

MODULE OVERVIEW

This module introduces trainees to offsets. Trainees will learn how to calculate the cut lengths of pipe when the run changes directions, including parallel offsets, rolling offsets, and offsets around obstructions.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Plumbing Level One*.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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 parallel 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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Demonstrate the steps needed to calculate a 45-degree offset around an obstruction. Create a list of tools/ charts needed for this.
2. Determine the length of pipe with fittings installed after calculating the offset.
3. Draw a diagram that illustrates the difference between a simple and a rolling offset.
4. Using appropriate charts, calculate, fabricate, and install a 60-degree simple and parallel offset.
5. Calculate the rolling offset using a framing square.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Framing square
Transparencies	Tape measure
Blank acetate sheets	Folding rule
Transparency pens	Wooden rule
Whiteboard/ chalkboard	Chalk
Markers/ chalk	Several 2 × 4s
Pencils and scratch paper	Module Examinations*
Appropriate personal protective equipment	Performance Profile Sheets*
Copies of your local code	
Scientific (trigonometric) calculator	

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Remind trainees that safety considerations apply in any construction activity conducted at a work site—including measuring and making calculations. Ensure that they are equipped with appropriate personal protective equipment and know how to use it properly.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference work is suggested for both instructors and motivated trainees interested in further study. This is optional materials for continued education rather than for task training.

Pipefitters Handbook. Forrest R. Lindsay. New York: Industrial Press Inc.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Plumbing Math Two*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Pythagorean Theorem	
A. The Pythagorean Theorem	_____
B. Checking the Squareness of a Corner	_____
C. Laying Out a Square Corner	_____
Session II. Offsets, Part One	
A. Fitting Allowances	_____
B. 45-Degree Offsets	_____
C. Laboratory – Trainees practice determining the length of pipe needed to make an offset. This laboratory corresponds to Performance Task 2.	_____
D. Determining the Starting Point of a 45-Degree Offset	_____
E. Performance Testing (Task 1)	_____
Session III. Offsets, Part Two	
A. Figuring Other Offsets	_____
B. Finding the Travel with a Framing Square	_____
Session IV. Finding Angles/Offsets on Parallel Runs of Pipe	
A. Finding Angles with a Folding Rule	_____
B. Offsets on Parallel Runs of Pipe	_____
C. Laying Out Multiple Offsets	_____
Session V. Rolling Offsets, Part One	
A. Drawing Rolling Offsets	_____
B. Laboratory – Trainees draw diagrams of simple and rolling offsets. This laboratory corresponds to Performance Task 3.	_____
C. Finding True Offset	_____
D. Finding Run and Travel in Rolling Offsets	_____

Session VI. Rolling Offsets, Part Two

A. Calculating Rolling Offsets with a Framing Square

B. Review

C. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.

2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

D. Performance Testing (Task 4)

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module reviews the different types of commercial drawings and techniques used to interpret information and verify dimensions. Trainees will learn how to write a request for information (RFI), locate plumbing entry points, create isometric drawings, do a material takeoff, and lay out fixture rough-ins.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Module 02201-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Interpret information from given site plans.
2. Verify dimensions shown on drawings and generate a request for information (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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Using a site plan, interpret or explain information as required by the instructor.
2. Write an RFI.
3. Using the site plan provided, locate plumbing entry points.
4. Use cut sheets and floor plans to lay out fixture rough-ins.
5. Do a material takeoff for DWV and water supply systems. Size pipes according to the local code. Create an isometric drawing.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard / chalkboard

Markers / chalk

Pencils and scratch paper

Appropriate personal protective equipment

Copies of your local code

Commercial drawings:

 Civil drawings (site plans)

 Architectural drawings

 Structural drawings

 Mechanical drawings

Plumbing drawings

Electrical drawings

Sample contractual documents:

 Addenda

 Change orders

 RFIs

 Clarifications

Blank RFI forms

Sample worksheet drawings:

