

PLUMBING 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 > Shop > Educational Materials Catalog.

Standards and Competencies

Apply the knowledge and skills needed to perform basic services with tools and equipment in a plumbing service situation

- Identify and utilize basic hand tools
 - Measure lines to the nearest 1/16" with a ruler/tape measure
 - Identify and use common hand tools specific to the plumbing trade
- Identify and utilize power tools used in the plumbing trade
 - Attach various hangers on concrete, metal and wooden walls
 - Cut out an opening in plywood or wood for various pipes and fixtures
 - Thread steel pipe with a power-driven thread cutter
- Identify and utilize equipment used in the plumbing trade
 - Light and adjust the air-acetylene torch
 - Set up and adjust the builder's level
 - Set up and light a propane furnace
 - Set up an inflatable rubber test plug in a pipe
 - Set up a mechanical test plug in a pipe

Apply the knowledge and skills needed to perform basic services with blueprints, measurements and calculations in a plumbing service situation

- Read and interpret blueprint reading
 - Read the architect's scale
 - Develop an isometric sketch of a drainage system
 - Determine measurements from a manufacturer's specifications
 - Determine rough-in locations
 - Establish grade lines for installing plumbing
 - Convert weight (mass) measurements from English system to metric system

Implement the knowledge and skills needed to perform services with systems rough-in in a plumbing service situation

- Perform the required steps to service drainage systems
- Label a cross-section of a P-trap
- Identify fittings required on a drainage system
- Install bathtub waste overflow and trap
- Calculate the slope required for building sewer lines
- Install soil or waste back vents
- Install cleanouts on drains
- Rough-in waste lines and vents for built-in lavatories
- Rough-in waste lines and vents for bathtubs
- Secure horizontal and vertical lines of pipe to wood, metal and masonry surfaces
- Perform the required steps to service water systems
- Make an isometric drawing of a hot and cold water system for a two-story house
- Determine pipe sizes for a hot and cold water system for a two-story house

- Rough-in water supply lines for bathtubs
- Rough-in water supply lines for water closets
- Rough-in water supply lines for water heaters
- Conduct water pressure tests on water supply systems
- Perform the required steps to service joining pipes
- Cut, ream, thread and join steel pipe
- Measure, cut and join cast iron pipe to a cast-iron fitting using the caulking method
- Join cast iron pipe to a cast iron fitting using a no-hub joint
- Join cast iron pipe to a cast iron fitting using a compression joint
- Cut, ream and join copper tubing using the sweat method
- Cut, ream and join copper tubing using a compression joint
- Cut, ream and join copper tubing using a flare joint
- Join cast iron pipe to a PVC pipe using a no-hub joint
- Join cast iron pipe to a PVC pipe using a PVC adapter
- Join PVC pipe to PVC fittings
- Perform the required steps to service pipe and pipe fittings
- Read fitting sizes
- Identify fittings from a sketch of a piping system
- Construct a materials take-off list from an isometric drawing

Implement the knowledge and skills needed to perform services with residential systems in a plumbing service situation

- Compute the cost for plumbing supplies
- Perform leak tests on various piping systems

Implement the skills and knowledge needed to perform fixture and appliance installation in a plumbing service situation

- Demonstrate the skills needed to install water valves and faucets
 - Install a kitchen sink faucet
 - Install a dual control lavatory faucet with pop-out drain plug
 - Disassemble and reassemble a single kitchen sink faucet
- Demonstrate the skills needed to install drainage connection
 - Install a cast iron water closet flange
 - Install a plastic water closet flange
 - Install a lavatory trap
 - Install a kitchen sink trap
- Demonstrate the skills needed to install fixtures and appliances
 - Install a water closet (floor mount)
 - Install a lavatory (wall hung type)
 - Install a bathtub
 - Install an electric water heater
 - Install a dishwasher
 - Install a garbage disposal unit
 - Install a gas water heater

Apply the knowledge and skills needed to perform system maintenance and repair in a plumbing service situation

- Perform the skills needed to repair and service water systems
 - Replace a section of galvanized water supply line
 - Thaw a frozen pipe with a plumber's torch
 - Repair a leaking water faucet or valve
 - Repair a leaking shower valve
 - Repair a ball cock on a water closet
 - Insulate water lines

- Perform maintenance and repair to drainage systems
 - Replace a lavatory trap
 - Clear obstructions from a lavatory drain
 - Clear obstructions from a water closet drain
 - Clear obstructions from a main drain line

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 plumbing training program and assessment:

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. To view high school standards, visit: 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
- Understands the scientific enterprise

Source: McREL compendium of national science standards. To view and search the compendium, visit: www.mcrel.org/standards-benchmarks/.

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.readwritethink.org/standards/index.html.