MODULE OVERVIEW
This module introduces chemical, compressed air, fuel oil, steam, and water systems and explains how to identify them by color-code. It also explains thermal expansion of pipes and pipe insulation.

PREREQUISITES
Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum and Pipefitting Level One.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify and explain the types of piping systems.
2. Identify piping systems according to color-coding.
3. Explain the effects and corrective measures for thermal expansion in piping systems.
4. Explain types and applications of pipe insulation.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Identify the type of piping system designated by a red color-code.
2. Identify the type of piping system designated by a yellow color-code.
3. Identify the type of piping system designated by a green color-code.
4. Identify the type of piping system designated by a bright blue color-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
- MSDSs for commonly used chemicals
- Various types of pipe from different piping systems
- Sections of color-coded pipe for identification
- Samples of various insulation materials
- Bimetallic strip
- Acetylene torch with rosebud
- Calculator
- Copies of the Quick Quiz*
- Module Examinations**
- Performance Profile Sheets**

*Located in the back of this module.
**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.
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 Piping 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>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Piping Systems</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Types of Piping Systems</td>
<td></td>
</tr>
<tr>
<td>C. Identifying Piping Systems</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory – Trainees practice identifying piping systems. This laboratory</td>
<td></td>
</tr>
<tr>
<td>corresponds to Performance Tasks 1 through 4.</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Thermal Expansion, Insulation, Review, and Testing</strong></td>
<td></td>
</tr>
<tr>
<td>A. Thermal Expansion</td>
<td></td>
</tr>
<tr>
<td>B. Pipe Insulation</td>
<td></td>
</tr>
<tr>
<td>C. Module Review</td>
<td></td>
</tr>
<tr>
<td>D. Module Examination</td>
<td></td>
</tr>
<tr>
<td>1. Trainees must score 70% or higher to receive recognition from NCCER.</td>
<td></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>
<td></td>
</tr>
<tr>
<td>E. Performance Testing</td>
<td></td>
</tr>
<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>
<td></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>
MODULE OVERVIEW

This module introduces the trainee to plot plans, structural drawings, elevation drawings, as-built drawings, equipment arrangement drawings, P&IDs, isometric drawings, spool sheets, and detail sheets.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Module 08201-06.

OBJECTIVES

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

1. Identify parts of drawings.
2. Identify types of drawings.
3. Make field sketches.
4. Interpret drawing indexes and line lists.

PERFORMANCE TASKS

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

1. Identify parts of a drawing:
   • Title block
   • Scales and measurements
   • Symbols and abbreviations
   • Notes
   • Revision blocks
   • Coordinates

2. Interpret the following:
   • Drawing indexes
   • Line lists

3. Identify the following types of drawings:
   • Plot plans
   • Structural drawings
   • Elevation and section drawings
   • Equipment arrangement drawings
   • P&IDs
   • Isometric drawings
   • Spool drawings
   • Pipe support drawings and detail sheets
   • Orthographic drawings

4. Make field sketches:
   • Orthographic
   • Isometric
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
- Set of blueprints
- Plot plan
- Structural drawings
- Elevation and section drawings
- As-built drawings
- Equipment arrangement drawings
- P&IDs
- Isometric drawings
- Spool drawings
- Equipment drawings
- Pipe support drawings
- Orthographic drawings
- Standard set of sketching tools
- Pencils
- Sketch pad
- Rulers
- Templates or protectors
- Calculators
- Several sets of piping drawings
- Commercial prints or public works drawings
- Small object such as a pipe fitting, valve, or coffee mug for sketching
- Copies of the Quick Quiz*
- Module Examinations**
- Performance Profile Sheets**

*Located in the back of this module.

**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. This module may require trainees to visit construction sites or utility areas. Ensure that they are briefed on site safety procedures.

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 material 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 Drawings and Detail Sheets. 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>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Identifying and Interpreting Drawings</strong></td>
<td></td>
</tr>
</tbody>
</table>
E. Laboratory – Trainees practice interpreting drawing indexes and line lists. This laboratory corresponds to Performance Task 2.

Session II. Identifying Different Types of Drawings

A. Plot Plans
B. Structural Drawings
C. Elevation and Section Drawings
D. Equipment Arrangement Drawings
E. P&IDs
F. Isometric Drawings
G. Spool Drawings
H. Pipe Support Drawings and Detail Sheets
I. Orthographic Drawings
J. Laboratory – Trainees practice identifying different types of drawings. This laboratory corresponds to Performance Task 3.

Sessions IV and V. Field Sketches

A. Orthographic
B. Isometric
C. Laboratory – Trainees practice making field sketches. This laboratory corresponds to Performance Task 4.

