

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

SECTION A: ORIENTATION

Unit 1-A: Occupational Introduction

1. Terms and definitions
2. Job responsibilities of residential plumbers
3. Occupational fields related to plumbing
4. Reasons why there are occupational opportunities for residential plumbers now and in the future
5. Desirable personality traits and attitudes for residential plumbers
6. Reasons for teamwork
7. Conditions which enhance good customer relations
8. Distribution of income for a residential plumbing business
9. Interview a plumber

Unit 2-A: Applying for a Job

1. Terms and definitions
2. Employer expectations and employee expectations in their relationship
3. Means of locating job openings
4. Four methods of applying for a job
5. Personal attributes or attitudes an employer looks for during a personal interview
6. Four items an applicant may need to prepare when applying for a job
7. Guidelines to follow when interviewing for a job
8. Write a resumé
9. Write a letter of application for a plumbing job
10. Complete an employment application form for a job as a plumber
11. Practice interview questions
12. Make an appointment by phone for a plumbing job interview
13. Follow up an interview
14. Evaluate a plumbing job offer
15. Compare job opportunities

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Unit 3-A: General Safety and First Aid

1. Terms and definitions
2. Things OSHA expects of an employer
3. Things OSHA expects of an employee
4. Basic first aid procedures for emergency situations
5. Colors of the safety color code and their applications
6. Rules for personal safety
7. Rules for general shop and field safety
8. Characteristics of a clean and orderly shop
9. Class of fire and their descriptions
10. Components of the fire triangle
11. Types of fire extinguishers and the classes of fire they are designed to extinguish
12. Fire extinguisher symbols and their meanings
13. Steps to be followed in case of an accident
14. Guidelines for lifting and carrying items safely
15. Purposes of a material safety data sheet (MSDS)
16. Interpret a material safety data sheet
17. Analyze problems related to shop safety and first aid
18. Operate a fire extinguisher
19. Lift a heavy object properly

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SECTION B: TOOLS AND EQUIPMENT

Unit 1-B: Hand Tools

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|-------------------------------------------------------------|---------------------------------------------------------------------------|
| 1. Terms and definitions | 7. Read a rule/tape measure |
| 2. Basic hand tools used in the plumbing trade | 8. Measure lines to the nearest quarter, eighth, and sixteenth of an inch |
| 3. Proper use and care of hand tools | 9. Use hand tools to inspect/replace a washer on a globe valve |
| 4. Safety precautions for handling and storing hand tools | 10. Measure and mark a predetermined length of pipe |
| 5. Rules used for measuring | 11. Use hand tools to cut a length of steel pipe |
| 6. Guidelines for the use and care of rules and steel tapes | 12. Use hand tools to ream steel pipe |
| | 13. Use hand tools to cut pipe threads |
| | 14. Set up and use a hacksaw to cut a length of PVC pipe |

Unit 2-B: Power Tools

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| 1. Terms and definitions | 5. Install a lavatory hanger on a concrete wall |
| 2. Power tools used in the plumbing trade | 6. Cut out a bathtub drain opening in a plywood floor |
| 3. Use and care of power tools used in the plumbing trade | 7. Thread steel pipe with a portable power-driven vise stand |
| 4. Safety precautions for power tools used in plumbing | |

Unit 3-B: Equipment

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|--------------------------------------------------------------------------|----------------------------------------------------|
| 1. Terms and definitions | 5. Light and adjust the air-acetylene torch |
| 2. Equipment generally used in plumbing | 6. Set up and adjust the builder's level |
| 3. Types of equipment and their correct use and care | 7. Set up an inflatable rubber test plug in a pipe |
| 4. Safety precautions related to operating an air-acetylene torch outfit | 8. Set up a mechanical test plug in a pipe |
| | 9. Set up and operate a ratchet lever hoist |

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SECTION C: BLUEPRINTS, MEASUREMENTS, AND CALCULATORS

Unit 1-C: Blueprint Reading

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|--------------------------------------------------------------------------|------------------------------------------------------------------|
| 1. Terms and definitions | 10. Read the architect's scale at $1/4'' = 1'$ |
| 2. Types of architectural drawings | 11. Read the architect's scale at $1/8'' = 1'$ |
| 3. Alphabet of lines | 12. Read the architect's scale at $1'' = 20'$ |
| 4. Floor plan and section drawing symbols | 13. Read the architect's scale at $1'' = 50'$ |
| 5. Plumbing, appliance, and structural symbols | 14. Determine dimensions on a drawing using an architect's scale |
| 6. Piping and fitting or valve symbols | |
| 7. Major items that should be included in a set of specifications | |
| 8. Finding specific information from a detailed specifications statement | |
| 9. Reading an architect's scale | |

