SHEET METAL

PURPOSE
To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of sheet metal.

First, download and review the General Regulations at: http://updates.skillsusa.org.

ELIGIBILITY
Open to active SkillsUSA members enrolled in programs with sheet metal as the occupational objective.

CLOTHING REQUIREMENTS
Class C: Contest Specific — Manufacturing/Construction Khaki Attire
- Official SkillsUSA khaki short-sleeve work shirt and pants
- Black, brown or tan leather work shoes

Note: Safety glasses must have side shields or goggles (prescription glasses may be used only if they are equipped with side shields. If not, they must be covered with goggles).

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These regulations refer to clothing items that are pictured and described at: www.skillsusastore.org. If you have questions about clothing or other logo items, call 1-888-501-2183.

Note: Contestants must wear their official contest clothing to the contest orientation meeting.

EQUIPMENT AND MATERIALS
1. Supplied by the technical committee:
   a. All necessary equipment, tools, materials and work benches
2. Supplied by the contestant:
   a. Tool box
   b. One each: Aviation M1, Aviation M2, Aviation M3 and combination or pattern tinner's snips
   c. 8" sheet metal worker's vice grips
   d. 8" or 10" regular vice grips
   e. 12" combination square with glass level
   f. 24" flat steel square
   g. 8" combination pliers
   h. One each: 6" and 12" straight-leg sprint dividers
   i. Flexible steel tape measure
   j. Scratch awl
   k. Screwdriver set (minimum one slotted and one Phillips)
   l. One each: ball peen, setting and riveting hammers
   m. Wood, leather or rubber mallet
   n. Two hand groovers, one for ¼" grooved lock, one for 5/16" grooved lock
   o. 36" straightedge
   p. Pop rivet gun
   q. Two wooden pencils
   r. Drive cleat turner
   s. Handheld calculator for written test
   t. Additional tools as desired, subject to approval of the technical committee
   u. Center punch
   v. One pound rivet set
   w. Marking pen
   x. Small trammel points
   y. Scratch gauges
   z. All competitors must create a one-page résumé and submit a hard copy to the technical committee chair at orientation. Failure to do so will result in a 10-point penalty.

***Note*:** Your contest may also require a hard copy of your résumé as part of the actual contest. Check the Contest Guidelines and/or the updates page on the SkillsUSA website at http://updates.skillsusa.org.

SCOPE OF THE CONTEST

The contest is defined by industry standards as established by the SkillsUSA Championships technical committee. The knowledge and skills tests will assess the ability to fabricate and install mechanical systems, specialty sheet metal and architectural/roofing sheet metal, and to lay out, develop and solve sheet metal problems.

Knowledge Performance

The contest will include a written knowledge exam assessing the areas of (but not limited to) shop safety procedures and sheet metal fabrication and installation.

Skill Performance

The contest will assess the ability to complete a sheet metal project involving a 26-gauge to 18-gauge galvanized or mild steel sheets on the basis of using hand tools, correctness of layout and shop safety procedures.

Contest Guidelines

1. Contestants will be judged on their ability to perform such jobs as connecting sheet metal pieces with drive cleats, spot welding and riveting.
2. Skills tested may include straight duct, transition fitting and 45-degree entry tap fitting.
3. Contestants will be given a job sheet explaining the job to be completed and the required time limits.
4. All layouts will be checked by the judges prior to cutting.
5. Contestants are not allowed to bring layout books to the contest.

Standards and Competencies

SM 1.0 — Lay out and develop various sheet metal problems using the principles of parallel line development, radial line development and triangulation development

1.1 Lay out rectangular sheet metal
1.2 Lay out round sheet metal
1.3 Transition sheet metal layout

SM 2.0 — Fabricate and install a variety of mechanical systems as outlined by the contest technical committee

2.1 Fabricate and install rectangular ductwork including:
- 2.1.1 Fabricate and install a straight duct (one-piece construction)
- 2.1.2 Fabricate and install a rectangular radius throat and radius heel duct elbow
- 2.1.3 Fabricate and install a rectangular square throat and heel duct elbow
- 2.1.4 Fabricate and install a rectangular duct ogee offset
- 2.1.5 Fabricate and install a rectangular duct transition
- 2.1.6 Fabricate and install a rectangular duct Y branch
- 2.1.7 Fabricate and install a rectangular shoe tap

