Module Overview

This module introduces the piping systems used to carry chemicals, compressed air, fuel oil, steam, and water in maritime applications. It explains how to identify systems by both color code and material. Trainees will learn how different types of piping are sized. Trainees will also learn about the effects of and corrective measures for thermal expansion and heat loss in piping systems.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime 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 used in maritime applications and the methods used to identify them.
2. Describe the types of pipe used in maritime systems, how they are used, and how they are sized.
3. Explain the effects and corrective measures for thermal expansion and heat loss in piping systems.

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 color codes.
2. Identify piping systems by material.
3. Identify pipe schedules by pipe.

Materials and Equipment

Multimedia projector and screen
Computer
Whiteboard/chalkboard
Markers/chalk
Calculators
Pencils and paper
Tape measures/rulers
Access to a facility with a range of installed piping systems

Samples of different types of pipe with a variety of wall thicknesses, including:
- Carbon steel
- Stainless steel
- Copper
- Cupronickel
- Plastic

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. Review safety guidelines associated with working with maritime piping systems. Emphasize the importance of knowing piping color codes and determining piping system contents for safety purposes.

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


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. Approximately 5 hours are suggested to cover *Piping Systems*. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. 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>F. Pipe Insulation</td>
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Session II. Laboratory/PT; Review and Testing

A. Laboratory/PT
   Trainees will identify piping systems by color code, piping material, and pipe schedules. This laboratory corresponds to Performance Tasks 1, 2, and 3.

B. Review

C. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on 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 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 align 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
Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime Pipefitting Level One.

Objectives
Upon completion of this module, trainees will be able to do the following:
1. Identify butt weld fittings.
2. Explain how to read and interpret butt weld piping drawings.
3. Describe how to properly prepare pipe ends for fit-up.
4. Explain how to determine pipe length between fittings for butt weld applications.
5. Describe the proper alignment procedures for various types of fittings.

Performance Tasks
Under the supervision of the instructor, trainees should be able to do the following:
1. Prepare pipe ends for fit-up.
2. Install backing rings.
3. Align pipe to both ends of various types of fittings, including flanges and ells.

Materials and Equipment
Multimedia projector and screen
Maritime Pipefitting Level Two PowerPoint®
Desktop or laptop computer
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Calculators
Tape measures
Piping drawings and views
Pipefitting guidebooks, specification book
Required PPE, including cutting goggles and full-face shield
Various sizes of carbon steel pipe, stainless steel pipe
Various backing rings
Scrap angle iron
Scrap channel iron
Hacksaws
Torch
Acetylene cylinder
Oxygen cylinder
Bottle cart
Hose sets
Regulators
Strikers
Butt weld fittings and flanges
Portable grinders
Pipe beveller
Oxyacetylene pipe-beveling machine (optional)
Soapstones
Lever-type clamps
Hydraulic clamps
Chain-type clamps
Alignment dogs
Hi-Lo gauge
Center finder
Straight pipe welding clamps
Framing squares
Hammers
Jack stand
Wraparounds
Wrenches
Pipe vises
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. Review safety guidelines associated with grinders and other power tools. Emphasize the importance of proper housekeeping.

**Additional Resources**

This module presents thorough resources for task training. The following resource material is suggested for further study.


**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. Approximately 37.5 hours are suggested to cover *Butt Weld Pipe Fabrication*; this includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. A majority of sessions will be spent in laboratories. 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>4. Line Numbers</td>
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<td>5. Specifications Book</td>
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Spirit levels
Torpedo levels
Tripod vises
Two-hole flange pins
Flange welding clamps
Module Examinations*
Performance Profile Sheets*
Sessions III–V. Preparing Pipe Ends for Fit-Up

A. Preparing Pipe Ends for Fit-Up
   1. Preparing Edges
   2. Cleaning Surfaces

B. Laboratory/PT
   Have trainees practice beveling and grinding pipe ends. This laboratory corresponds to Performance Task 1.

Sessions VI and VII. Determining Pipe Lengths Between Fittings

A. Determining Pipe Lengths Between Fittings
   1. Calculating Takeout
   2. Obtaining Proper Spacing Between Pipes and Fittings
   3. Calculating Pipe Lengths

B. Laboratory/PT
   Have trainees practice calculating takeout, obtaining proper spacing, and calculating pipe lengths.

Session VIII. Selecting and Installing Backing Rings

A. Selecting and Installing Backing Rings

B. Laboratory/PT
   Have trainees practice calculating takeout and obtaining proper spacing. This laboratory corresponds to Performance Task 2.