Session VI. Review and Testing

A. Module Review
B. Module Examination
   1. Trainees must score 70% 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.
C. 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 identifies and provides installation methods for different types of valves. It also covers valve storage and handling.

PREREQUISITES
Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 and 08202-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify types of valves that start and stop flow.
2. Identify types of valves that regulate flow.
3. Identify valves that relieve pressure.
4. Identify valves that regulate the direction of flow.
5. Identify types of valve actuators.
6. Explain how to properly store and handle valves.
7. Explain valve locations and positions.
8. Explain the factors that influence valve selection.
9. Interpret valve markings and nameplate information.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Identify valves that start and stop flow.
2. Identify valves that regulate flow.
3. Identify valves that relieve pressure.
4. Identify valves that regulate the direction of flow.
5. Identify valve actuators.
6. Given a select number of valves, match each valve to its given application.
7. Interpret valve markings and nameplate information.

MATERIALS AND EQUIPMENT LIST
- Overhead projector and screen
- Ball valves
- Transparencies
- Venturi-type and top-entry ball valves
- Blank acetate sheets
- Various types of plug valves
- Transparency pens
- Globe valves
- Whiteboard/chalkboard
- Angle valves
- Markers/chalk
- Y-type valves
- Pencils and scratch paper
- Butterfly valves
- Appropriate personal protective equipment
- Diaphragm valves
- Gate valves with various types of bonnets and stems
- Needle valves
- Knife gate valve
- Control valves
- Safety valves

continued
Pressure-relief valves
Various types of check valves
Swing check valves
Lift check valves
Ball check valves
Butterfly check valves
Foot valves
Gear operators
Chain operators

*Located in the back of this module.

**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. This module may require trainees to visit construction sites or utility areas. Ensure that they are briefed on site 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 Identifying and Installing 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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</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Valves That Start and Stop Flow</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Gate Valves</td>
<td></td>
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<tr>
<td>C. Knife Gate Valves</td>
<td></td>
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<tr>
<td>D. Ball Valves</td>
<td></td>
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<tr>
<td>E. Plug Valves</td>
<td></td>
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<tr>
<td>F. Three-Way Valves</td>
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<tr>
<td>G. Laboratory – Trainees practice identifying valves that start and stop flow. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Valves that Regulate Flow and Pressure</strong></td>
<td></td>
</tr>
<tr>
<td>A. Globe Valves</td>
<td></td>
</tr>
<tr>
<td>B. Y-Type Valves</td>
<td></td>
</tr>
</tbody>
</table>
C. Butterfly Valves
D. Diaphragm Valves
E. Needle Valves
F. Control Valves
G. Laboratory – Trainees practice identifying valves that regulate flow. This laboratory corresponds to Performance Task 2.

Session IV. Valves That Relieve Pressure
A. Safety Valves
B. Pressure-Relief Valves
C. Laboratory – Trainees practice identifying valves that relieve pressure. This laboratory corresponds to Performance Task 3.

Session V. Valves That Regulate the Direction of Flow
A. Swing Check Valves
B. Lift Check Valves
C. Ball Check Valves
D. Butterfly Check Valves
E. Foot Valves
F. Laboratory – Trainees practice identifying valves that regulate the direction of flow. This laboratory corresponds to Performance Task 4.

Session VI. Actuators
A. Gear Operators
B. Chain Operators
C. Pneumatic and Hydraulic Actuators
D. Electric or Air Motor-Driven Actuators
E. Laboratory – Trainees practice identifying valve actuators. This laboratory corresponds to Performance Task 5.

Session VII. Installation and Applications
A. Storing and Handling Valves
B. Installing Valves
C. Valve Selection, Types, and Applications
D. Laboratory – Trainees practice matching a valve to the given application. This laboratory corresponds to Performance Task 6.
E. Valve Markings
F. Laboratory – Trainees practice interpreting valve markings. This laboratory corresponds to Performance Task 7.

Session VIII. Review and Testing
A. Module Review
B. Module Examination
   1. Trainees must score 70% 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.
C. 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 use ratios and proportions, solve basic algebra, area, volume, and circumference problems, and solve for right triangles using the Pythagorean theorem.

PREREQUISITES
Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 through 08203-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify and explain the use of special measuring devices.
2. Use tables of weights and measurements.
3. Use formulas to solve basic problems.
4. Solve area problems.
5. Solve volume problems.
7. Solve right triangle problems using the Pythagorean theorem.

PERFORMANCE TASKS
This is a knowledge-based module; there are no Performance Tasks.

