

Plumbing 1, 2, 3, and 4 6280, 6281, 6282, 6283

If a student takes Introduction to Construction and scores 70% on all assessments (A-H), he or she does not have to repeat these modules in Air Conditioning and Refrigeration Technology, Building Construction, Cabinetmaking, Carpentry, Electricity, Masonry, Mechatronics, Plumbing, and Welding.

PREREQUISITE: Contren® Core Modules

NCCER CONTREN® CORE MODULES

MODULE A: BASIC SAFETY

1. Identify the responsibilities and personal characteristics of a professional craftsman.
2. Explain the role that safety plays in the construction crafts.
3. Describe what job-site safety means.
4. Explain the appropriate safety precautions around common job-site hazards.
5. Demonstrate the use and care of appropriate personal protective equipment.
6. Follow safe procedures for lifting heavy objects.
7. Describe safe behavior on and around ladders and scaffolds.
8. Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDs (Material Safety Data Sheets).
9. Describe fire prevention and fire fighting techniques.
10. Define safe work procedures around electrical hazards.
11. Complete 10-hour OSHA course/assessment and receive card.

MODULE B: BASIC MATH

1. Add, subtract, multiply, and divide whole numbers, with and without a calculator.
2. Use a standard ruler and a metric ruler to measure.
3. Add, subtract, multiply, and divide fractions.
4. Add, subtract, multiply, and divide decimals, with and without a calculator.
5. Convert decimals to percents and percents to decimals.
6. Convert fractions to decimals and decimals to fractions.
7. Explain what the metric system is and how it is important in the construction trade.
8. Recognize and use metric units of length, weight, volume, and temperature.
9. Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them.

MODULE C: INTRODUCTION TO HAND TOOLS

1. Recognize and identify some of the basic hand tools used in the construction trade.
2. Use these tools safely.
3. Describe the basic procedures for taking care of these tools.

MODULE D: INTRODUCTION TO POWER TOOLS

1. Identify commonly used power tools of the construction trade.
2. Use power tools safely.
3. Explain how to maintain power tools properly.

MODULE E: INTRODUCTION TO BLUEPRINTS

1. Recognize and identify basic blueprint terms, components, and symbols.
2. Relate information on blueprints to actual locations on the print.
3. Recognize different classifications of drawings.
4. Interpret and use drawing dimensions.

MODULE F: BASIC RIGGING

1. Explain how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a job site.
2. Describe inspection techniques and load-handling safety practices.
3. Explain the American National Standards Institute (ANSI) hand signals.

MODULE G: BASIC COMMUNICATION SKILLS

1. Explain techniques for communicating effectively with coworkers and supervisors.
2. Demonstrate verbal and written communication skills necessary in the workplace.
3. Demonstrate telephone and e-communication skills necessary in the workplace.

MODULE H: BASIC EMPLOYABILITY SKILLS

1. Identify the roles of individuals and companies in the construction industry.
2. Explain the importance critical thinking and problem solving skills in the workplace.
3. Describe computer systems and their industry applications.
4. Explain interpersonal relationship skills, self-presentation, and key workplace issues such as sexual harassment, stress, and substance abuse.

PLUMBING 1, 2, 3 AND 4

UNIT A: INTRODUCTION TO THE PLUMBING PROFESSION

1. Describe the history of the plumbing profession.
2. Identify the responsibilities of a person working in the construction industry.
3. State the personal characteristics of a professional.
4. Identify the stages of progress within the plumbing profession and its positive impact on society.

UNIT B: PLUMBING SAFETY

1. Describe the common unsafe acts and unsafe conditions that cause accidents.
2. Describe how to handle unsafe acts and unsafe conditions.
3. Explain how the cost of accidents and illnesses affects everyone on site.
4. Demonstrate the use and care of appropriate personal protective equipment.
5. Identify job-site hazardous work specific to plumbers.
6. Demonstrate the proper use of ladders.
7. Demonstrate how to maintain power tools safely.
8. Explain how to work safely in and around a trench.
9. Describe and demonstrate the lockout/tagout process.

UNIT C: PLUMBING TOOLS

1. Identify the basic hand and power tools used in the plumbing trade.
2. Demonstrate the proper use of plumbing tools.
3. Demonstrate the ability to know when and how to select the proper tool(s) for 4. tasks.
5. Demonstrate the proper maintenance for caring for hand and power tools.
6. Demonstrate how to prepare a surface for tool use.
7. Describe the safety requirements for using plumbing tools.

