

# PLUMBING



## PURPOSE

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

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

## ELIGIBILITY

Open to active SkillsUSA members enrolled in programs with residential plumbing as the occupational objective.

## CLOTHING REQUIREMENTS

### Class D: Contest Specific — Blue Attire

- Official SkillsUSA light blue work shirt.
- Navy pants.
- Black, brown or tan leather work safety shoes (with protective toe cap).

**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).

These regulations refer to clothing items that are pictured and described at: [www.skillsusastore.org](http://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 supplies and appliances required for the project
  - b. Tank and tips will be provided
2. Supplied by the contestant:
  - a. 8' steel tape measure
  - b. Copper tubing cutter with reamer
  - c. Arc joint pliers (channel lock type)
  - d. 8" or 10" adjustable wrench

- e. Set of assorted slotted and Phillips screwdrivers
- f. Torpedo level
- g. 14-16 oz. claw hammer
- h. Plastic (PVC) pipe reamer or suitable knife
- j. Suitable saw or shear to cut PVC pipe
- k. Copper cleaning tool (inside and outside)
- l. 2H pencil and eraser
- m. Cutters suitable for cast-iron soil pipe
- n. Torque wrench for no-hub clamps
- o.  $\frac{5}{16}$ " nut driver
- p. Hacksaw
- q.  $\frac{3}{8}$ " drive socket set
- r. Portable battery screw gun
- s. Plumb bob
- t. Wiping rag
- u. 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 set by the current industry technical standards.

### Knowledge Performance

The contest will include a written knowledge exam assessing knowledge of the industry standards.

### Skill Performance

The contest includes a testing station with a series of changes designed to test the ability to perform jobs or skills selected from the following list of competencies as determined by the SkillsUSA Championships technical committee.

### Contest Guidelines

All piping will be visually inspected and may be tested for leaks.

## Standards and Competencies

### PLB 1.0 — Perform basic plumbing tasks using appropriate tools and equipment

- 1.1 Identify and use basic hand tools, power tools and equipment
  - 1.1.1 Measure lines to the nearest  $\frac{1}{16}$ " with a ruler/tape measure
  - 1.1.2 Cut out an opening for various pipes and fixtures
- 1.2 Demonstrate proper use of hangers and supports

### PLB 2.0 — Read and interpret blueprints and perform measurements and calculations

- 2.1 Read the architect's scale
- 2.2 Read and develop an isometric sketch of a plumbing system
- 2.3 Determine measurements from a manufacturer's specifications
- 2.4 Determine rough-in locations
- 2.5 Interpret riser diagrams

### PLB 3.0 — Perform proper plumbing systems rough-in

- 3.1 Properly install DWV systems
  - 3.1.1 Label a cross-section of a P-trap
  - 3.1.2 Identify the proper fittings required for a DWV system
  - 3.1.3 Calculate the slope required for drainage lines
  - 3.1.4 Install proper venting
  - 3.1.5 Install cleanouts
  - 3.1.6 Rough-in plumbing fixtures
  - 3.1.7 Perform DWV rough-in inspection test
- 3.2 Properly install water supply systems
  - 3.2.1 Determine proper pipe sizing for hot and cold water systems
  - 3.2.2 Rough-in water supply lines for plumbing fixtures and appliances
  - 3.2.3 Perform approved water pressure tests
- 3.3 Identify and perform the proper joining method for given piping material
  - 3.3.1 Join steel and CSS pipe and fittings
  - 3.3.2 Join cast iron pipe and fittings
  - 3.3.3 Join copper tube and fittings
  - 3.3.4 Join plastic pipe and fittings
- 3.4 Identify types of fittings
- 3.5 Identify size of fittings

### PLB 4.0 — Install plumbing fixtures, appliances and appurtenances

- 4.1 Install fixture supply stops
- 4.2 Install water supplies
- 4.3 Install appropriate traps
- 4.4 Install a faucet/valve
- 4.5 Install a drain assembly
- 4.6 Install the fixture level, plumb and secure
- 4.7 Install appropriate relief valves

### PLB 5.0 — Perform plumbing systems service and repair

- 5.1 Replace a section of damaged water supply pipe
- 5.2 Repair damaged DWV pipe
- 5.3 Repair a leaking faucet
- 5.4 Repair a leaking shower valve
- 5.5 Replace a water closet fill valve
- 5.6 Replace a trap
  - 5.7.1 Clear obstructions from a drain
  - 5.7.2 Clear obstructions from a water closet drain
  - 5.7.3 Clear obstructions from a main drain line

### PLB 6.0 — Perform plumbing tasks in a safe environment

- 6.1 Keep your work area clean and safe
- 6.2 Understand and apply OSHA regulations that involve plumbing practices
- 6.3 Use appropriate safety apparel for the task being performed
  - 6.3.1 Wear appropriate safety glasses, hard hats, work boots, respirators, ear protection, back and knee protection, etc., for a given situation
- 6.4 Demonstrate safe soldering practices
  - 6.4.1 Demonstrate correct procedure for connecting torch equipment including regulators, tanks, hose, torch and tips
  - 6.4.2 Ignite and extinguish torch using safe practices
  - 6.4.3 Check for unsafe conditions such as cracked hoses, damaged gauges and leaks
- 6.5 Demonstrate proper use of GFI in potentially hazardous conditions
- 6.6 Demonstrate safe use of power and hand tools

- 6.7 Maintain proper ventilation when working with chemicals and other potentially hazardous materials

#### **PLB 7.0 — Employability**

- 7.1 Exhibit personal skills such as attendance, time management, individual responsibility and teamwork
- 7.2 Practice good customer relations
- 7.3 Fill out a job application completely and legibly
- 7.4 Maintain professional conduct and appearance
- 7.4.1 Demonstrate polite, attentive attitude
- 7.4.2 Wear neat, clean clothing and be well groomed
- 7.5 Respect the property of both your customer and employer

#### **Committee Identified Academic Skills**

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

#### **Math Skills**

- Solve single variable algebraic expressions.
- Solve multiple variable algebraic expressions.
- Measure angles.
- 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.
- Find slope of a line.
- Solve practical problems involving complementary, supplementary and congruent angles.
- Use measures of interior and exterior angles of polygons to solve problems.

#### **Science Skills**

- Plan and conduct a scientific investigation.
- Describe characteristics of types of matter based on physical and chemical properties.
- Use knowledge of physical properties (shape, density, solubility, odor, melting point, boiling point, color).
- Use knowledge of classification of elements as metals, metalloids and nonmetals.

- Describe phases of matter.
- Describe and identify physical changes to matter.
- Use knowledge of potential and kinetic energy.
- Use knowledge of mechanical, chemical and electrical energy.
- Use knowledge of speed, velocity and acceleration.
- Use knowledge of Newton's laws of motion.
- Use knowledge of work, force, mechanical advantage, efficiency and power.
- Use knowledge of simple machines, compound machines, powered vehicles, rockets and restraining devices.

#### **Language Arts Skills**

- Demonstrate comprehension of a variety of informational texts.
- Use text structures to aid comprehension.
- Demonstrate knowledge of appropriate reference materials.
- Use print, electronic databases and online resources to access information in books and articles.

#### **Connections to National Standards**

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

#### **Math Standards**

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

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

#### **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.
- Understands the scientific enterprise.

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

### **Language Arts Standards**

- Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

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