MATERIALS AND EQUIPMENT LIST
- Overhead projector and screen
- Transparencies
- Blank acetate sheets
- Transparency pens
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Architect’s scale
- Engineer’s scale
- Copies of the Quick Quiz*
- Module Examinations**

*Located in the back of this module.
**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. This module may require trainees to visit construction sites or utility areas. Ensure that they are briefed on site 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.

The Pipefitters’ Blue Book. W. V. Graves. Webster, TX: Graves Publisher.

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 Pipefitting Trade Math. 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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</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Measuring and Using Tables and Formulas</strong></td>
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<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Special Measuring Devices</td>
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<tr>
<td>C. Using Tables</td>
<td></td>
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<tr>
<td>D. Using Formulas</td>
<td></td>
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<tr>
<td>E. Laboratory – Trainees practice using formulas to solve problems.</td>
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<tr>
<td><strong>Session III. Solving Area Problems</strong></td>
<td></td>
</tr>
<tr>
<td>A. Rectangles</td>
<td></td>
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<tr>
<td>B. Triangles</td>
<td></td>
</tr>
<tr>
<td>C. Circles</td>
<td></td>
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<tr>
<td>D. Laboratory – Trainees practice solving area problems.</td>
<td></td>
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<tr>
<td><strong>Session IV. Solving Volume Problems</strong></td>
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</tr>
<tr>
<td>A. Rectangular Solids</td>
<td></td>
</tr>
<tr>
<td>B. Cylinders</td>
<td></td>
</tr>
<tr>
<td>C. Spheres</td>
<td></td>
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<tr>
<td>D. Pyramids</td>
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<tr>
<td>E. Cones</td>
<td></td>
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<tr>
<td>F. Laboratory – Trainees practice solving volume problems.</td>
<td></td>
</tr>
<tr>
<td><strong>Session V. Solving Circumference Problems and Right Triangles</strong></td>
<td></td>
</tr>
<tr>
<td>A. Solving Circumference Problems</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory – Trainees practice solving circumference problems.</td>
<td></td>
</tr>
<tr>
<td>C. Pythagorean Theorem</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory – Trainees practice solving right triangles using the Pythagorean theorem.</td>
<td></td>
</tr>
<tr>
<td><strong>Session VI. Review and Testing</strong></td>
<td></td>
</tr>
<tr>
<td>A. Module Review</td>
<td></td>
</tr>
<tr>
<td>B. Module Examination</td>
<td></td>
</tr>
<tr>
<td>1. Trainees must score 70% or higher to receive recognition from NCCER.</td>
<td></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>
MODULE OVERVIEW

This module describes the materials used in threaded piping systems. It explains how to determine pipe lengths between threaded pipe fittings, prepare the pipe and fittings for fit-up, and assemble the piping system.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 through 08204-06.

OBJECTIVES

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

1. Identify and explain the materials used in threaded piping systems.
2. Identify and explain pipe fittings.
3. Read and interpret screwed fitting joint drawings.
4. Identify and explain types of threads.
5. Determine pipe lengths between joints.
6. Thread and assemble piping and valves.
7. Calculate offsets.

PERFORMANCE TASKS

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

1. Read and interpret screwed fitting joint drawings.
2. Determine pipe lengths between fittings, using the center-to-center method.
3. Determine pipe lengths between fittings, using the center-to-face method.
4. Determine pipe lengths between fittings, using the face-to-face method.
5. Given the length of travel of a 45-degree piping offset, calculate the length of the set.
6. Given the length of the set and the degree of the fittings, use the table of elbow constants to figure the travel and the run.
7. Calculate offsets, using the table of multipliers used to calculate offsets.
8. Calculate the travel of a rolling offset.
10. Thread pipe, using a threading machine.
11. Apply pipe joint compound to the male threads of the pipe.
12. Make up the pipe and fittings.
13. Install a screwed valve.
## MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead projector and screen</td>
<td>Manual pipe threader</td>
</tr>
<tr>
<td>Transparencies</td>
<td>Powered pipe threader</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Cutting oil</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>Pipe stand</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Vises</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Reamers</td>
</tr>
<tr>
<td>Pencils and scratch paper</td>
<td>(\frac{3}{8})-inch to (\frac{3}{4})-inch sets of open-end wrenches</td>
</tr>
<tr>
<td>Appropriate personal protective equipment</td>
<td>Adjustable wrenches</td>
</tr>
<tr>
<td>Various types of pipe</td>
<td>Channel-lock pliers</td>
</tr>
<tr>
<td>Various sizes of pipe</td>
<td>Drift pins</td>
</tr>
<tr>
<td>Assorted elbows</td>
<td>Framing squares</td>
</tr>
<tr>
<td>Return bends</td>
<td>Measuring tape</td>
</tr>
<tr>
<td>Branch connections</td>
<td>Soapstones</td>
</tr>
<tr>
<td>Caps and plugs</td>
<td>Torque wrenches</td>
</tr>
<tr>
<td>Line connections</td>
<td>Liquid Teflon®</td>
</tr>
<tr>
<td>Nipples</td>
<td>Teflon® tape</td>
</tr>
<tr>
<td>Flanges</td>
<td>Pipe dope</td>
</tr>
<tr>
<td>Examples of various pipe threads</td>
<td>Copies of the Quick Quiz*</td>
</tr>
<tr>
<td>Fitting manufacturer’s makeup chart</td>
<td>Module Examinations**</td>
</tr>
<tr>
<td>Thread gauge</td>
<td>Performance Profile Sheets**</td>
</tr>
<tr>
<td>Pipe drawings</td>
<td></td>
</tr>
</tbody>
</table>