 Floor plans and corresponding schedules

 Isometric drawing of a supply and DWV system

 Plumbing plans and corresponding schedules
 and isometric drawings

 Plumbing plans and corresponding approved
 submittal data and cut sheets

 Coordination drawings

 As-built drawings

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the dangers of working with structural steel. In jurisdictions where cutting is permitted, ensure that trainees obtain permission from the structural engineer and possibly the code administrator.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Blueprint Reading for the Building Trades. 1985. John E. Traister. Carlsbad, CA: Craftsman Book Company.
A Manual of Construction Documentation: An Illustrated Guide to Preparing Construction Drawings. 1989. Glenn E. Wiggins. New York: Whitney Library of Design.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Reading Commercial Drawings*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Commercial Drawings, Part One	
A. Civil Drawings – The Site Plans	_____
B. Architectural Drawings	_____
Session II. Commercial Drawings, Part Two	
A. Structural Drawings	_____
B. Mechanical Drawings	_____
C. Plumbing Drawings	_____
D. Electrical Drawings	_____
Session III. Commercial Drawings, Part Three	
A. Working with Construction Drawings	_____
B. Title Block	_____
Session IV. Commercial Drawings, Part Four	
A. Documenting Changes to Construction Drawings	_____
B. Performance Testing (Task 2)	_____
Session V. Worksheet Drawings, Part One	
A. Floor Plan and Schedules	_____
B. Alternates	_____
C. Entry Points, Walls, and Chases	_____
1. Laboratory — Trainees practice using site plans to interpret or explain information you specify. This laboratory corresponds to Performance Task 1.	_____
D. Performance Testing (Task 3)	_____

Session VI. Worksheet Drawings, Part Two

- A. Using Plumbing Plans
- B. Schedules
- C. Approved Submittal Data
- D. Isometric Drawings

Session VII. Worksheet Drawings, Part Three

- A. The Material Takeoff
 - 1. Laboratory — Trainees practice sizing pipes according to the local code and creating isometric drawings. This laboratory corresponds to Performance Task 5.
- B. Coordination Drawings
- C. As-Built Drawings

Session VIII. Worksheet Drawings, Part Four

- A. Practice Problems
- B. Review
- C. Module Examination
 - 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- D. Performance Testing (Task 4)
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module discusses the types of hangers and supports that are used to install drain, waste, and vent (DWV) and water supply systems. Trainees will learn how to properly identify, install, and modify hangers and supports, as well as how to identify and install fire-stopping materials.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Plumbing Level One; and Plumbing Level Two*, Modules 02201-05 and 02202-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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 and 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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

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

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Copies of your local code

Calculators

A variety of pipe attachments

Notched steel clamps and standard channels

A variety of connectors

Reducing rod coupling

Two threaded support rods of different sizes

Powder-actuated fastening tool

Published guidelines for powder-actuated fastening tool

Concrete inserts, support rods, and appropriate nuts

Engineer's specifications for hanger installation

Sections of floor joists

Sections of pipe

Tools and materials for drilling

Tools and materials for notching

Approved and unapproved fire-stopping materials and sealants	A news article highlighting the importance of fire-stopping materials
Steel collar lined with an intumescent block	Module Examinations*
Tools and materials to box floor joists	Performance Profile Sheets*
Tools and materials to add furring strips	
Tools and materials to build a chase	

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the dangers of working with powder-actuated fastening tools. Ensure that trainees consult the proper authority and refer to local code when spacing hangers and supports and modifying structural members.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Handbook of Materials Selection. 2002. Myer Kutz, ed. New York: J. Wiley.

NFPA 1, Uniform Fire Code, Latest Edition. Quincy, MA: National Fire Protection Association.

Practical Plumbing Engineering. 1991. Cyril M. Harris, ed. New York: McGraw-Hill.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 10 hours are suggested to cover *Hangers, Supports, Structural Penetrations, and Fire Stopping*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Installing Pipe Hangers and Supports, Part One	
A. Pipe Attachments	_____
B. Connectors	_____
C. Structural Attachments	_____
D. Powder-Actuated Fastening Systems	_____
E. Structural Attachments	_____
Session II. Installing Pipe Hangers and Supports, Part Two	
A. Special Hangers and Accessories	_____
B. Pipe Hanger Locations	_____
C. Supporting Vertical and Horizontal Piping	_____
1. Laboratory – Trainees practice installing pipe hangers and supports. This laboratory corresponds to Performance Task 1.	_____
D. Supporting Closet Bends and Stack Bases	_____
E. Supporting Multiple Side-by-Side Runs of Pipe	_____