UNIT D: INTRODUCTION TO PLUMBING MATH

1. Add, subtract, multiply, and divide whole numbers.
2. Add, subtract, multiply, and divide fractions.
3. Add, subtract, multiply, and divide decimals.
4. Convert decimals to percentages and percentages to decimals.
5. Convert fractions to decimals and decimals to fractions.
6. Explain what the metric system is and how it is important in the plumbing trade.
7. Square various numbers and take square roots of numbers, with and without a calculator.
8. Identify the parts of a fitting and use common pipe-measuring techniques.
9. Use fitting dimension tables to determine fitting allowances and thread make-up.
10. Calculate end-to-end measurements using fitting allowances and thread makeup.

UNIT E: INTRODUCTION TO PLUMBING DRAWINGS

1. Identify pictorial (isometric and oblique), schematic, and orthographic drawings, and discuss how different views are used to depict information about objects.
2. Identify the basic symbols used in schematic drawings of pipe assemblies.
3. Explain the types of drawings that may be included in a set of plumbing drawings and the relationship among the different drawings.
4. Interpret plumbing-related information from a set of plumbing drawings.
5. Sketch orthographic and schematic drawings.
6. Use an architect's scale to draw lines to scale and to measure lines drawn to scale.
7. Discuss how code requirements apply to certain drawings.

UNIT F: PLASTIC PIPE AND FITTINGS

1. Identify types of materials and schedules of plastic piping.
2. Identify proper and improper applications of plastic piping.
3. Identify types of fittings and valves used with plastic piping.
4. Identify and determine the kinds of hangers and supports needed for plastic piping.
5. Identify the various techniques used in hanging and supporting plastic piping.
6. Properly measure, cut, and join plastic piping.
7. Explain proper procedures for the handling, storage, and protection of plastic pipes.

UNIT G: COPPER PIPE AND FITTINGS

1. Identify the types of materials and schedules used with copper piping.
2. Identify the material properties, storage, and handling requirements of copper piping.
3. Identify the types of fittings and valves used with copper piping.
4. Identify the techniques used in hanging and supporting copper piping.
5. Properly measure, ream, cut, and join copper piping.
6. Identify the hazards and safety precautions associated with copper piping.

UNIT H: CAST-IRON PIPE AND FITTINGS

1. Recognize proper and improper applications of cast-iron piping.
2. Identify the material properties, storage, and handling requirements of carbon steel piping.
3. Identify the types of materials and schedules used in cast-iron piping.
4. Identify the types of fittings used with cast-iron piping.
5. Identify the various techniques used in handling and supporting cast-iron piping.
6. Properly measure, cut, and join cast-iron piping.
7. Identify the hazards and safety precautions associated with cast-iron piping.

UNIT I: CARBON STEEL PIPE AND FITTINGS

1. Recognize proper applications of carbon steel piping.
2. Identify the material properties, storage, and handling requirements of carbon steel piping.
3. Identify the various techniques used in hanging and supporting carbon steel piping.
4. Properly measure, cut, groove, thread, and join carbon steel piping.

UNIT J: CORRUGATED STAINLESS STEEL TUBING

1. Identify the common manufacturers of corrugated stainless steel tubing.
2. Recognize proper and improper applications of corrugated stainless steel tubing.
3. Identify the various techniques used in hanging and supporting corrugated stainless steel tubing.
4. Explain how to properly measure, cut, join, and groove corrugated stainless steel tubing.
5. Identify the material properties, storage, and handling requirements of corrugated stainless steel tubing.

UNIT K: FIXTURES AND FAUCETS

1. Identify the basic types of materials used in the manufacture of plumbing fixtures.
2. Discuss common types of sinks, lavatories, and faucets.
3. Identify and discuss common types of bathtubs, bath-shower modules, shower stalls, and shower baths.
4. Discuss common types of toilets, urinals, and bidets.
5. Identify and describe common types of drinking fountains and water coolers.
6. Discuss common types of garbage disposals and domestic dishwashers.