*Located in the back of this module.

**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. This module requires trainees to work with hand tools. Ensure that they are briefed on shop 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 15 hours are suggested to cover Threaded Pipe Fabrication. 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. Threaded Piping Systems and Fittings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td>____________</td>
</tr>
<tr>
<td>B. Materials Used in Threaded Piping Systems</td>
<td>____________</td>
</tr>
<tr>
<td>C. Pipe Fittings</td>
<td>____________</td>
</tr>
<tr>
<td><strong>Session II. Screwed Fitting Joint Drawings and Threads</strong></td>
<td></td>
</tr>
<tr>
<td>A. Screwed Fitting Joint Drawings</td>
<td>____________</td>
</tr>
<tr>
<td>B. Laboratory – Trainees practice reading and interpreting screwed fitting joint drawings. This laboratory corresponds to Performance Task 1.</td>
<td>____________</td>
</tr>
<tr>
<td>C. Threads</td>
<td>____________</td>
</tr>
<tr>
<td><strong>Session III. Determining Pipe Lengths Between Fittings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Center-to-Center Method</td>
<td>____________</td>
</tr>
<tr>
<td>B. Laboratory – Trainees practice determining pipe length using the center-to-center method. This laboratory corresponds to Performance Task 2.</td>
<td>____________</td>
</tr>
<tr>
<td>C. Center-to-Face Method</td>
<td>____________</td>
</tr>
<tr>
<td>D. Laboratory – Trainees practice determining pipe length using the center-to-face method. This laboratory corresponds to Performance Task 3.</td>
<td>____________</td>
</tr>
<tr>
<td>E. Face-to-Face Method</td>
<td>____________</td>
</tr>
<tr>
<td>F. Laboratory – Trainees practice determining pipe length using the face-to-face method. This laboratory corresponds to Performance Task 4.</td>
<td>____________</td>
</tr>
<tr>
<td><strong>Session IV. Calculating Offsets</strong></td>
<td></td>
</tr>
<tr>
<td>A. Calculating Offsets</td>
<td>____________</td>
</tr>
<tr>
<td>B. 45-Degree Offsets</td>
<td>____________</td>
</tr>
<tr>
<td>C. Laboratory – Trainees practice determining pipe length for a 45-degree piping offset. This laboratory corresponds to Performance Task 5.</td>
<td>____________</td>
</tr>
<tr>
<td>D. Elbow Constants</td>
<td>____________</td>
</tr>
<tr>
<td>E. Laboratory – Trainees practice determining pipe length using elbow constants. This laboratory corresponds to Performance Task 6.</td>
<td>____________</td>
</tr>
<tr>
<td>F. Multipliers</td>
<td>____________</td>
</tr>
<tr>
<td>G. Laboratory – Trainees practice determining pipe length using multipliers. This laboratory corresponds to Performance Task 7.</td>
<td>____________</td>
</tr>
<tr>
<td>H. Rolling Offsets</td>
<td>____________</td>
</tr>
<tr>
<td>I. Laboratory – Trainees practice determining pipe length for a rolling offset. This laboratory corresponds to Performance Task 8.</td>
<td>____________</td>
</tr>
</tbody>
</table>
**Session V. Assembly Techniques**

A. Threading Pipe Using a Manual Threader

B. Laboratory – Trainees practice threading pipe using a manual threader.
   This laboratory corresponds to Performance Task 9.

C. Threading Pipe Using a Threading Machine

D. Laboratory – Trainees practice threading pipe using a threading machine.
   This laboratory corresponds to Performance Task 10.

