic process and equipment troubleshooting.
5.3. Identify short circuiting, globular, spray and pulsed transfer welding of carbon steel, stainless steel and/or aluminum.
5.4. Select the 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).
5.5. Prepare carbon steel, stainless steel and/or aluminum for welding.

W6.0—Produce welds using a Fluxed Cored Arc Welding (FCAW) process to AWS QC10 standards.

6.1. Demonstrate correct safety procedures for FCAW.
6.2. Demonstrate ability to correctly set up FCAW power sources, related welding equipment and do basic process and equipment troubleshooting.
6.3. Select the correct type of filler metal, type of shielding gas, amperage and voltage based upon carbon steel and/or stainless-steel sheet and/or plate (¼" to ⅜" thickness).
6.4. Prepare stainless steel and/or carbon steel for welding.

W 7.0 — Produce welds using a Gas Tungsten Arc Welding (GTAW) process to AWS QC10 standards.

7.1. Demonstrate safety procedures for GTAW.
7.2. 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.
7.3. Select the correct type of tungsten and filler metal based on aluminum, stainless steel, or carbon steel sheet and/or plate (1⁄16" to 1⁄4" thickness).
7.4. Prepare aluminum, stainless steel and/or carbon steel for welding.

W 8.0 — Produce cut materials using an Oxygen Fuel Cutting (OFC) process to AWS QC10 standards.

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

W9.0—Produce cut materials using a Plasma Arc Cutting (PAC) process to AWS QC10 standards.

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

W 10.0 — Demonstrate knowledge of visual inspection.

10.1. Examine and measure undercut.
10.2. Examine and measure porosity.
10.3. Measure fillet size.
10.4. Examine and measure weld reinforcement.
10.5. Determine acceptability of welded samples in accordance with provided acceptance criteria.

W 11.0 — Demonstrate knowledge of welding positions and terminology.

11.1. Start, stop, and restart stringer beads in the flat, horizontal, vertical up and down, and overhead positions.
11.2. Weld a pad with a multiple pass weld in the flat, horizontal, vertical up and down, and overhead positions.
11.3. Weld a lap joint with a single pass, fillet weld in flat, horizontal, vertical up and down, and overhead positions.

11.4. Weld a lap joint with a multiple pass, fillet weld in the flat, horizontal, vertical up and down, and overhead positions.
11.5. Weld a T-joint with a single pass, fillet weld in the flat, horizontal, vertical up and down, and overhead positions.
11.6. Weld a T-joint with a multiple pass, fillet weld in the flat, horizontal, vertical up and down, and overhead positions.
11.7. Weld a butt joint with a single pass square groove weld in the flat, horizontal, vertical up and down, and overhead positions.
11.8. 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.
11.9. Weld a butt joint with a multiple pass V-groove weld in the flat, horizontal, vertical up and down, and overhead positions.
11.10. Weld a butt joint with complete joint penetration, multiple pass, double groove weld in the flat, horizontal, vertical up and down, and overhead positions.
11.11. Weld a 2" to 8" diameter, schedules 40 to 80 pipe, single/multiple pass V-groove weld in the 2G, 5G and 6G positions.
11.12. Lay out, weld, cut and prepare coupons for evaluation.

W 12.0 — SkillsUSA Framework

The SkillsUSA Framework is used to pinpoint the Essential Elements found in Personal Skills, Workplace Skills, and Technical Skills Grounded in Academics. Students will be expected to display or explain how they used some of these Essential Elements. Please reference the graphic, as you may be scored on specific elements applied to your project.

COMMITTEE IDENTIFIED ACADEMIC SKILLS

The technical committee has identified that the following academic skills are embedded in this competition.

Math Skills

- Use fractions to solve practical problems.
- Convert fractions to decimals and vice versa.
- 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 for oral presentations.

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

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.

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).