Session III. Structural Penetration

- A. Drilling
- B. Notching
- C. Boxing Floor Joists
- D. Furring Strips
- E. Building a Chase
- F. Performance Testing (Task 2)

Session IV. Fire Stopping

- A. Fire-Stopping Materials
 - 1. Laboratory – Trainees practice installing common types of fire-stopping materials. This laboratory corresponds to Performance Task 3.
- B. Review
- C. Module Examination
 - 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- D. Performance Testing
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module explains how to install, modify, and test drain, waste, and vent (DWV) systems. Trainees will learn about the various steps and components of the installation process, including how to develop a material takeoff, use plans and rough-ins to determine the location of fixtures, and locate the stack in a structure.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*, and *Plumbing Level Two*, Modules 02201-05 through 02203-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Develop a material takeoff from a given set of plans.
2. Use plans and fixture rough-in sheets or rough-in book to determine location of fixtures and route of the plumbing.
3. Locate the stack within the structure.
4. Demonstrate an ability to install a DWV system using appropriate hangers and correct grade.
5. Modify structural members using the appropriate tools and without weakening the structure, following the applicable code.
6. Demonstrate the ability to correctly size and install a building sewer and a building drain and final connection.
7. Test a DWV system according to code.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Copies of your local code

Plans and fixture rough-in sheets

Rough-in book

Sample material takeoff forms

Floor plans

Manufacturers' rough-in sheets

Variety of carrier fittings

Variety of carriers used to support urinals and other fixtures

Variety of lavatory and sink carriers

Blocking materials

Job/project specifications

Sample plot plans

General-purpose level

Builder's level	Sample architectural plans without the fixture locations marked
Stadia rod	
Plumb bob	Drawing paper
Basic framing	Daily log
DWV stack	Testing tools and equipment
Fixture drains	Module Examinations*
Variety of fittings	Performance Profile Sheets*
Tools to complete a DWV installation	

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize the importance of wearing fall protection when working on a roof, and stress that trainees must always follow OSHA guidelines when shoring or terracing a trench. Remind trainees of the dangers of working around toxic and flammable vapors, including sewer gases.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Code Check Plumbing: A Field Guide to the Plumbing Codes. 2000. Redwood Kardon. Newtown, CT: Taunton Press.

Handbook of Materials Selection. 2002. Myer Kutz, ed. New York: J. Wiley.

Plumber's and Pipe Fitter's Calculations Manual. 1999. R. Dodge Woodson. New York: McGraw-Hill.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 25 hours are suggested to cover *Installing and Testing DWV Piping*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Plans and Material Takeoffs, Part One	
A. Materials Takeoffs	_____
B. Locating Plumbing Fixtures	_____
C. Locating Building Drains and Sewers	_____
D. Locating Residential Water Closets	_____
1. Laboratory – Trainees practice completing material takeoffs. This laboratory corresponds to Performance Task 1.	_____
Session II. Material Takeoffs, Part Two	
A. Locating Commercial Water Closets	_____
B. Locating Urinals and Other Fixtures	_____
C. Locating Residential Lavatories	_____
D. Performance Testing (Task 2)	_____

MODULE OVERVIEW

This module reviews the different types of roof, floor, and area drains. Trainees will learn how to use surveyor's tools to set the elevation and install these drains, as well as how to install waterproof membranes and flashing.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Modules 02201-05 through 02204-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

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

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Surveyor's level
Transparencies	Straight board
Blank acetate sheets	String line
Transparency pens	Copies of <i>Figure 18</i> with the callouts covered
Whiteboard/chalkboard	Tools used to cut roof openings
Markers/chalk	Sections of roof deck
Pencils and scratch paper	Flashing or a waterproof membrane
Appropriate personal protective equipment	Tools to install drains
Copies of your local code	Copies of Quick Quiz**
Roof, floor, and area drains	Module Examinations*
Copies of plans and specifications	Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

**Located at the end of this module.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. When working with roof, floor, and area drains, remind trainees to consult local codes, and in areas that require high levels of sanitation, check with the local health department.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Controlled Storm Water Drainage, 1979. Louis Blendermann. New York: Industrial Press.

Water and Plumbing, 2000. Ifte Choudhury and J. Trost. Upper Saddle River, N.J.: Prentice Hall.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 5 hours are suggested to cover *Installing Roof, Floor, and Area Drains*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction to Drains	
A. Basic Parts of Drains	_____
B. Types of Drains	_____
C. Determining Requirements for Floor Drains	_____
Session II. Installing Drains	
A. Installing Floor and Area Drains	_____
B. Laboratory – Trainees practice using a surveyor’s level. This laboratory corresponds to Performance Task 1.	_____
C. Installing Roof Drains	_____
D. Review	_____
E. Module Examination	_____
1. Trainees must score 70 percent or higher to receive recognition from NCCER.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	
F. Performance Testing (Tasks 2 and 3)	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	

MODULE OVERVIEW

This module discusses the basic types of valves and how they operate. Trainees will learn to identify the types of valves and their parts, as well as how to select the most appropriate valve for a plumbing system.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Modules 02201-05 through 02205-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Identify types of valves.
2. Identify parts of valves.
3. Identify applications of valves.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Globe
Transparencies	Angle
Blank acetate sheets	Ball
Transparency pens	Butterfly
Whiteboard / chalkboard	Check
Markers / chalk	Flushometer
Pencils and scratch paper	Flush
Appropriate personal protective equipment	Plug
Copies of your local code	Temperature and pressure (T/P)
Copies of the valve cross section in <i>Figure 3</i> with the callouts covered	Pressure regulator
Copies of the valve drawing in <i>Figure 5</i> with the callouts covered	Supply stop
Copies of <i>Figure 12</i> with the callouts covered	Float-controlled
Float valve assembly	Backwater
Variety of packing materials	Flushometer and float-controlled valve repair kits and faulty flushometer and float-controlled valves
Variety of valves, including the following:	A variety of other faulty valves
Gate	Tools to repair valves
	Module Examinations*
	Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Always take safety precautions when repairing plumbing components. Remind trainees to consult local code for venting requirements and ensure that the correct valve is used for the intended system, operating pressures, and temperatures.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

NIBCO Catalog C-VSG-0502, *Valve Selection & Specification Guide for Building Services*, 2002. Elkhart, IN: NIBCO.

Piping and Valves. 2001. Frank R. Spellman and Joanne Drinan. Lancaster, PA: Technomic.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 5 hours are suggested to cover *Types of Valves*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Types of Valves	
A. Gate, Globe, and Angle Valves	_____
B. Ball, Butterfly, and Check Valves	_____
C. Flushometer, Flush, and Plug Valves	_____
D. Temperature and Pressure (T/P) and Pressure Regulator Valves	_____
E. Supply Stop, Float-Controlled, and Backwater Valves	_____
F. Performance Testing (Task 1)	_____
Session II. Valve Selection and Repair	
A. Valve Components	_____
B. Laboratory – Trainees practice identifying valve components. This laboratory corresponds to Performance Task 2.	_____
C. Selecting Valves for Specific Applications	_____
D. Laboratory – Trainees practice selecting valves. This laboratory corresponds to Performance Task 3.	_____
E. Repairing Valves	_____
F. Review	_____
G. Module Examination	_____
1. Trainees must score 70 percent or higher to receive recognition from NCCER.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	
H. Performance Testing (Tasks 2 and 3)	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	

MODULE OVERVIEW

This module reviews techniques for installing and testing water supply piping. Trainees will learn how to develop a material takeoff, determine fixture locations, and modify structural members. Trainees will learn how to test a water supply system and size and install a water service line.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Modules 02201-05 through 02206-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Demonstrate the ability to locate a water meter.
2. Develop a water supply piping material takeoff from a given set of plans.
3. Using instructor-provided plans and fixture rough-in sheets, determine location of fixtures and route of the water supply piping.
4. Describe procedures for modifying a structural member without weakening it, using the appropriate procedures and codes.
5. Demonstrate the ability to correctly size and install a water service line including backflow preventer.
6. Describe how to properly test a water supply system.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Fixture rough-in sheets
Transparencies	Job specifications
Blank acetate sheets	Copies of an inspector's test record
Transparency pens	Variety of meters larger than 1½ inches in diameter
Whiteboard / chalkboard	Tools to plumb and set the meters
Markers / chalk	Sizing tables
Pencils and scratch paper	Pipe sleeves
Appropriate personal protective equipment	Sections of pipe
Copies of your local code	Backing boards
Construction plans	Ells
Takeoff drawings	Module Examinations*
Approved submittal data	Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the dangers associated with testing water supply piping. Ensure that trainees always follow the appropriate safety procedures.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Practical Plumbing Engineering. 1991. Cyril M. Harris, ed. New York: McGraw-Hill.