UNIT L: INTRODUCTION TO DRAIN, WASTE, AND VENT (DWV) SYSTEMS

1. Explain how waste moves from a fixture through the drain system to the environment.
2. Identify the major components of a drainage system and describe their functions.
3. Identify the different types of traps and their components, explain the importance of traps, and identify the ways that traps can lose their seals.
4. Identify the various types of drain, waste, and vent (DWV) fittings and describe their applications.
5. Identify significant code and health issues, violations, and consequences related to DWV systems.

UNIT M: INTRODUCTION TO WATER DISTRIBUTION SYSTEMS

1. Describe the process by which water is distributed in municipal, residential, and

- private water systems.
2. Identify the major components of a water distribution system, and describe the function of each component.
 3. Explain the relationships between components of a water distribution system.

PLUMBING – ADVANCED

For schools with more classroom instructional hours, choose from the list of advanced standards for your second, third, and fourth year students.

ADVANCED UNIT A: PLUMBING MATH 2

1. Calculate $11\frac{1}{4}$ -, $22\frac{1}{2}$ -, 45-, 60-, and 72-degree offsets.
2. Check the squareness of a corner using the 3-4-5 ratio.
3. Lay out square corners using the 3-4-5 ratio.
4. Use a framing square to find the travel.
5. Use a folding rule to find given angles.
6. Calculate $11\frac{1}{4}$ -, $22\frac{1}{2}$ -, 45-, 60-, and 72-degree offsets.
7. Calculate rolling offsets using constants for the angled fittings.
8. Calculate rolling offsets using a framing square.
9. Calculate 45-degree offsets around obstructions.

ADVANCED UNIT B: READING COMMERCIAL DRAWINGS

1. Interpret information from given site plans.
2. Verify dimensions shown on drawings and generate an RFI when you find discrepancies.
3. Locate plumbing entry points, walls, and chases.
4. Create an isometric drawing.
5. Do a material takeoff for drainage, waste, and vent (DWV) and water supply systems from information shown on drawings.
6. Use approved submittal data, floor plans, and architectural details to lay out fixture rough-ins, to develop estimates, and to establish general fixture locations.
7. Recognize the need for coordination and shop drawings.

ADVANCED UNIT C: HANGERS, SUPPORTS, STRUCTURAL PENETRATIONS, AND FIRE STOPPING

1. Identify the hangers and supports used to install DWV and water supply systems and explain their applications.
2. Install pipe hangers and supports correctly according to local applicable codes and manufacturer's specifications.
3. Modify structural members using the appropriate tools without weakening the structure.
4. Identify and install common types of fire-stopping materials used in penetrations through fire-rated structural members, walls, floors, and ceilings.

ADVANCED UNIT D: INSTALLING AND TESTING DWV PIPING

1. Develop a material takeoff from a given set of plans.
2. Use plans and fixture rough-in sheets to determine location of fixtures and route

- of the plumbing.
3. Install a building sewer and a building drain.
 4. Locate the stack within the structure.
 5. Install a DWV system using appropriate hangers and correct grade or slope.
 6. Modify structural members using the appropriate tools without weakening the structure.
 7. Test a DWV system.

ADVANCED UNIT E: INSTALLING ROOF, FLOOR, AND AREA DRAINS

1. Use a surveyor's level or transit level to set the elevation of a floor or area drain.
2. Install a roof drain, a floor drain, and an area drain.
3. Install waterproof membranes and flashing.

ADVANCED UNIT F: TYPES OF VALVES

1. Identify the basic types of valves.
2. Describe the differences in pressure ratings for valves.
3. Demonstrate the ability to service various types of valves.

ADVANCED UNIT G: INSTALLING AND TESTING WATER SUPPLY PIPING

1. Develop a material takeoff from a given set of plans.
2. Use plans and fixture rough-in sheets to determine the location of fixtures and the route of the water supply piping.
3. Locate and size a water meter.
4. Locate a water heater, water softener, and hose bibbs.
5. Install a water distribution system using appropriate hangers.
6. Modify structural members, using the appropriate tools, without weakening the structure.
7. Correctly size and install a water service line, including backflow prevention.
8. Test a water supply system.

ADVANCED UNIT H: INSTALLING FIXTURES, VALVES, AND FAUCETS

1. Describe the general procedures you should follow before installing any fixture.
2. Install bathtubs, shower stalls, valves, and faucets.
3. Install water closets and urinals.
4. Install lavatories, sinks, and pop-up drains.
5. Protect fixtures.