2.2 Properly use flats, bars, drive cleats and pocket/government locks in rectangular ductwork fittings
- 2.2.1 Use flats in rectangular ductwork fittings
- 2.2.2 Use bars in rectangular ductwork fittings
- 2.2.3 Use drive cleats in rectangular ductwork fittings
- 2.2.4 Use pocket/government locks in rectangular ductwork fittings

2.3 Fabricate and install round ductwork
- 2.3.1 Fabricate and install round straight duct
- 2.3.2 Fabricate and install round duct elbow
- 2.3.3 Fabricate and install round duct Y branch
- 2.3.4 Fabricate and install round duct offset
- 2.3.5 Fabricate and install round duct taper (transition)
- 2.3.6 Fabricate and install round duct lateral (round tap)
- 2.3.7 Fabricate and install round saddle tap

2.4 Connect joints of round or rectangular duct together end to end using a companion angle
2.5 Fabricate and install single wall equipment casing/housing
2.6 Fabricate and install double wall equipment casing/housing
2.7 Fabricate and install flanged duct section
2.8 Fabricate and install drop-cheek elbow
2.9 Fabricate and install rectangular twisted transition

SM 3.0 — Fabricate and install architectural/roofing sheet metal including seam metal, standing and metal flat-lock roof panels; gutters; downspouts/conductors; louvers; column covers; and a metal ceiling panel

3.1 Fabricate and install seam metal roof panel, batten and cap
3.2 Fabricate and install a standing seam metal roof panel
3.3 Fabricate and install a metal flat-lock roof panel
3.4 Fabricate and install an ogee gutter
3.5 Fabricate and install half-round gutter
3.6 Fabricate and install a rectangular downspout/conductor
3.7 Fabricate and install an offset in rectangular downspout/conductor
3.8 Fabricate and install a conductor head
3.9 Flashing
3.10 Coping
3.11 Fabricate and install a gravel stop fascia
3.12 Fabricate and install a metal siding panel
3.13 Fabricate and install louvers
3.14 Fabricate and install column covers
3.15 Fabricate and install a metal ceiling panel

SM 4.0 — Fabricate and install specialty sheet metal including single and multi-blade damper, hoppers, dust collectors, chutes, tubes, signs and support saddles

4.1 Fabricate and install a rectangular single blade damper in frame
4.2 Fabricate and install a rectangular multi-blade damper in frame
4.3 Fabricate and install a hopper
4.4 Fabricate and install a cyclone dust collector
4.5 Fabricate and install a helical (spiral) chute
4.6 Fabricate and install a rectangular tube
4.7 Fabricate and install a round tube
4.8 Fabricate and install a hollow metal letter
4.9 Fabricate and install a metal sign
4.10 Fabricate and install a round duct support saddle (floor mounted)

Committee Identified Academic Skills

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

Math Skills

- Use fractions to solve practical problems
- Use proportions and ratios to solve practical problems
- Simplify numerical expressions
- Solve practical problems involving percentages
- Solve single variable algebraic expressions
- Measure angles
- Find surface area and perimeter of two-dimensional objects
- Find volume and surface area of three-dimensional objects
- Apply transformations (rotate or turn, reflect or flip, translate or slide, and dilate or scale) to geometric figures
- Construct three-dimensional models
- Apply Pythagorean Theorem
- Solve problems using proportions, formulas and functions
- Find slope of a line
- Use laws of exponents to perform operations
- Use measures of interior and exterior angles of polygons to solve problems
- Find arc length and the area of a sector

Science Skills

None Identified

Language Arts Skills

None Identified

Connections to National Standards

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

Math Standards

- Numbers and operations
- Geometry
- Measurement
- Data analysis and probability
- Problem solving
- Communication
- Connections
- Representation

Source: NCTM Principles and Standards for School Mathematics. For more information, visit: http://www.nctm.org.

Science Standards

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

Source: McREL compendium of national science standards. To view and search the compendium, visit: http://www2.mcrel.org/compendium/browse.asp.

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.ncte.org/standards.