Sessions IX and X. Using and Caring for Clamps and Alignment Tools; Performing Alignment Procedures

A. Using and Caring for Clamps and Alignment Tools
   1. Angle Iron Jigs
   2. Shop-Made Aligning Dogs
   3. Cage Clamps

B. Performing Alignment Procedures
   1. Aligning Straight Pipe
   2. Aligning a Pipe to a 45-Degree Elbow
   3. Aligning a Pipe to a 90-Degree Elbow
   4. Squaring a 90-Degree Corner
   5. Aligning a Pipe to a Flange
   6. Aligning a Pipe to a Tee
   7. Fitting Butt Weld Valves
Session XI–XIV. Laboratories/PTs

A. PT/Laboratory

1. Have trainees practice aligning straight pipe. This laboratory corresponds to Performance Task 3.
2. Have trainees practice aligning a pipe to a 45-degree elbow. This laboratory corresponds to Performance Task 3.
3. Have trainees practice aligning a pipe to a 90-degree elbow. This laboratory corresponds to Performance Task 3.
4. Have trainees practice aligning a pipe to a 90-degree corner. This laboratory corresponds to Performance Task 3.
5. Have trainees practice aligning a pipe to a flange. This laboratory corresponds to Performance Task 3.
6. Have trainees practice aligning a pipe to a tee. This laboratory corresponds to Performance Task 3.
7. Have trainees practice fitting butt weld valves. This laboratory corresponds to Performance Task 3.

Session XV. Review and Testing

A. 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 socket weld piping systems. It identifies the fittings used in socket weld pipe fabrication, explains how to determine pipe lengths between socket weld fittings, prepare the pipe and fittings, and align socket weld fittings for proper fit-up.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime Pipefitting Level One.

Objectives

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

1. Identify and explain socket weld fittings.
2. Read and interpret socket weld piping drawings.
3. Determine pipe lengths between socket weld fittings.
4. Describe how to fabricate socket weld fittings to pipe.

Performance Tasks

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

1. Calculate pipe lengths from line drawings using the center-to-center method, the center-to-face method, and the face-to-face method.
2. Align two elbows to a section of pipe.
3. Align a socket weld flange to a pipe.

Materials and Equipment

- Multimedia projector and screen
- Computer
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Calculators
- Tape measures
- Piping drawings and views
- Pipefitting guidebooks, specification book
- Required PPE, including cutting goggles and full-face shield
- Various sizes of carbon steel pipe and stainless steel pipe
- Socket weld fittings and flanges
- Portable grinders
- Gap-A-Let™
- Framing squares
- Hammers
- Jack stand
- Wrenches
- Pipe vises
- Spirit levels
- Torpedo levels
- Tripod vises
- Two-hole flange pins
- 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. Review safety guidelines associated with grinders and other power tools. Emphasize the importance of proper housekeeping.

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


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. Approximately 25 hours are suggested to cover *Socket Weld Pipe Fabrication*. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. A majority of sessions will be spent in laboratories. 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>3. Face-to-Face Method</td>
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<td>B. PT/Laboratory</td>
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<tr>
<td>Have trainees practice determining pipe lengths between fittings using the center-to-center method, the center-to-face method, and the face-to-face method. This laboratory corresponds to Performance Task 1.</td>
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Sessions VI through IX. Alignment Procedures

A. PT/Laboratory
   1. Have trainees practice aligning elbows to a section of pipe. This laboratory corresponds to Performance Task 2.
   2. Have trainees practice aligning a socket weld flange to a pipe. This laboratory corresponds to Performance Task 3.

Session X. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on 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 Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module describes brazing of copper and other metals for maritime piping systems. It identifies brazing tools and materials and describes how to properly measure pipe lengths and prepare and align pipe ends for brazing. Tools, equipment, and methods used in brazing are also described.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime Pipefitting Level One.

Objectives

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

1. Identify the tools and materials used to braze copper and other metals.
2. Describe how to prepare pipe ends for brazing.
3. Describe the materials and methods used to braze piping made of copper and other metals including stainless steel, brass, cupronickel, nickel-copper, valve bronze, and Inconel.