E. Pipe Joint Compound

F. Laboratory – Trainees practice applying pipe joint compound.
   This laboratory corresponds to Performance Task 11.

G. Fitting Screwed Pipe and Fittings

H. Laboratory – Trainees practice making up the pipe and fitting.
   This laboratory corresponds to Performance Task 12.

I. Installing Threaded Valves

J. Laboratory – Trainees practice installing a screwed valve. This laboratory
   corresponds to Performance Task 13.

**Session VI. Review and Testing**

A. Module Review

B. Module Examination
   1. Trainees must score 70% 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.

C. 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 describes the materials used in socket weld piping systems. It explains how to determine pipe lengths between socket weld fittings, prepare the pipe and fittings for fit-up, and fabricate socket weld fittings.

PREREQUISITES
Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 through 08205-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify and explain types of socket weld piping materials.
2. Identify and explain socket weld fittings.
3. Read and interpret socket weld piping drawings.
4. Determine pipe lengths between socket weld fittings.
5. Fabricate socket weld fitting to pipe.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Identify various socket weld fittings.
2. Interpret socket weld drawings.
3. Calculate pipe lengths from line drawings, using the center-to-center method.
4. Calculate pipe lengths from line drawings, using the center-to-face method.
5. Calculate pipe lengths from line drawings, using the face-to-face method.
6. Align a 90-degree elbow to the end of a pipe.
7. Square a pipe into a 90-degree elbow.
8. Align a flange to the end of a pipe.
9. Align a 45-degree elbow to the end of a pipe.
10. Align pipes joined by a coupling.
11. Install a valve.

MATERIALS AND EQUIPMENT LIST
<table>
<thead>
<tr>
<th>Material/Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead projector and screen</td>
<td>Stainless steel pipe</td>
</tr>
<tr>
<td>Transparencies</td>
<td>Various socket weld piping drawings</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Specification books</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>Two-hole flange pins</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Calculator</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Socket weld flanges</td>
</tr>
<tr>
<td>Pencils and scratch paper</td>
<td>Spring ring inserts or Gap-A-Lets</td>
</tr>
<tr>
<td>Appropriate personal protective equipment</td>
<td>Squares</td>
</tr>
<tr>
<td>Socket weld fittings</td>
<td>Torpedo levels</td>
</tr>
<tr>
<td>Tape measures</td>
<td>Spirit levels</td>
</tr>
<tr>
<td>Various types, sizes, and schedules of pipe</td>
<td>Tripod vises</td>
</tr>
<tr>
<td>Carbon steel pipe</td>
<td></td>
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</tbody>
</table>

continued


**SAFETY CONSIDERATIONS**

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to use hand tools to join pipe. Ensure they are briefed on shop safety procedures.

**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 material 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 *Socket Weld Pipe Fabrication.* 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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</thead>
<tbody>
<tr>
<td><strong>Session I. Socket Weld Fittings and Materials</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Socket Weld Pipe</td>
<td></td>
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<tr>
<td>C. Socket Weld Pipe Fittings</td>
<td></td>
</tr>
<tr>
<td>D. Socket Weld Flanges</td>
<td></td>
</tr>
<tr>
<td>E. Laboratory – Trainees practice identifying socket weld fittings. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Socket Weld Drawings</strong></td>
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</tr>
<tr>
<td>A. Double- and Single-Line Drawings</td>
<td></td>
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<tr>
<td>B. Isometric Drawings</td>
<td></td>
</tr>
<tr>
<td>C. Piping Symbols</td>
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</tr>
<tr>
<td>D. Line Numbers and Specifications Book</td>
<td></td>
</tr>
<tr>
<td>E. Laboratory – Trainees practice reading and interpreting socket weld drawings. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
</tbody>
</table>
**Sessions III and IV. Determining Pipe Lengths Between Fittings**

A. Center-to-Center Method

B. Laboratory – Trainees practice determining pipe length using the center-to-center method. This laboratory corresponds to Performance Task 3.

C. Center-to-Face Method

D. Laboratory – Trainees practice determining pipe length using the center-to-face method. This laboratory corresponds to Performance Task 4.

E. Face-to-Face Method

F. Laboratory – Trainees practice determining pipe length using the face-to-face method. This laboratory corresponds to Performance Task 5.

**Sessions V and VI. Fabricating Socket Weld Fittings To Pipe I**

A. Preparing Pipe For Alignment

B. Aligning 90-Degree Elbow to Pipe

C. Laboratory – Trainees practice aligning a 90-degree elbow to pipe. This laboratory corresponds to Performance Task 6.

D. Squaring Pipe into a 90-Degree Elbow

E. Laboratory – Trainees practice squaring pipe into a 90-degree elbow. This laboratory corresponds to Performance Task 7.