Water Quality & Systems: A Guide for Facility Managers. 1996. Robert N. Reid. New York: UpWord Publishing.

Water Supply Systems Security. 2004. Larry W. Mays, ed. New York: McGraw-Hill.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Installing and Testing Water Supply Piping*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Overview of an Installation	
A. Introduction	_____
Session II. Main to Meter Water Service, Part One	
A. Piping Materials and Sizes	_____
B. Freeze Protection	_____
C. Pipe Protection	_____
Session III. Main to Meter Water Service, Part Two	
A. Water Meters	_____
B. Laboratory – Trainees practice locating water meters. This laboratory corresponds to Performance Task 1.	_____
Session IV. Water Heater, Water Softener, and Hose Bibbs	
A. Locating the Water Heater	_____
B. Locating the Water Softener	_____
C. Locating the Hose Bibb	_____
D. Laboratory – Trainees practice determining the location of fixtures and the route of the water supply piping. This laboratory corresponds to Performance Task 3.	_____
Session V. Locating Fixtures	
A. Assembling and Installing the Stubouts	_____
B. Performance Testing (Task 2)	_____
Session VI. Main Supply Lines	
A. Supply Lines	_____
B. Shock Arresters	_____
C. Other Water Supply Connections	_____

Session VII. Completing the Installation

- A. Accessibility for Maintenance and Repair
- B. Freeze Protection
- C. Puncture Protection
- D. Backflow Prevention
- E. Performance Testing (Tasks 4 and 5)

Session VIII. Testing

- A. Testing
- B. Air Test
- C. Hydrostatic Test
- D. Test Pump Operation
- E. Review
- F. Module Examination
 - 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- G. Performance Testing (Task 6)
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module discusses the installation of basic plumbing fixtures. Trainees will learn how to use approved submittal data and manufacturer's instructions when installing fixtures. Trainees will also learn how to install valves and faucets.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Modules 02201-05 through 02207-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Protect fixtures after delivery and before occupancy.
2. Install bathtubs, shower stalls, valves, and bath/shower faucets.
3. Install lavatories, sinks, sink faucets, and pop-up drains.
4. Install water closets, urinals, and test valves.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Variety of threaded valves
Transparencies	Teflon® tape or pipe dope
Blank acetate sheets	Pipe-reaming tool
Transparency pens	Copper-cleaning tool
Whiteboard/chalkboard	CPVC primer and solvent
Markers/chalk	Stubout
Pencils and scratch paper	Copies of Figures 11, 12, and 13 with callouts covered
Appropriate personal protective equipment	Flushometer control stop
Copies of your local code	Manufacturer's instructions for a variety of valves
Variety of fixtures	Uncut countertop
Cardboard cartons to protect fixtures	Rim-mounted sink
Bathtub	Fixture sealant
Blocking	Lift rod assembly
Variety of valves, including threaded valves, soldered valves, solvent-welded valves, flanged valves, compression connection valves	Manufacturer's instructions for lavatories, sinks, and pop-up drains
Valves for water closets, including float-controlled valves and manual flush valves	New water closets and urinals
	Tools to install fixtures, valves, and faucets

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

**Located at the end of this module.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the necessity to follow manufacturer's instructions and guidelines. Ensure that trainees understand the importance of properly installing valve components.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Installing & Repairing Plumbing Fixtures. 1994. Peter Hemp. Newton, CT: Taunton Press.

Materials and Components of Interior Architecture, 6th Edition. 2003. J. Rosemary Riggs. Upper Saddle River, NJ: Prentice Hall.