Performance Task

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

1. Properly prepare copper or cupronickel pipe and fittings for brazing.

Materials and Equipment

- Multimedia projector and screen
- Computer
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Calculators
- Tape measures
- Piping drawings and views
- Pipefitting guidebooks, specification book
- Required PPE, including cutting goggles and full-face shield
- Goggles, No. 3 tint
- Flame-resistant gloves
- Long-sleeve shirt and cuff-less pants (cotton)
- High-top work boots
- Hearing protection as designated by the instructor or training facility provider
- Hard hat as designated by the instructor or training facility provider
- Fire extinguisher

- Fire blanket or other flame/heat blocking material if work is being done near other flammable material
- Cleaning and cutting tools, pipe reamers
- Samples of properly and badly brazed fittings, various metals
- Air/acetylene torch set with appropriate tip
- Oxyacetylene equipment with appropriate brazing tips
- Tip cleaner kit
- Torch wrench
- Flashback arrester
- Cup-type striker
- Brazing filler metals; phosphorous-bearing filler metal is suggested for brazing fluxes
- Copper and cupronickel tubing and fittings
- Tubing cutters
- Hacksaws
- Flux
- Brazing rings
- 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. Review safety guidelines associated with brazing copper and other metals. Consistently remind trainees of the hazards associated with open flames, sparks, combustible and explosive gases, toxic fumes, and hot objects and surfaces related to brazing. Emphasize the importance of proper housekeeping.

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


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. Approximately 12½ hours are suggested to cover Brazing. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. A majority of sessions will be spent in laboratories. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic Planned Time

Sessions I–III. Introduction, Brazing Equipment and Materials; Preparing Pipe Ends for Brazing

A. Introduction
   1. Brazing Safety

B. Brazing Equipment and Materials
   1. Pipe Cutting and Cleaning Equipment
   2. Materials

C. Preparing Pipe Ends for Brazing

D. Laboratory
   1. Have trainees practice properly preparing copper pipe and fittings for brazing. This laboratory corresponds to Performance Task 1.
   2. Have trainees practice properly preparing cupronickel pipe and fittings for brazing. This laboratory corresponds to Performance Task 1.

Session IV. Brazing Pipe Fittings

A. Brazing Pipe Fittings
   1. Brazing Equipment Setup
   2. Basic Procedure to Prepare Oxyacetylene Brazing Equipment for Use
   3. Lighting the Oxyacetylene Torch
   4. Brazing Joints
Session V. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on 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 Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module describes steel pipe and its fabrication methods. It identifies the fittings used in threaded pipe fabrication. It also explains how to determine pipe lengths between threaded fittings, prepare the pipe and fittings, and assemble threaded pipe and fittings.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime Pipefitting Level One.

Objectives

Upon completion of this module, trainees will be able to do the following:
1. Identify and describe characteristics of pipe threads and fittings.
2. Calculate pipe lengths between threaded joints.
3. Describe how to thread and assemble threaded pipe and fittings.

Performance Task

Under the supervision of the instructor, trainees should be able to do the following:
1. Determine pipe lengths between fittings using the center-to-center method.
2. Determine pipe lengths between fittings using the center-to-face method.
3. Determine pipe lengths between fittings using the face-to-face method.
4. Assemble threaded pipe using various fittings.

Materials and Equipment

Multimedia projector and screen
Maritime Pipefitting Level Two PowerPoint®
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Appropriate personal protective equipment
Various types and sizes of steel pipe
Assorted elbows
Return bends
Branch connections
Caps and plugs
Line connections
Nipples
Flanges
Examples of various pipe threads
Fitting manufacturer’s makeup chart
Thread gauge

Pipe drawings
Manual pipe threader
Powered pipe threader
Cutting oil
Pipe stand
Vises
Threaded pipe reamers
3⁄8-inch to 3⁄4-inch sets of open-end wrenches
Adjustable wrenches
Channel-lock pliers
Drift pins
Framing squares
Measuring tape
Soapstones
Torque wrenches
PTFE tape
Pipe dope
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. Review safety guidelines associated with grinders and other power tools. Emphasize the importance of proper housekeeping.