Unit 2-C: Sketches and Diagrams for Plumbers

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| 1. Characteristics of a plan view sketch | 4. Develop three types of sketches of a drainage system in a basement floor |
| 2. Characteristics of a riser diagram | |
| 3. Characteristics of an isometric sketch | 5. Develop an isometric sketch of a drainage system |

Unit 3-C: Rough-In Locations

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|--------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 1. Terms and definitions | 10. Determine measurements from a manufacturer's specifications |
| 2. Three individuals who could be responsible for determining rough-in locations | 11. Determine rough-in locations for a bathroom |
| 3. Verbal orders | 12. Establish grade lines for installing plumbing |
| 4. Sketches | |
| 5. Marking out locations | |
| 6. Information commonly found on manufacturer's specifications | |
| 7. Information which can be determined from manufacturer's specifications | |
| 8. Residential construction trainworks | |
| 9. Cooperating and coordinating techniques between plumbers and other trades-workers | |

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Unit 4-C: Building and Plumbing Codes

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|---------------------------------------------------------------------------------|------------------------------------------------------|
| 1. Terms and definitions | 7. Apply code regulations to a plumbing installation |
| 2. Membership of a plumbing code governing board, its authority, and its duties | 8. Use the BOCA Basic/National Plumbing Code |
| 3. Benefits of zoning laws, building codes, and plumbing codes | |
| 4. Major categories that should be included in a plumbing code | |
| 5. Basic principles of plumbing codes | |
| 6. Illegal fittings and installations | |

Unit 5-C: Metric Measurement for Plumbers

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|--------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| 1. Terms and definitions | 9. Read U.S. customary and metric rules |
| 2. Common metric abbreviations | 10. Convert English system measurements to metric measurements |
| 3. Convert approximate pipe sizes and lengths from the English system to the metric system | |
| 4. Convert temperature measurements from the English system to the metric system | |
| 5. Convert liquid measurements from the English system to the metric system | |
| 6. Convert weight (mass) measurements from the English system to the metric system | |
| 7. Calculate the volume of rectangular and cylindrical tanks | |
| 8. Convert cubic feet and inches to gallons | |

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SECTION D: SYSTEMS ROUGH-IN

Unit 1-D: Drainage Systems

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| 1. Terms and definitions | 16. Label a cross section of a P-trap |
| 2. Soil, waste, and vent pipes in a drainage system | 17. Identify fittings on a drainage system |
| 3. Materials used in soil and waste pipes | 18. Secure a permit for the installation of a plumbing system |
| 4. Functions of soil, waste, and vent pipes in a drainage system | 19. Install a bathtub waste and overflow and trap on a two-story building |
| 5. Purposes of plumbing traps | 20. Install a prefabricated shower base drain (caulked method) |
| 6. Types of traps | 21. Lay out trench lines |
| 7. Various types of pipe hangers, clamps, and supports | 22. Calculate the slope required for building sewer lines |
| 8. Pipe hangers, clamps, and supports and their uses | 23. Install drain pipe in trenches |
| 9. Location, materials, and functions of building sewers and storm drains | 24. Install storm drains |
| 10. Installation of building sewers and storm drains | 25. Backfill trenches |
| 11. Steps used when adding new plumbing to an old system during the planning and roughing-in stages | 26. Install pipe sleeves or thimbles through walls, ceilings, or floors |
| 12. Water and air methods of testing drainage systems for leaks | 27. Install soil or waste back vents |
| 13. Trenching techniques | 28. Install cleanouts on drains |
| 14. Shoring materials and devices and their definitions | 29. Rough-in waste lines and vents for built-in lavatories |
| 15. Safety precautions for various trenching hazards | 30. Rough-in waste lines and vents for bathtubs |
| | 31. Secure horizontal and vertical lines of pipe to masonry surfaces with hangers |
| | 32. Secure horizontal and vertical lines of pipe to wood surfaces with hangers |
| | 33. Secure horizontal and vertical lines of pipe to metal surfaces with hangers |
| | 34. Install vent terminals (roof flashing) |
| | 35. Inspect a plumbing system |

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Unit 2-D: Water Systems

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|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1. Terms and definitions | 9. Make an isometric drawing of a hot and cold water system for a two-story house |
| 2. Components of a water system in a single-family dwelling and their functions | 10. Determine pipe sizes for a hot and cold water system for a two-story house |
| 3. Factors to consider when installing a hot water system | 11. Rough-in water supply lines for bathtubs |
| 4. Sizing of pipes in residential water systems | 12. Rough-in water supply lines for a water closet |
| 5. Materials used for pipes and materials used for valves in water pipe systems | 13. Rough-in water supply lines for a water heater |
| 6. Prevention of frozen pipes in cold weather | 14. Make water pressure tests on water supply systems |
| 7. Preventing contamination of water systems by cross connections | |
| 8. Two methods of testing a water system for leaks | |

Unit 3-D: Joining Pipes

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| 1. Terms and definitions | 7. Cut, ream, thread, and join a piece of 1" galvanized and steel pipe to a 1" fitting |
| 2. Tools, materials, and equipment necessary to join steel pipe | 8. Join cast iron pipe to a cast iron fitting using a no-hub joint |
| 3. Tools, materials, and equipment necessary to join cast iron pipe by the compression and no-hub methods | 9. Join cast iron pipe to a cast iron fitting using a compression joint |
| 4. Tools, materials, and equipment necessary to join copper tubing by the sweat joint, compression, and flare methods | 10. Cut, ream, and join copper tubing using the sweat method |
| 5. Tools, materials, and equipment necessary to join PVC and flexible plastic pipe | 11. Cut, ream, and join copper tubing using a compression joint |
| 6. Tools, materials, and equipment necessary to join pipe by using the roll-grooved coupling method | 12. Cut, ream, and join copper tubing using a flare joint |
| | 13. Cut, ream, and join copper tubing using a hammered flare joint |
| | 14. Cut, ream, and join PVC pipe to a PVC fitting |
| | 15. Cut, ream, and join flexible plastic pipe with insert fittings |
| | 16. Join clay pipe with couplings |
| | 17. Wipe clay pipe joints |

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Unit 3-D: Joining Pipes (continued)

18. Cut cast iron soil pipe with snap-type chain cutter
19. Bend copper tubing with a spring bender
20. Thread steel pipe with an adjustable die
21. Join cast iron pipe to clay pipe
22. Join ductile iron pipe using the roll-grooved coupling method

Unit 4-D Pipe Fittings

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|----------------------------------------------------------------------------------------|--------------------------------------------------------|
| 1. Terms and definitions | 15. Read fitting sizes |
| 2. Materials used to make pipe fittings and their specific uses, types, and properties | 16. Identify fittings from a sketch of a piping system |
| 3. Basic plumbing branches | |
| 4. Basic plumbing bends | |
| 5. Basic unions and couplings | |
| 6. Basic caps and plugs | |
| 7. Basic bushings and nipples | |
| 8. Basic closet flanges and cleanouts | |
| 9. Basic no-hub fittings | |
| 10. Flexible plastic (PE) insert fittings | |
| 11. PVC-DWV fittings | |
| 12. Polybutylene fittings | |
| 13. Two types of malleable iron fittings | |
| 14. Four types of adapters | |

Unit 5-D: Pipe

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| 1. Terms and definitions | 6. Advantages and disadvantages of plastic pipe |
| 2. Types of pipes used in residential plumbing | 7. Three common methods of measuring pipe |
| 3. Types of copper pipes and their identification colors | 8. Construct a materials take-off list from an isometric drawing |
| 4. Applications for types of pipe to be used in the plumbing trade | |
| 5. Black steel and galvanized steel pipe | |

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Unit 5-D: Pipe (continued)

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|-------------------------------------------------|------------------------------------------------------------------|
| 6. Advantages and disadvantages of plastic pipe | 8. Construct a materials take-off list from an isometric drawing |
| 7. Three common methods of measuring pipe | |

SECTION E: RESIDENTIAL SYSTEMS

Unit 1-E: Private Water Systems

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|-------------------------------------------------------------------|---------------------------------------------------------------------------|
| 1. Terms and definitions | 8. Compute the cost for plumbing supplies |
| 2. Types of private water supplies | 9. Install a pump and controls according to manufacturer's specifications |
| 3. Possible sources of contamination in private water supplies | |
| 4. Types of pumps used for private water systems | |
| 5. Operating principles of pumps used for private water systems | |
| 6. Pump controls used on private water systems | |
| 7. Applications of various pump controls on private water systems | |

Unit 2-E: Septic Systems

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| 1. Terms and definitions | 6. Install a septic tank |
| 2. Operation of a septic system | |
| 3. Basic design of a septic system | |
| 4. Septic tank construction materials | |
| 5. Septic tank care | |

Unit 3-E: Water Treatment

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|-------------------------------------------------------------|----------------------------------------------------------------------|
| 1. Terms and definitions | 5. Prepare a water sample for analysis by a state testing laboratory |
| 2. Five methods of disinfecting water | |
| 3. Probable causes of poor water quality symptoms | |
| 4. Poor water conditions and the means used to control them | |

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Unit 4-E: Fuel Piping Systems

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|--------------------------------------------------------------------------------------------|-------------------------------------------------|
| 1. Terms and definitions | 5. Fuel piping testing methods |
| 2. Materials for pipe, fittings, and valves which are commonly used in fuel piping systems | 6. Size a gas pipe for residential construction |
| 3. Methods of joining fuel piping for different types of materials | 7. Perform leak tests on gas supply lines |
| 4. Basic principles of natural gas codes | |

SECTION F: FIXTURE AND APPLIANCE INSTALLATION

Unit 1-F: Water Valves and Faucets

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|------------------------------------|-------------------------------------------------------------------|
| 1. Terms and definitions | 10. Install a stop and waste valve (solder method) |
| 2. Five types of valves | 11. Install a kitchen sink faucet |
| 3. Parts of a globe valve | 12. Install a dual control lavatory faucet with pop-up drain plug |
| 4. Parts of a gate valve | 13. Disassemble and reassemble a single lever kitchen sink faucet |
| 5. Parts of a check valve | |
| 6. Parts of a ball valve | |
| 7. Parts of a flush valve | |
| 8. Single and dual control faucets | |
| 9. Features of specific faucets | |

Unit 2-F: Drainage Connections

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|--------------------------------------------------------------|-------------------------------------------------------|
| 1. Terms and definitions | 4. Install a cast iron water closet flange |
| 2. Various drainage connections used in residential plumbing | 5. Install a plastic water closet flange |
| 3. Ways a trap can lose its seal | 6. Install a brass to copper pipe water closet flange |
| | 7. Install a brass to lead pipe water closet flange |
| | 8. Install a lavatory trap |
| | 9. Install a kitchen sink trap |

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Unit 3-F: Fixtures and Appliances

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|-----------------------------------------------------------------------------------------|---------------------------------------------------------------|
| 1. Terms and definitions | 5. Install a floor-mounted water closet |
| 2. Common fixtures and appliances used in residential plumbing | 6. Install a wall-mounted lavatory |
| 3. Fixtures and appliances and their installation requirements | 7. Install a recessed bathtub |
| 4. Construction and materials used in the manufacture of common fixtures and appliances | 8. Install shower bath accessories in a ceramic tile bathroom |
| | 9. Install an electric water heater |
| | 10. Install a dishwasher |
| | 11. Install a garbage disposal unit |
| | 12. Install a gas water heater |

SECTION G: SYSTEM MAINTENANCE AND REPAIR

Unit 1-G: Water Systems Maintenance and Repair

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|------------------------------------------------------|---------------------------------------------------------------|
| 1. Terms and definitions | 5. Install a prefabricated air chamber in a water supply line |
| 2. Methods of thawing frozen pipes | 6. Replace a section of galvanized water supply line |
| 3. Emergency repair methods for leaking pipes | 7. Thaw a frozen pipe with a plumber's torch |
| 4. Water closet tank malfunctions and their remedies | 8. Repair a leaking faucet |
| | 9. Repair a leaking shower valve |
| | 10. Replace a gas water heater |
| | 11. Repair a ball cock on a water closet |
| | 12. Replace a pressure control switch on a water pump |
| | 13. Insulate water lines |

Unit 2-G: Drainage Systems Maintenance and Repair

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|--------------------------------------------------------------------|-------------------------------------------------|
| 1. Terms and definitions | 4. Replace a lavatory trap |
| 2. Types of equipment used to clear stoppages in plumbing fixtures | 5. Clear obstructions from a lavatory drain |
| 3. Cleanout access points in a drainage system | 6. Clear obstructions from a water closet drain |
| | 7. Clear obstructions from a main drain line |