ADVANCED UNIT I: INSTALLING WATER HEATERS

1. Describe the basic operation of water heaters.
2. Identify and explain the functions of the basic components of water heaters.
3. Install an electric water heater.

4. Install a gas water heater.
5. Describe the safety hazards associated with water heaters.

ADVANCED UNIT J: FUEL GAS SYSTEMS

1. Identify the major components of the following fuel systems and describe the function of each component: natural gas, LP gas (liquefied petroleum gas), and fuel oil.
2. Identify the physical properties of each type of fuel.
3. Identify the safety precautions and potential hazards associated with each type of fuel and system.
4. Connect appliances to the fuel gas system properly.
5. Apply local codes to various fuel gas systems.
6. Design, size, purge, and test fuel gas systems.
7. Demonstrate familiarity with applicable fuel gas codes.

ADVANCED UNIT K: SERVICING OF FIXTURES, VALVES, AND FAUCETS

1. Identify common repair and maintenance requirements for fixtures, valves, and faucets.
2. Identify the proper procedures for repairing and maintaining fixtures, valves, and faucets.

ADVANCED UNIT L: APPLIED MATH

1. Identify the weights and measures used in the English and metric systems.
2. Demonstrate an understanding of the concepts of area and volume.
3. Demonstrate an understanding of the practical applications of area and volume calculations.
4. Demonstrate an understanding of the concepts of temperature and pressure and how they apply to plumbing installations.
5. Explain the functions and applications of six simple machines.

ADVANCED UNIT M: CODES

1. Describe the model and local plumbing codes and their purposes.
2. Explain the procedure for modifying plumbing codes.
3. Demonstrate familiarity with the model code (if applicable) and local code used in your area.
4. Use the local plumbing code to find and cite references.

ADVANCED UNIT N: TYPES OF VENTING

1. Demonstrate an understanding of the scientific principles of venting.
2. Design vent systems according to local code requirements.
3. Sketch the different types of vents.

4. Construct given vent configurations.
5. Install the different types of vents correctly.

ADVANCED UNIT O: INDIRECT AND SPECIAL WASTE

1. Identify the reasons for using indirect systems.
2. Discuss the requirements for receptors and backflow preventers.
3. Demonstrate the ability to install an indirect waste system.
4. Identify the reasons for using special waste systems.
5. Describe the purpose of interceptors and how each type functions.
6. Sketch the basic installation and maintenance requirements for interceptors.
7. Describe the precautions that must be taken when installing interceptors to ensure ease of future maintenance and repair.
8. Install an interceptor.
9. Use the local plumbing code to cite the requirements for using indirect waste disposal systems.
10. Use the local plumbing code to cite the requirements for using special waste disposal systems.

ADVANCED UNIT P: SEWAGE PUMPS AND SUMP PUMPS

1. Explain the functions, components, and operation of sewage and sump pumps.
2. Size a storm water sump by calculating the runoff from paved and unpaved land surfaces.
3. Size a sewage sump by calculating the sewage flow from a structure.
4. Install and adjust sensors, switches, and alarms in sewage and sump pumps.
5. Troubleshoot and repair sewage and sump pumps.
6. Using a detailed drawing, identify system components.
7. Install a sump pump.

ADVANCED UNIT Q: SIZING WATER SUPPLY PIPING

1. Calculate pressure drops in a water supply system.
2. Size pipe for different flow rates.
3. Explain the difference between and advantages of a continuous-flow system and an intermittent-flow system.
4. Identify fixtures with high flow rates.
5. Explain the proper viscosity of liquids used in water supply installation.
6. Lay out a water supply system.
7. Calculate developed lengths of branches for a given water supply system.
8. Calculate flow rates for high flow rate fixtures.

ADVANCED UNIT R: BACKFLOW PREVENTERS

1. Explain the principle of backflow due to back siphonage or back pressure.
2. Explain the hazards of backflow and demonstrate the importance of backflow

- preventers.
3. Identify and explain the applications of the six basic backflow prevention devices.
 4. Install common types of backflow preventers.