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


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. Approximately 15 hours are suggested to cover *Threaded Pipe Fabrication*. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. A majority of sessions will be spent in laboratories. 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><strong>Sessions II and III. Determining Pipe Lengths Between Fittings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Determining Pipe Lengths Between Fittings</td>
<td></td>
</tr>
<tr>
<td>1. PT/Laboratory</td>
<td></td>
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<tr>
<td>Have trainees practice determining pipe length using the center-to-center method. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>2. PT/Laboratory</td>
<td></td>
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<tr>
<td>Have trainees practice determining pipe length using the center-to-face method. This laboratory corresponds to Performance Task 2.</td>
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<tr>
<td>3. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>Have trainees practice determining pipe length using the face-to-face method. This laboratory corresponds to Performance Task 3.</td>
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</tr>
</tbody>
</table>
Sessions IV and V. Threaded Pipe Assembly

A. Threaded Pipe Assembly
   1. Pipe Joint Tape and Compounds
   2. Selecting Wrenches
   3. Fitting Screwed Pipe and Fittings
   4. Installing Threaded Valves

B. PT/Laboratory
   Have trainees practice properly preparing and assembling threaded pipe and fittings. This laboratory corresponds to Performance Task 1.

Session VI. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on 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 Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module describes how to identify the types, sizes, and assembly methods used for fiberglass and plastic pipe and fittings. It describes adhesives for glass fiber-reinforced epoxy (GRE) pipe, as well as cleaners, primers, and cements for plastic pipe. Spacing for plastic pipe support is discussed.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime Pipefitting Level One.

Objectives

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

1. Identify the types, sizes, and assembly methods for fiberglass pipe and fittings.
2. Identify the types, sizes, and assembly methods for plastic pipe and fittings.

Performance Task

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

1. Properly measure, cut, and join plastic piping.

Materials and Equipment

- Multimedia projector and screen
- Computer
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Calculators
- Tape measures
- Required PPE, including safety glasses and rubber or latex gloves, work gloves
- GRE/plastic pipe cutting tools
- Hacksaws, saber saw
- Pipe wraparound
- GRE/plastic pipe reamers, shavers
- Sand cloth, cleaning cloths
- Marking pens, scratch awl
- Various samples of GRE epoxy adhesives, plastic pipe cleaners (clear), primers (purple), solvent-cements
- MSDS or SDS for solvent-related products
- Hammer and woodblock
- Examples of GRE pipe and fittings
- Examples of PVC/CPVC plastic pipe and fittings
- Samples of properly and badly assembled fittings of GRE, PVC/CPVC plastic pipe
- 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. Review safety guidelines associated with preparing and assembling glass fiber-reinforced (GRE) and plastic pipe. Consistently remind trainees of the hazards associated with the toxic and flammable nature of epoxy adhesives and chemical cleaners, primers, and cements. Emphasize the importance of proper housekeeping.

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


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. Approximately 12½ hours are suggested to cover Fiberglass and Plastic Pipe. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. A majority of sessions will be spent in laboratories. 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>Sessions I and II. Introduction; Fiberglass Pipe; Plastic Pipe; Pressure Testing</td>
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</tr>
<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Fiberglass Pipe</td>
<td></td>
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<tr>
<td>1. Adhesives</td>
<td></td>
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<tr>
<td>2. Assembling Bell-and-Spigot Joints</td>
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<tr>
<td>C. Plastic Pipe</td>
<td></td>
</tr>
<tr>
<td>1. Plastic Pipe Sizes</td>
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<tr>
<td>2. Labeling (Markings)</td>
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<tr>
<td>3. Fittings</td>
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<tr>
<td>4. PVC Pipe</td>
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<tr>
<td>5. CPVC Pipe</td>
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<tr>
<td>6. Joining Plastic Pipe</td>
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<tr>
<td>7. Plastic Pipe Support Spacing</td>
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<tr>
<td>D. Pressure Testing</td>
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<tr>
<td>Sessions III–IV. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>A. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>1. Have trainees practice properly measuring and cutting plastic pipe. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td>2. Have trainees practice properly joining plastic pipe. This laboratory corresponds to Performance Task 1.</td>
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</tr>
</tbody>
</table>
Session V. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on 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 Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module examines the types of valves used to start and stop flow, regulate flow, relieve pressure, and regulate the direction of flow. Various types of valve actuators are also explained. In addition, different types of flanges and flange gaskets used in maritime piping systems are identified and described.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: Core Curriculum; Maritime Pipefitting Level One.

Objectives

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

1. Identify various types of valves based on their primary functions.
2. Identify types of valve actuators.
3. Describe factors related to the selection, storage, and handling of valves.
4. Identify and describe various types of flanges and gaskets.