Plumbing Fixtures and Appliances. 1982. Patrick J. Higgins and Kevin T. O'Hearn. Westport, CT: Intext, Inc.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Installing Fixtures, Valves, and Faucets*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Tips and Techniques; Installing Bathtubs and Shower Stalls	
A. Pre-Installation Tips and Techniques	_____
B. Installing Bathtubs and Shower Stalls	_____
C. Laboratory – Trainees practice protecting fixtures. This laboratory corresponds to Performance Task 1.	_____
Session II. Installing Valves and Faucets, Part One	
A. Threaded Valves	_____
B. Soldered Valves	_____
C. Solvent-Welded Valves	_____
Session III. Installing Valves and Faucets, Part Two	
A. Flanged Valves	_____
B. Compression Connection Valves	_____
C. Installing Faucets	_____
D. Performance Testing (Task 2)	_____
Session IV. Installing Valves for Water Closets and Urinals	
A. Float-Controlled Valves	_____
B. Flush Valves	_____
C. Flushometers	_____

Session V. Installing Lavatories, Sinks, and Pop-Up Drains

- A. Wall-Hung Lavatories and Sinks
- B. Built-in Lavatories and Sinks
- C. Pop-up Drains
- D. Performance Testing (Task 3)

Session VI. Installing Water Closets and Urinals

- A. Water Closets
- B. Urinals
- C. Review
- D. Module Examination
 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- E. Performance Testing (Task 4)
 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module introduces basic electricity and how it relates to plumbing system components. Trainees will learn how to calculate voltage, current, resistance, and power using Ohm's law and the power formula. Trainees will also learn about the purpose and operation of electrical components, as well as how to use electrical test equipment and interpret electrical symbols.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Modules 02201-05 through 02208-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. State and demonstrate the safety precautions that must be followed when working on electrical equipment.
2. State how electrical power is generated and distributed.
3. Describe how voltage, current, resistance, and power are related.
4. Use Ohm's law to calculate the current, voltage, and resistance in a circuit.
5. Use the power formula to calculate how much power is consumed by a circuit.
6. Describe the differences between series and parallel circuits.
7. Recognize and describe the purpose and operation of the various electrical components used in plumbing equipment.
8. Make voltage, current, and resistance measurements using electrical test equipment. Determine the positioning of leads. Test a fuse for continuity.
9. Explain and understand electrical symbols.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Demonstrate use of an ohmmeter.
2. Describe the difference between a series and a parallel circuit.
3. Demonstrate use of power formulas.
4. State and demonstrate performance requirements.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard / chalkboard

Markers / chalk

Pencils and scratch paper

Appropriate personal protective equipment

Copies of your local code

Current edition of the *National Electrical Code*[®]
(NEC[®])

Copy of *NFPA 70*

Voltmeter

Variety of insulated tools

Variety of magnets and magnetic objects

In-line and clamp-on ammeters

Voltage meters

Ohmmeters

Variety of wiring diagrams, including the following:

Wiring diagrams

Simplified schematic diagrams

Ladder diagrams

Manufacturer's component location diagrams

Circuit diagrams

Variety of switches	Immersion element
Variety of fuses	Anode
Variety of relays	Manufacturer's instructions for an electric water heater
Variety of overload protection devices	Module Examinations*
Circuit board	Performance Profile Sheets*
Digital readout	

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the dangers of working with high voltage. Ensure that trainees follow safety procedures and use properly insulated tools.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Modern Refrigeration and Air Conditioning, Latest Edition. Tinley Park, IL: The Goodheart-Willcox Company, Inc.

Vest Pocket Guide to the National Electrical Code®, Latest Edition. Quincy, MA: National Fire Protection Association.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Basic Electricity*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction to Basic Electricity	
A. Electrical Safety	_____
B. Effect of Current	_____
C. Safety Practices	_____
Session II. Electricity and Magnetism	
A. Current, Voltage, and Resistance	_____
B. AC and DC Voltage	_____
C. Magnets and Electromagnets	_____
D. Electrical Power Generation and Distribution	_____
E. Ohm's Law	_____
Session III. Electrical Measuring Instruments	
A. Ammeter	_____
B. Multimeters	_____
C. Performance Testing (Task 1)	_____

Session IV. Electrical Circuits

- A. Circuit Diagrams _____
- B. Series Circuits _____
- C. Parallel Circuits _____
- D. Series-Parallel Circuits _____
- E. Laboratory – Trainees practice identifying the difference between series and parallel circuits. This laboratory corresponds to Performance Task 2. _____
- F. Circuit Characteristics _____
- G. Laboratory – Trainees practice using power formulas. This laboratory corresponds to Performance Task 3. _____

Session V. Electrical Components

- A. Electrical Symbols _____
- B. Load Devices _____
- C. Control Devices _____

Session VI. Electronic Controls and Water Heaters

- A. Electronic Controls _____
- B. Water Heater Electrical Systems _____
- C. Review _____
- D. Module Examination _____
 - 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- E. Performance Testing (Task 4) _____
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module describes basic operation of water heaters. Trainees will learn how to identify the components and functions of water heaters, as well as how to install electric and gas water heaters.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Plumbing Level One; and Plumbing Level Two*, Modules 02201-05 through 02209-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Identify and explain the basic functions of the components of water heaters.
2. Demonstrate how to install an electric water heater.
3. Demonstrate how to install a gas water heater.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Copies of <i>Figure 6</i> with the callouts covered
Transparencies	Water heater specifications
Blank acetate sheets	Dip tube
Transparency pens	Anti-siphon tube
Whiteboard/chalkboard	Copies of <i>Figure 17</i> with the callouts covered
Markers/chalk	Drip lines
Pencils and scratch paper	A variety of safety pans
Appropriate personal protective equipment	Module Examinations*
Copies of your local code	Performance Profile Sheets*
Manufacturers' instructions for installing water heaters	

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the dangers of gas- and oil-fired water heaters. Emphasize the importance of checking settings and properly matching the gas supply.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

The Hot Water Handbook: An Advanced Primer on Domestic Hot Water. 1998. George Lanthier and Robert Suffredini. Arlington, MA: Firedragon Enterprises.

Planning and Installing Solar Thermal Systems: A Guide for Installers, Architects, and Engineers. 2004. German Solar Energy Society (DGS). Sterling, VA: Earthscan.

Residential Hot Water Systems: Repair and Maintenance. 1987. John E. Traister. Englewood Cliffs, NJ: Prentice Hall.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 5 hours are suggested to cover *Installing Water Heaters*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Types of Water Heaters	
A. Introduction	_____
B. Storage Water Heaters	_____
C. Indirect Water Heaters	_____
D. Instantaneous Water Heaters	_____
E. Performance Testing (Task 1)	_____
Session II. Selecting, Installing, and Testing Water Heaters	
A. Selecting Water Heaters	_____
B. Installing Water Heaters	_____
C. Testing Water Heaters	_____
D. Review	_____
E. Module Examination	_____
1. Trainees must score 70 percent or higher to receive recognition from NCCER.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	
F. Performance Testing (Tasks 2 and 3)	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	

MODULE OVERVIEW

This module discusses the components of fuel systems, the properties of each fuel, and the associated hazards. Trainees will learn to connect appliances to fuel gas systems, as well as to how to design, size, purge, and test fuel gas systems.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum*; *Plumbing Level One*; and *Plumbing Level Two*, Modules 02201-05 through 02210-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

1. Identify the major components of the following fuel systems and describe the function of each component:
 - Natural gas
 - LP gas (liquefied petroleum gas)
 - 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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Properly connect appliances to the fuel gas system.
2. Design, size, purge, and test fuel gas systems.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Manufacturer's installation procedures for a variety of appliances
Transparencies	Manometer
Blank acetate sheets	Variety of appliance labels
Transparency pens	Anode and cleaning materials
Whiteboard / chalkboard	Float gauge
Markers / chalk	Plumbing drawings
Pencils and scratch paper	Gas supplier installation information
Appropriate personal protective equipment	Pump manufacturer's specifications
Copies of your local code	Approved fire-stopping materials
National Fire Prevention Association (NFPA) standards that apply to fuel gas and fuel oil	Module Examinations*
Manufacturer's instructions and product warranties	Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees of the dangers of associated with fuel gas systems. Ensure that trainees follow fire codes, and emphasize the importance of properly purging and testing gas lines.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

2003 International Fuel Gas Code. Falls Church, VA: International Code Council and American Gas Association.

Fuel Gas Systems. 1983. Donald L. Wise, ed. Boca Raton, FL: CRC Press.

National Fuel Gas Code Handbook, Third Edition, 1996. Theodore C. Lemoff, ed. Quincy, MA: National Fire Protection Association

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Fuel Gas Systems*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Types of Oil and Gas Used as Fuels	
A. Types of Oil and Gas	_____
B. Natural Gas	_____
C. Liquefied Petroleum Gas	_____
D. Fuel Oil	_____
Session II. Common Factors in Fuel Systems, Part One	
A. Materials	_____
B. Design and Sizing	_____
Session III. Common Factors in Fuel Systems, Part Two	
A. Manufacturer's Installation Instructions	_____
B. Testing	_____
C. Combustion Air	_____
D. Venting	_____
Session IV. Common Factors in Fuel Systems, Part Three	
A. Appliances	_____
B. Performance Testing (Task 1)	_____
Session V. Factors Specific to Natural Gas	
A. Materials	_____
B. Other Factors	_____
C. Installation Considerations	_____
Session VI. Factors Specific to LP Gas	
A. Materials	_____
B. Other Factors	_____
C. Installation Considerations	_____

Session VII. Factors Specific to Fuel Oil

- A. Materials
- B. Other Factors
- C. Installation Considerations

Session VIII. Fire Stopping

- A. Fire Codes
- B. Fire-Stopping Materials
- C. Review
- D. Module Examination
 1. Trainees must score 70 percent or higher to receive recognition from NCCER.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- E. Performance Testing (Task 2)
 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module reviews the various types of fixtures, valves, and faucets. Trainees will learn how to troubleshoot and identify possible causes of problems with fixtures, valves, and faucets.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Plumbing Level One; and Plumbing Level Two, Modules 02201-05 through 02211-05.

OBJECTIVES

Upon completion of this module, the trainee will be able to do the following:

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.

PERFORMANCE TASKS

Under the supervision of the instructor, the trainee should be able to do the following:

1. Diagnose the cause of problems in fixtures, valves, and faucets requiring repair or maintenance.
2. Repair fixtures using the proper tools and replacement parts.
3. Use manufacturer's instructions to disassemble and reassemble a valve.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Balancing valve
Transparencies	T&P valve
Blank acetate sheets	Worn spout O-ring
Transparency pens	Old water filter
Whiteboard/chalkboard	Water filter cartridges and accompanying manufacturer's instructions
Markers/chalk	Electronic controls, batteries, and accompanying manufacturer's instructions
Pencils and scratch paper	Variety of faulty globe, gate, flushometer, and float-controlled valves, as well as repair kits and accompanying manufacturer's instructions
Appropriate personal protective equipment	Variety of faulty tank flush, balancing, and temperature and pressure (T&P) valves, as well as repair kits and accompanying manufacturer's instructions
Copies of your local code	Variety of faulty faucets
Globe valve	Module Examinations*
Wrench	Performance Profile Sheets*
Screw extractor	
Valves with broken screws	
Variety of sizes and shapes of preformed packing	
Tools to repair globe and angle valves and compression faucets	
Flushometer repair kit	
Float-controlled valve repair kit	

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Remind trainees why broken screws should never be extracted by attaching the extractor bit to a drill. Ensure that trainees take precautions against electrical shocks, as well as slips, trips, and falls.

ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Installing & Repairing Plumbing Fixtures. 1994. Peter Hemp. Newton, CT: Taunton Press.

Plumbing Fixtures and Appliances. 2001. Washington, DC: International Pipe Trades Joint Training Committee.

Plumbing Fixtures and Fittings. 2003. Boca Raton, FL: Catalina Research.

Piping and Valves. 2001. Frank R. Spellman and Joanne Drinan. Lancaster, PA: Technomic.

TEACHING TIME FOR THIS MODULE

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 5 hours are suggested to cover *Servicing of Fixtures, Valves, and Faucets*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Servicing of Fixtures, Valves, and Faucets, Part One	
A. General Safety Guidelines	_____
B. Globe and Gate Valves	_____
C. Laboratory – Trainees practice repairing valves and faucets. This laboratory corresponds to Performance Task 2.	_____
D. Flushometers and Float-Controlled Valves	_____
Session II. Servicing of Fixtures, Valves, and Faucets, Part Two	
A. Tank Flush Valves	_____
B. Balancing and Temperature and Pressure (T&P) Valves	_____
C. Faucets	_____
D. Faucet Water Filters	_____
E. Electronic Controls	_____
F. Review	_____
G. Module Examination	_____
1. Trainees must score 70 percent or higher to receive recognition from NCCER.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	
H. Performance Testing (Tasks 1 and 3)	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	