**Sessions VII and VIII. Fabricating Socket Weld Fittings To Pipe II**

A. Aligning Flange to Pipe

B. Laboratory – Trainees practice aligning a flange to the end of a pipe. This laboratory corresponds to Performance Task 8.

C. Aligning 45-Degree Elbow to Pipe Using Levels

D. Aligning 45-Degree Elbow to Pipe Using Squares

E. Laboratory – Trainees practice aligning a 45-degree elbow to the end of a pipe. This laboratory corresponds to Performance Task 9.

F. Aligning Pipe Joined By Couplings

G. Laboratory – Trainees practice aligning pipe joined by couplings. This laboratory corresponds to Performance Task 10.

**Session IX. Valves**

A. Installing Welded Valves

B. Laboratory – Trainees practice installing a valve. This laboratory corresponds to Performance Task 11.

**Session X. Review and Testing**

A. Module Review

B. Module Examination

1. Trainees must score 70% 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.

C. 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 describes the materials used in butt weld piping systems. It explains how to determine pipe lengths between butt weld fittings, prepare the pipe and fittings for fit-up, and fabricate butt weld fittings. It also describes how to select and install backing rings, fabricate channel iron welding jigs, and use and care for welding clamps.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 through 08206-06.

OBJECTIVES

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

1. Identify butt weld piping materials and fittings.
2. Read and interpret butt weld piping drawings.
3. Prepare pipe ends for fit-up.
4. Determine pipe lengths between fittings.
5. Select and install backing rings.
6. Perform alignment procedures for various types of fittings.

PERFORMANCE TASKS

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

1. Identify various butt weld fittings.
2. Interpret a butt weld drawing.
3. Clean a beveled pipe end, using a portable grinder.
4. Calculate pipe lengths from line drawings, using the center-to-center method.
5. Calculate pipe lengths from line drawings, using the center-to-face method.
6. Calculate pipe lengths from line drawings, using the face-to-face method.
7. Align straight pipe.
8. Align a pipe to a 45-degree elbow.
9. Align a pipe to a 90-degree elbow.
10. Square a pipe into a 90-degree elbow.
11. Align a pipe to a flange.
12. Align a pipe to a tee.
13. Install a valve.
MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead projector and screen</td>
<td>Bottle cart</td>
</tr>
<tr>
<td>Transparencies</td>
<td>Hose sets</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Regulators</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>Strikers</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Cutting goggles</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Full-face shields</td>
</tr>
<tr>
<td>Pencils and scratch paper</td>
<td>Tape measures</td>
</tr>
<tr>
<td>Appropriate personal protective equipment</td>
<td>Soapstones</td>
</tr>
<tr>
<td>Various sizes of carbon steel pipe</td>
<td>Lever-type clamps</td>
</tr>
<tr>
<td>Butt weld fittings</td>
<td>Hydraulic clamps</td>
</tr>
<tr>
<td>Butt weld flanges</td>
<td>Chain-type clamps</td>
</tr>
<tr>
<td>Piping drawings</td>
<td>Alignment dogs</td>
</tr>
<tr>
<td>Portable grinders</td>
<td>Hi-Lo gauge</td>
</tr>
<tr>
<td>Pipe beveller (optional)</td>
<td>Center finder</td>
</tr>
<tr>
<td>Oxyacetylene pipe-beveling machine (optional)</td>
<td>Straight pipe welding clamps</td>
</tr>
<tr>
<td>Pipefitting guidebooks</td>
<td>Framing squares</td>
</tr>
<tr>
<td>Specification book</td>
<td>Hammers</td>
</tr>
<tr>
<td>Fitting manufacturer’s literature on takeout</td>
<td>Jack stands</td>
</tr>
<tr>
<td>Calculators</td>
<td>Wraparounds</td>
</tr>
<tr>
<td>Carbon steel pipe</td>
<td>Wrenches</td>
</tr>
<tr>
<td>Stainless steel pipe</td>
<td>Pipe vises</td>
</tr>
<tr>
<td>Various backing rings</td>
<td>Spirit levels</td>
</tr>
<tr>
<td>Scrap angle iron</td>
<td>Torpedo levels</td>
</tr>
<tr>
<td>Scrap channel iron</td>
<td>Tripod vises</td>
</tr>
<tr>
<td>Steel plate</td>
<td>Two-hole flange pins</td>
</tr>
<tr>
<td>Hacksaws</td>
<td>Flange welding clamps</td>
</tr>
<tr>
<td>Torch</td>
<td>Copies of the Quick Quiz*</td>
</tr>
<tr>
<td>Acetylene cylinder</td>
<td>Module Examinations**</td>
</tr>
<tr>
<td>Oxygen cylinder</td>
<td>Performance Profile Sheets**</td>
</tr>
</tbody>
</table>

*Located in the back of this module.

**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. This module requires trainees to use grinders and other power tools. Ensure all trainees are briefed on power tool safety and shop safety procedures. This module requires trainees to use an oxyacetylene torch. Ensure all trainees are briefed on safety equipment and fire safety.

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 material 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 37.5 hours are suggested to cover Butt Weld Pipe Fabrication. 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><strong>Topic Planned Time</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Session I. Butt Weld Fittings and Materials</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Butt Weld Pipe</td>
<td></td>
</tr>
<tr>
<td>C. Butt Weld Pipe Fittings</td>
<td></td>
</tr>
<tr>
<td>D. Butt Weld Flanges</td>
<td></td>
</tr>
<tr>
<td>E. Laboratory – Trainees practice identifying butt weld fittings. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
</tbody>
</table>
Sessions VII and VIII. Alignment Procedures I

A. Selecting and Installing Backing Rings

B. Laboratory – Trainees practice installing backing rings.

C. Using and Caring For Alignment Tools

D. Alignment Procedures

E. Aligning Straight Pipe

F. Laboratory – Trainees practice aligning straight pipe. This laboratory corresponds to Performance Task 7.

Sessions IX and X. Alignment Procedures II

A. Aligning Pipe to a 45-Degree Elbow

B. Laboratory – Trainees practice aligning pipe to a 45-degree elbow. This laboratory corresponds to Performance Task 8.

C. Aligning Pipe to a 90-Degree Elbow

D. Laboratory – Trainees practice aligning pipe to a 90-degree elbow. This laboratory corresponds to Performance Task 9.

E. Squaring Pipe to a 90-Degree Elbow

F. Laboratory – Trainees practice squaring pipe to a 90-degree elbow. This laboratory corresponds to Performance Task 10.

Sessions XI and XII. Alignment Procedures III

A. Aligning Pipe to Flange

B. Laboratory – Trainees practice aligning a pipe to a flange. This laboratory corresponds to Performance Task 11.

C. Aligning Pipe to A Tee

D. Laboratory – Trainees practice aligning a pipe to a tee. This laboratory corresponds to Performance Task 12.

Sessions XIII and XIV. Valves

A. Fitting Butt Weld Valves

B. Laboratory – Trainees practice installing a valve. This laboratory corresponds to Performance Task 13.

Session XV. Review and Testing

A. Module Review

B. Module Examination

1. Trainees must score 70% 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.

C. 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 the use of shoring materials per OSHA standards and covers shoring systems, installing a hydraulic vertical shore, determining the overall fall of a sewer line, setting the grade and elevation of a trench, and backfilling.

PREREQUISITES
Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 through 08207-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify and explain the use of shoring materials.
2. Identify and explain the use of premanufactured support systems.
3. Install a vertical shore to be used for shoring.
4. Determine the overall fall of a sewer line.
5. Determine and set the grade and elevation of a trench.
6. Explain backfilling procedures.

PERFORMANCE TASKS
This is a knowledge-based module. There are no performance tasks.

MATERIALS AND EQUIPMENT LIST

| Overhead projector and screen                  | Laser level, transmitter and receiver |
| Transparencies                                | Boxes                                |
| Blank acetate sheets                          | Soils and sand                       |
| Transparency pens                             | Small digging tools                  |
| Whiteboard/chalkboard                        | Scale                                |
| Markers/chalk                                 | DVD/VCR and monitor (optional)       |
| Pencils and scratch paper                     | Safety video (optional)              |
| Appropriate personal protective equipment     | String line                          |
| Samples of soils                              | Stakes                               |
| Manufacturer’s literature on shoring systems  | Copies of the Quick Quiz*            |
| Various types of grade stakes                 | Module Examinations**                |

*Located in the back of this module.