Performance Tasks

This is a knowledge-based module; there are no performance tasks.

Materials and Equipment

<table>
<thead>
<tr>
<th>Multimedia projector and screen</th>
<th>Two-flange valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime Pipefitting Level Two PowerPoint®</td>
<td>Diaphragm valves</td>
</tr>
<tr>
<td>Computer</td>
<td>Control valves</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Safety valves</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Pressure-relief valves</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Swing check valves</td>
</tr>
<tr>
<td>Calculators</td>
<td>Lift check valves</td>
</tr>
<tr>
<td>Tape measures</td>
<td>Ball check valves</td>
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<tr>
<td>Appropriate personal protective equipment</td>
<td>Butterfly check valves</td>
</tr>
<tr>
<td>Gate valves with various types of bonnets and stems</td>
<td>Foot valves</td>
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<tr>
<td>Knife gate valve</td>
<td>Gear operators</td>
</tr>
<tr>
<td>Ball valves</td>
<td>Chain operators</td>
</tr>
<tr>
<td>Venturi-type and top-entry ball valves</td>
<td>Electric, hydraulic actuators</td>
</tr>
<tr>
<td>Various types of plug valves</td>
<td>Reach rods</td>
</tr>
<tr>
<td>Plug lubricants</td>
<td>Photographs or drawings of valve boxes</td>
</tr>
<tr>
<td>Three-way valves</td>
<td>Examples of pressure-relief valves</td>
</tr>
<tr>
<td>Globe valves</td>
<td>Backflow preventer</td>
</tr>
<tr>
<td>Angle valves</td>
<td>Various types of flanges, flange facings</td>
</tr>
<tr>
<td>Y-type valves</td>
<td>Flat ring and full-face flange gaskets of various materials</td>
</tr>
<tr>
<td>Butterfly valves</td>
<td>Module Examinations*</td>
</tr>
<tr>
<td>Wafer, wafer lug valves</td>
<td></td>
</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.
Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Review safety guidelines associated with identifying and working with valves, actuators, flanges, and gaskets used in maritime piping. Consistently remind trainees of the hazards associated with the toxic and flammable nature of epoxy adhesives and chemical cleaners, primers, and cements. Emphasize the importance of proper housekeeping.

Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


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. Approximately 20 hours are suggested to cover Identifying Valves, Flanges, and Gaskets. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. 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>
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</thead>
<tbody>
<tr>
<td>Session I. Introduction; Valves That Start and Stop Flow</td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Valves That Start and Stop Flow</td>
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<tr>
<td>1. Gate Valves</td>
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<td>2. Knife Gate Valves</td>
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<tr>
<td>3. Ball Valves</td>
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<td>4. Plug Valves</td>
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<tr>
<td>5. Three-Way Valves</td>
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<tr>
<td>Session II. Valves that Regulate Flow; Control Valves</td>
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</tr>
<tr>
<td>A. Valves that Regulate Flow</td>
<td></td>
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<tr>
<td>1. Globe Valves</td>
<td></td>
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<tr>
<td>2. Y-Type Valves</td>
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<tr>
<td>3. Butterfly Valves</td>
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<tr>
<td>4. Diaphragm Valves</td>
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<td>5. Needle Valves</td>
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<tr>
<td>B. Control Valves</td>
<td></td>
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<tr>
<td>Session III. Valves That Relieve Pressure; Valves That Regulate the Direction of Flow</td>
<td></td>
</tr>
<tr>
<td>A. Valves That Relieve Pressure</td>
<td></td>
</tr>
<tr>
<td>1. Safety Valves</td>
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<tr>
<td>2. Pressure-Relief Valves</td>
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</tbody>
</table>
B. Valves That Regulate the Direction of Flow
  1. Swing Check Valves
  2. Lift Check Valves
  3. Ball Check Valves
  4. Butterfly Check Valves
  5. Foot Valves

Session IV. Valve Actuators
A. Valve Actuators
   1. Gear Operators
   2. Chain Operators
   3. Pneumatic and Hydraulic Actuators
   4. Electric or Air Motor-Driven Actuators
   5. Reach Rods

Session V. Storing and Handling Valves; Valve Placement
A. Storing and Handling Valves
   1. Safety Considerations
   2. Storing Valves
   3. Rigging Valves
B. Valve Placement

Session VI. Valve Selection, Types, and Applications; