

SHEET METAL (VIRTUAL)



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.

Contest Clothing Notes (Apply ONLY to Virtual Competitions):

- Official SkillsUSA Competition Clothing recommended but NOT required.
- Contestant clothing options include the following:
 - Official Competition Clothing.
 - Trade Appropriate Clothing.
 - Professional Dress.
 - Business Casual.
- Clothing must meet industry safety standards.
- No identification of the contestant, school or state is allowed on clothing.
- No offensive, vulgar or inappropriate images or text are allowed on contestants clothing.
- No shorts or sleeveless shirts are allowed.
- Skirts must be at least knee-length.
- Proper Personal Protective Equipment (PPE) must be worn by contestant to meet all state, local and school requirements due to COVID-19.

- Scoring deductions may only be given and/or disqualification of contestant if clothing safety standards are not met.

Note: safety glasses with 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).

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.

EQUIPMENT AND MATERIALS

Supplied by the contestant:

1. Computer with high-speed internet capability and camera to use applications such as Zoom, Teams, etc. The minimum recommended internet bandwidth speeds for joining Zoom meetings, accessing on-demand curriculum and other online operations is 2.0 Mbps up and down. You can test your current internet speeds by following this link: www.speedtest.net. Allow the page to load and click on GO.
2. A secondary camera(s) may be required to provide judges with the ability to view contestants from different angles. Additional camera requirements will be located on the SkillsUSA website at <http://updates.skillsusa.org>.
3. A contest Proctor will be required to be on site to assist judges. A local industry expert is preferred to serve as the Proctor and shall not be an individual that has been involved with the training of the contestant(s). The Proctor will serve as the onsite "hands and eyes" for the judges. Proctor will follow instructions from the judges for safety and operations related to the competition. Proctor may be asked by judges to perform several tasks such as operating a portable camera to show specific components or steps, measure parts, or any task that will provide judges with information needed to assist in accurate scoring of the contestant's work or presentation. However, the Proctor shall not serve as a judge nor have any influence on contestant scores.

4. The contestant's instructor or advisor shall be on site to observe all competition activities to ensure a safe and healthy competition experience for all participants. That instructor or advisor will not be allowed to interact or interfere with the competitor unless a safety issue arises that requires interaction. Any other support or interaction between the contestant and the instructor/advisor will result in disqualification.
5. All competitors must create a one-page résumé and submit an electronic copy to the technical committee chair at least seven (7) days in advance of the competition. Failure to do so will result in a 10-point penalty. Instructions for submission of the electronic résumé copy will be provided on the SkillsUSA website at <http://updates.skillsusa.org>.
6. Work Bench
7. Tool box
8. One each: Aviation M1, Aviation M2, Aviation M3 and combination or pattern tinner's snips
9. 8" sheet metal worker's vice grips
10. 8" or 10" regular vice grips
11. 12" combination square with glass level
12. 24" flat steel square
13. 8" combination pliers
14. One each: 6" and 12" straight-leg sprint dividers
15. Flexible steel tape measure
16. Scratch awl
17. Screwdriver set (minimum one slotted and one Phillips)
18. One each: ball peen, setting and riveting hammers
19. Wood, leather or rubber mallet
20. Two hand groovers, one for ¼" grooved lock, one for ⅝" grooved lock
21. 36" straightedge
22. Pop rivet gun
23. Two wooden pencils
24. Drive cleat turner
25. Handheld calculator for written test
26. Additional tools as desired, subject to approval of the technical committee
27. Center punch
28. One pound rivet set
29. Marking pen
30. Small trammel points
31. Scratch gauges

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

Note for Virtual Competitions: Contestants may not be required to perform all the standards and competencies listed in this section. However, contestants should be prepared to perform components in all areas. Prior to the competition, the technical committee may determine which standards and competencies contestants will be perform for the virtual contests. The technical committee will determine if additional information is needed for contestants prior to the competition.

These changes will be posted on the SkillsUSA Championships contest update website at: <http://updates.skillsusa.org>.

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.