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 11½-, 22½-, 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 11½-, 22½-, 45-, 60-, and 72-degree parallel offsets.
7. Calculate rolling offsets using constants for the angled fittings.
8. 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
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Copies of your local code
Scientific (trigonometric) calculator

Framing square
Tape measure
Folding rule
Wooden rule
Chalk
Several 2 × 4s
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

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.


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.

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<td>B. 45-Degree Offsets</td>
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<td>C. Laboratory – Trainees practice determining the length of pipe needed to make an offset. This laboratory corresponds to Performance Task 2.</td>
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<td>D. Determining the Starting Point of a 45-Degree Offset</td>
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<td><strong>Session IV. Finding Angles/Offsets on Parallel Runs of Pipe</strong></td>
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<td>A. Finding Angles with a Folding Rule</td>
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<td>C. Laying Out Multiple Offsets</td>
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<td><strong>Session V. Rolling Offsets, Part One</strong></td>
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<td>A. Drawing Rolling Offsets</td>
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<tr>
<td>B. Laboratory – Trainees draw diagrams of simple and rolling offsets. This laboratory corresponds to Performance Task 3.</td>
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<tr>
<td>C. Finding True Offset</td>
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<td>D. Finding Run and Travel in Rolling Offsets</td>
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</tbody>
</table>
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.
Reading Commercial Drawings
Annotated Instructor’s Guide

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
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.


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.

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<td>B. Architectural Drawings</td>
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<td>B. Mechanical Drawings</td>
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<td>C. Plumbing Drawings</td>
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<td>D. Electrical Drawings</td>
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<td>A. Working with Construction Drawings</td>
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<td>B. Title Block</td>
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<td><strong>Session IV. Commercial Drawings, Part Four</strong></td>
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<td>A. Documenting Changes to Construction Drawings</td>
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<td>B. Performance Testing (Task 2)</td>
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<tr>
<td><strong>Session V. Worksheet Drawings, Part One</strong></td>
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<td>A. Floor Plan and Schedules</td>
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<td>B. Alternates</td>
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<td>C. Entry Points, Walls, and Chases</td>
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<tr>
<td>1. Laboratory — Trainees practice using site plans to interpret or explain information you specify. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>D. Performance Testing (Task 3)</td>
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</tbody>
</table>

* 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.
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.
Hangers, Supports, Structural Penetrations, and Fire Stopping
Annotated Instructor’s Guide

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
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.


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.

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<td>B. Connectors</td>
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<td>C. Structural Attachments</td>
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<td>D. Powder-Actuated Fastening Systems</td>
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<td>E. Structural Attachments</td>
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<td>Session II. Installing Pipe Hangers and Supports, Part Two</td>
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<td>A. Special Hangers and Accessories</td>
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<td>B. Pipe Hanger Locations</td>
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<td>C. Supporting Vertical and Horizontal Piping</td>
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<tr>
<td>1. Laboratory – Trainees practice installing pipe hangers and supports. This laboratory corresponds to Performance Task 1.</td>
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<td>D. Supporting Closet Bends and Stack Bases</td>
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<tr>
<td>E. Supporting Multiple Side-by-Side Runs of Pipe</td>
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</table>
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.
Installing and Testing DWV Piping
Annotated Instructor’s Guide

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 | Sample material takeoff forms |
| Transparencies                | Floor plans                   |
| Blank acetate sheets          | Manufacturers’ rough-in sheets |
| Transparency pens             | Variety of carrier fittings   |
| Whiteboard/chalkboard        | Variety of carriers used to support urinals and other fixtures |
| Markers/chalk                 | Variety of lavatory and sink carriers |
| Pencils and scratch paper     | Blocking materials            |
| Appropriate personal protective equipment | Job/project specifications |
| Copies of your local code    | Sample plot plans             |
| Plans and fixture rough-in sheets | General-purpose level |
| Rough-in book                 |                              |
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.


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.

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<td>C. Locating Building Drains and Sewers</td>
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<td>D. Locating Residential Water Closets</td>
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</tbody>
</table>
|       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)            |                  |
Session III. Framing for Lavatories and Sinks
   A. Basic Framing
   B. Locating Commercial Lavatories and Sinks
   C. Locating and Roughing-In Tubs and Showers
   D. Locating Fixtures for the Physically Challenged
   E. Performance Testing (Task 3)

Session IV. Grade, Part One
   A. The Importance of Grade
   B. Sources of Grade Information
   C. Calculating Grade

Session V. Grade, Part Two
   A. Calculating Percentage of Grade
   B. Measuring Grade Using a General-Purpose Level
   C. Introduction to Builder’s Levels

Session VI. Grade, Part Three
   A. Measuring Grade Using Builder’s Levels
   B. Computing Grade
   C. Performance Testing (Task 4)

Session VII. DWV Rough: Below-Grade Pipe
   A. Verifying the Layout
   B. Installing Below-Grade Pipe

Session VIII. Installing Above-Grade Pipe, Part One
   A. Locating the Stack
   B. Locating the Center Line
   C. Selecting Fittings

Session IX. Installing Above-Grade Pipe, Part Two
   A. Connecting and Installing Fittings
   B. Extending and Flashing the Stack
   C. Connecting the Fixture Drains
   D. Performance Testing (Tasks 5 and 6)

Session X. First and Second Roughs
   A. Inspections and Testing
   B. Testing Tools and Equipment
   C. Testing a DWV System
      1. Laboratory – Trainees practice testing DWV systems according to code. This laboratory corresponds to Performance Task 7.
   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
      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.
Installing Roof, Floor, and Area Drains
Annotated Instructor’s Guide

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


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.

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<td>A. Basic Parts of Drains</td>
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<td>B. Types of Drains</td>
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<td>C. Determining Requirements for Floor Drains</td>
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<tr>
<td><strong>Session II. Installing Drains</strong></td>
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<tr>
<td>A. Installing Floor and Area Drains</td>
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<tr>
<td>B. Laboratory – Trainees practice using a surveyor’s level. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>C. Installing Roof Drains</td>
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<tr>
<td>D. Review</td>
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<tr>
<td>E. Module Examination</td>
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<tr>
<td>1. Trainees must score 70 percent or higher to receive recognition from NCCER.</td>
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<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
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<tr>
<td>F. Performance Testing (Tasks 2 and 3)</td>
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<tr>
<td>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.</td>
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<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
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<tr>
<td>3. Module Examination</td>
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</table>
MODULE OVERVIEW
This module discusses the basic types of valves and how they operate. Trainees will learn to identify the
K
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
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Copies of your local code
Copies of the valve cross section in Figure 3 with the callouts covered
Copies of the valve drawing in Figure 5 with the callouts covered
Copies of Figure 12 with the callouts covered
Float valve assembly
Variety of packing materials
Variety of valves, including the following:
  Gate
  Globe
  Angle
  Ball
  Butterfly
  Check
  Flushometer
  Flush
  Plug
  Temperature and pressure (T/P)
  Pressure regulator
  Supply stop
  Float-controlled
  Backwater
  Flushometer and float-controlled valve repair kits
  and faulty flushometer and float-controlled valves
  A variety of other faulty valves
  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.


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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td>Session I. Types of Valves</td>
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<tr>
<td>A. Gate, Globe, and Angle Valves</td>
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<tr>
<td>B. Ball, Butterfly, and Check Valves</td>
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<tr>
<td>C. Flushometer, Flush, and Plug Valves</td>
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<tr>
<td>D. Temperature and Pressure (T/P) and Pressure Regulator Valves</td>
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<tr>
<td>E. Supply Stop, Float-Controlled, and Backwater Valves</td>
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<tr>
<td>F. Performance Testing (Task 1)</td>
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<tr>
<td>Session II. Valve Selection and Repair</td>
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<tr>
<td>A. Valve Components</td>
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<tr>
<td>B. Laboratory – Trainees practice identifying valve components. This laboratory corresponds to Performance Task 2.</td>
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<tr>
<td>C. Selecting Valves for Specific Applications</td>
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<tr>
<td>D. Laboratory – Trainees practice selecting valves. This laboratory corresponds to Performance Task 3.</td>
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<tr>
<td>E. Repairing Valves</td>
<td></td>
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<tr>
<td>F. Review</td>
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</tr>
<tr>
<td>G. Module Examination</td>
<td>1. Trainees must score 70 percent or higher to receive recognition from NCCER.</td>
</tr>
<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
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<tr>
<td>H. Performance Testing (Tasks 2 and 3)</td>
<td>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.</td>
</tr>
<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
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</tbody>
</table>
Installing and Testing Water Supply Piping
Annotated Instructor’s Guide

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
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Copies of your local code
Construction plans
Takeoff drawings
Approved submittal data

Fixure rough-in sheets
Job specifications
Copies of an inspector’s test record
Variety of meters larger than 1½ inches in diameter
Tools to plumb and set the meters
Sizing tables
Pipe sleeves
Sections of pipe
Backing boards
Ells
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. 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.


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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td>Session I. Overview of an Installation</td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>Session II. Main to Meter Water Service, Part One</td>
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<tr>
<td>A. Piping Materials and Sizes</td>
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<tr>
<td>B. Freeze Protection</td>
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<tr>
<td>C. Pipe Protection</td>
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<tr>
<td>Session III. Main to Meter Water Service, Part Two</td>
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<tr>
<td>A. Water Meters</td>
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</tr>
<tr>
<td>B. Laboratory – Trainees practice locating water meters. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>Session IV. Water Heater, Water Softener, and Hose Bibbs</td>
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<tr>
<td>A. Locating the Water Heater</td>
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<tr>
<td>B. Locating the Water Softener</td>
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<tr>
<td>C. Locating the Hose Bibb</td>
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<tr>
<td>D. Laboratory – Trainees practice determining the location of fixtures and the route of the water supply piping. This laboratory corresponds to Performance Task 3.</td>
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<tr>
<td>Session V. Locating Fixtures</td>
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<tr>
<td>A. Assembling and Installing the Stubouts</td>
<td></td>
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<tr>
<td>B. Performance Testing (Task 2)</td>
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<tr>
<td>Session VI. Main Supply Lines</td>
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<tr>
<td>A. Supply Lines</td>
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<tr>
<td>B. Shock Arresters</td>
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<tr>
<td>C. Other Water Supply Connections</td>
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</tbody>
</table>
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
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Copies of your local code
- Variety of fixtures
- Cardboard cartons to protect fixtures
- Bathtub
- Blocking
- Variety of valves, including threaded valves, soldered valves, solvent-welded valves, flanged valves, compression connection valves
- Valves for water closets, including float-controlled valves and manual flush valves
- Variety of threaded valves
- Teflon® tape or pipe dope
- Pipe-reaming tool
- Copper-cleaning tool
- CPVC primer and solvent
- Stubout
- Copies of Figures 11, 12, and 13 with callouts covered
- Flushometer control stop
- Manufacturer’s instructions for a variety of valves
- Uncut countertop
- Rim-mounted sink
- Fixture sealant
- Lift rod assembly
- Manufacturer’s instructions for lavatories, sinks, and pop-up drains
- New water closets and urinals
- Tools to install fixtures, valves, and faucets
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.


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.

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td><strong>Session I. Tips and Techniques; Installing Bathtubs and Shower Stalls</strong></td>
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<tr>
<td>A. Pre-Installation Tips and Techniques</td>
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<tr>
<td>B. Installing Bathtubs and Shower Stalls</td>
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<tr>
<td>C. Laboratory – Trainees practice protecting fixtures. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Session II. Installing Valves and Faucets, Part One</strong></td>
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<tr>
<td>A. Threaded Valves</td>
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<tr>
<td>B. Soldered Valves</td>
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<tr>
<td>C. Solvent-Welded Valves</td>
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<tr>
<td><strong>Session III. Installing Valves and Faucets, Part Two</strong></td>
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<tr>
<td>A. Flanged Valves</td>
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<tr>
<td>B. Compression Connection Valves</td>
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<tr>
<td>C. Installing Faucets</td>
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<tr>
<td>D. Performance Testing (Task 2)</td>
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<tr>
<td><strong>Session IV. Installing Valves for Water Closets and Urinals</strong></td>
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<tr>
<td>A. Float-Controlled Valves</td>
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<td>B. Flush Valves</td>
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<tr>
<td>C. Flushometers</td>
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</tbody>
</table>
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 | Voltmeter
Transparencies | Variety of insulated tools
Blank acetate sheets | Variety of magnets and magnetic objects
Transparency pens | In-line and clamp-on ammeters
Whiteboard/chalkboard | Voltage meters
Markers/chalk | Ohmmeters
Pencils and scratch paper | Variety of wiring diagrams, including the following:
Appropriate personal protective equipment | Wiring diagrams
Copies of your local code | Simplified schematic diagrams
Current edition of the National Electrical Code® | Ladder diagrams
(NEC®) | Manufacturer’s component location diagrams
Copy of NFPA 70 | Circuit diagrams
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.


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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td>Session I. Introduction to Basic Electricity</td>
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<td>A. Electrical Safety</td>
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<td>B. Effect of Current</td>
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<td>C. Safety Practices</td>
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<tr>
<td>Session II. Electricity and Magnetism</td>
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<tr>
<td>A. Current, Voltage, and Resistance</td>
<td></td>
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<tr>
<td>B. AD and DC Voltage</td>
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<tr>
<td>C. Magnets and Electromagnets</td>
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<tr>
<td>D. Electrical Power Generation and Distribution</td>
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<tr>
<td>E. Ohm’s Law</td>
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<tr>
<td>Session III. Electrical Measuring Instruments</td>
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<td>A. Ammeter</td>
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<tr>
<td>B. Multimeters</td>
<td></td>
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<tr>
<td>C. Performance Testing (Task 1)</td>
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</tr>
</tbody>
</table>

* 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.
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.
Installing Water Heaters
Annotated Instructor’s Guide

Module 02210-05

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
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Copies of your local code
- Manufacturers’ instructions for installing water heaters
- Copies of Figure 6 with the callouts covered
- Water heater specifications
- Dip tube
- Anti-siphon tube
- Copies of Figure 17 with the callouts covered
- Drip lines
- A variety of safety pans
- 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. 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.


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 2 1/2 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.

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td><strong>Session I. Types of Water Heaters</strong></td>
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<tr>
<td>A. Introduction</td>
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<td>B. Storage Water Heaters</td>
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<td>C. Indirect Water Heaters</td>
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<td>D. Instantaneous Water Heaters</td>
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<tr>
<td>E. Performance Testing (Task 1)</td>
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<tr>
<td><strong>Session II. Selecting, Installing, and Testing Water Heaters</strong></td>
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<tr>
<td>A. Selecting Water Heaters</td>
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<td>B. Installing Water Heaters</td>
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<td>C. Testing Water Heaters</td>
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<tr>
<td>D. Review</td>
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<td>E. Module Examination</td>
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<tr>
<td>F. Performance Testing (Tasks 2 and 3)</td>
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</table>
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.


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.

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Session I. Types of Oil and Gas Used as Fuels</td>
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<tr>
<td>A. Types of Oil and Gas</td>
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<td>B. Natural Gas</td>
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<td>C. Liquefied Petroleum Gas</td>
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<td>D. Fuel Oil</td>
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<td>Session II. Common Factors in Fuel Systems, Part One</td>
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<td>A. Materials</td>
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<td>B. Design and Sizing</td>
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<td>Session III. Common Factors in Fuel Systems, Part Two</td>
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<tr>
<td>A. Manufacturer’s Installation Instructions</td>
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<td>B. Testing</td>
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<td>C. Combustion Air</td>
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<td>D. Venting</td>
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<td>Session IV. Common Factors in Fuel Systems, Part Three</td>
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<td>A. Appliances</td>
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<td>B. Performance Testing (Task 1)</td>
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<td>Session V. Factors Specific to Natural Gas</td>
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<td>A. Materials</td>
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<td>B. Other Factors</td>
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<td>C. Installation Considerations</td>
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<td>Session VI. Factors Specific to LP Gas</td>
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<td>A. Materials</td>
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<td>B. Other Factors</td>
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<td>C. Installation Considerations</td>
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</table>
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.
SERVICE OF FIXTURES, VALVES, AND FAUCETS
Annotated Instructor’s Guide

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.


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.

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<tr>
<td><strong>Session I. Servicing of Fixtures, Valves, and Faucets, Part One</strong></td>
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<tr>
<td>A. General Safety Guidelines</td>
<td></td>
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<td>B. Globe and Gate Valves</td>
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<tr>
<td>C. Laboratory – Trainees practice repairing valves and faucets. This laboratory corresponds to Performance Task 2.</td>
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<tr>
<td>D. Flushometers and Float-Controlled Valves</td>
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<tr>
<td><strong>Session II. Servicing of Fixtures, Valves, and Faucets, Part Two</strong></td>
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<tr>
<td>A. Tank Flush Valves</td>
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<tr>
<td>B. Balancing and Temperature and Pressure (T&amp;P) Valves</td>
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<tr>
<td>C. Faucets</td>
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<td>D. Faucet Water Filters</td>
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<td>E. Electronic Controls</td>
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<td>F. Review</td>
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