ADVANCED UNIT S: WATER PRESSURE BOOSTER AND RECIRCULATION SYSTEMS

1. Explain the complete water pressure booster system and its components.
2. Explain the maintenance and basic troubleshooting processes for water pressure booster systems.
3. Describe the characteristics of the different recirculation systems.
4. Identify the basic components of a recirculation system.
5. Identify the location of various components within a recirculation system.
6. Install a water pressure booster system per engineering plans and specifications.
7. Install the basic components of a recirculation system.
8. Use the local plumbing code to find and cite requirements for recirculation systems.
9. Diagnose basic problems in recirculation systems.

ADVANCED UNIT T: SERVICING PIPING SYSTEMS, FIXTURES, AND APPLIANCES

1. Diagnose water supply problems.
2. Diagnose water quality problems.
3. Explain different types of corrosion and their effects on pipes.
4. Diagnose and solve fixture and appliance problems.
5. Troubleshoot and repair water supply problems.
6. Troubleshoot and repair water heater problems.
7. Troubleshoot and repair water drainage problems.
8. Troubleshoot lawn irrigation systems.

ADVANCED UNIT U: BUSINESS MATH FOR PLUMBERS

1. Correctly price a small job.
2. Understand how components of cost relate to profit.

ADVANCED UNIT V: SIZING DWV AND STORM SYSTEMS

1. Calculate drainage fixture units for waste systems.
2. Size building drains and sewers.
3. Size a vent system.
4. Identify and size special kinds of waste and vent systems.
5. Size roof drainage systems.

ADVANCED UNIT W: PRIVATE WATER SUPPLY SYSTEMS

1. Identify the qualities of a good well.
2. Explain the operation of various types of pumps and well components.
3. Explain the installation of private water supply system components.
4. Troubleshoot a private water supply system.

ADVANCED UNIT X: PRIVATE WASTE DISPOSAL SYSTEMS

1. Describe the types of private waste disposal systems.
2. Discuss the maintenance and replacement of private waste disposal systems.
3. Discuss the local code requirements for private waste disposal systems.

ADVANCED UNIT Y: LOCATING BURIED SEWER AND WATER LINES

1. Use plans and blueprints to locate lines.
2. Use an electronic pipe locator to locate metallic and nonmetallic pipe.
3. Use a camera to locate and diagnose metallic and nonmetallic pipe.
4. Describe utility protection and notification procedures.

ADVANCED UNIT Z: HYDRONIC AND SOLAR HEATING SYSTEMS

1. Describe the basic types of hydronic and solar heating systems and their components.
2. Describe the procedures for roughing in and testing the piping in hydronic or solar heating systems.
3. Describe the procedures for installing equipment in hydronic or solar heating systems.
4. Describe the procedures used to test, balance, and start up hydronic or solar heating systems.

ADVANCED UNIT AA: WATER SUPPLY TREATMENT

1. Flush out visible contaminants from plumbing systems.
2. Disinfect a potable water plumbing system.
3. Identify common water problems.
4. Practice methods used to soften water.
5. Analyze and measure water-conditioning problems.

ADVANCED UNIT BB: SWIMMING POOLS AND HOT TUBS

1. Explain swimming pool and hot tub systems and their components.
2. Explain the local procedures and codes for plumbing a swimming pool.
3. Explain the local procedures and codes for plumbing a hot tub.
4. Discuss water quality issues related to swimming pools and hot tubs.
5. Identify and discuss backflow requirements for swimming pools and hot tubs according to local procedures and codes.

ADVANCED UNIT CC: COMPRESSED AIR

1. Discuss the installation of compressed air systems and their components and accessories.
2. Describe the applications of compressed air systems.
3. Identify the different methods of conditioning compressed air.
4. Identify the types, functions, and capacities of different air compressor systems.
5. Identify the safety issues related to compressed air systems.
6. Troubleshoot a compressed air system.

ADVANCED UNIT DD: CORROSIVE-RESISTANT WASTE PIPING

1. Discuss corrosive wastes and explain where they are found.
2. Discuss common types of materials used for corrosive-resistant waste piping.
3. Explain the methods of joining corrosive-resistant waste piping.
4. Discuss safety issues and hazard communications.

ADVANCED UNIT EE: PLUMBING FOR MOBILE HOMES AND MOBILE HOME PARKS

1. Describe the proper location and layout of sewer and supply lines for a mobile home park.
2. Explain the procedure for connecting water and sewer lines to mobile homes.
3. Discuss code issues that are specific to mobile homes.
4. Explain a travel trailer park and its plumbing needs.
5. Describe a sanitary dump system.