**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. This module may require trainees to visit construction sites. Ensure all trainees are briefed on site safety and excavation safety.
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 *Excavations*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Trenching Hazards</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Soil Hazards</td>
<td></td>
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<tr>
<td>C. Guidelines for Working In and Near a Trench</td>
<td></td>
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<tr>
<td>D. Indications of an Unstable Trench</td>
<td></td>
</tr>
<tr>
<td>E. Trench Failure</td>
<td></td>
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<tr>
<td><strong>Session II. Trench Safety</strong></td>
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</tr>
<tr>
<td>A. Shoring Systems</td>
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<tr>
<td>B. Shielding Systems</td>
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<td>C. Sloping Systems</td>
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<tr>
<td>D. Combined Systems</td>
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</tr>
<tr>
<td><strong>Session III. Determining Grade and Backfilling</strong></td>
<td></td>
</tr>
<tr>
<td>A. Setting Grade Using String Line</td>
<td></td>
</tr>
<tr>
<td>B. Setting Grade Using Laser Level</td>
<td></td>
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<tr>
<td>C. Initial Backfill</td>
<td></td>
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<tr>
<td>D. Final Backfill</td>
<td></td>
</tr>
<tr>
<td><strong>Session IV. Review and Testing</strong></td>
<td></td>
</tr>
<tr>
<td>A. Module Review</td>
<td></td>
</tr>
<tr>
<td>B. Module Examination</td>
<td></td>
</tr>
<tr>
<td>1. Trainees must score 70% or higher to receive recognition from NCCER.</td>
<td></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>
MODULE OVERVIEW
This module explains pipe installation procedures and guidelines, including the procedures for cast iron, ductile iron, concrete, carbon steel, fiberglass, and thermoplastic pipe. It includes an introduction to horizontal directional drilling for pipe installation.

PREREQUISITES
Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Pipefitting Level One; and Pipefitting Level Two, Modules 08201-06 through 08208-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify and explain the types of underground piping materials.
2. Identify the size classifications of underground pipe.
3. Identify and explain the use of underground pipe fittings.
4. Explain the joining methods for underground pipe.
5. Explain the storage and handling methods of underground pipe.
6. Identify and explain underground pipe installation guidelines.
7. Join CPVC and PVC.
8. Join ductile iron.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Join CPVC and PVC.
2. Join ductile iron.

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
DVD/VCR and monitor (optional)
Safety video (optional)
Various types of lifting devices
Cast iron bell-and-spigot pipe fittings
Cast iron hubless pipe fittings
Soil pipe cutter
Manufacturer’s recommendations for installing cast iron pipe
Lever tool

Hammers
Hacksaws
Demolition or cut-off saw
Pry bar
Assembly tools
Tape measures
Inside caulking irons
Outside caulking irons
Chisels
Soapstones
Wraparounds
Compression gaskets
Mechanical joint
No-hub joints
Flange gaskets
Gasket lubricant

continued
Lubricant
Ductile iron flanged pipe and fittings
Torque nut drivers
Torque wrenches
Dresser couplings
Iron alloy pipe and fittings
Vitrified clay bell-and-spigot pipe
Vitrified clay plain-end pipe
Acetone primer and MSDS
Fiberglass pipe adhesive kits
MSDS for fiberglass adhesives
Fiberglass bell-and-spigot pipe
Fiberglass Redi-Thread pipe

Fiberglass threaded-and-bonded pipe
Samples of different types of plastic pipe
ABS and PVC pipe and fittings
CPVC pipe and fittings
PE, PEX, and PB pipe and fittings
Water supply and DWV fittings
Reamers
Tubing cutters
Sandpaper
Teflon® tape
Copies of the Quick Quiz*
Module Examinations**
Performance Profile Sheets**

*Located in the back of this module.

**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. This module requires trainees to use hand tools and solvent cements. Ensure all trainees are briefed on hand tool safety, chemical safety, and shop safety procedures. This module may require trainees to visit construction sites. Ensure all trainees are briefed on site safety procedures.

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 material 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 *Underground Pipe Installation.* 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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<tr>
<td><strong>Session I. Underground Pipe Installation Guidelines</strong></td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Underground Pipe Installation Guidelines</td>
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<tr>
<td>C. Storage and Handling of Underground Pipe</td>
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<tr>
<td><strong>Session II and III. Cast Iron and Ductile Iron Pipe</strong></td>
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<tr>
<td>A. Cast Iron Pipe</td>
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<tr>
<td>B. Ductile Iron Pipe</td>
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<tr>
<td>C. Laboratory – Trainees practice joining ductile iron pipe. This laboratory corresponds to Performance Task 2.</td>
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</table>
Session IV. Concrete Pipe
   A. Pipe Sizes
   B. Joining Concrete Pipe
   C. Cutting Concrete Pipe
   D. Installation

Session V. Carbon Steel, Iron Alloy, and Fiberglass Pipe
   A. Carbon Steel Pipe
   B. Iron Alloy Pipe
   C. Fiberglass Pipe

Sessions VI and VII. Thermoplastic Pipe
   A. Properties
   B. Sizing and Labeling
   C. Types
   D. Fittings
   E. Cutting
   F. Joining
   G. Laboratory – Trainees joining PVC and CPVC pipe. This laboratory corresponds to Performance Task 1.

Session VIII. Review and Testing
   A. Module Review
   B. Module Examination
      1. Trainees must score 70% 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.
   C. 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.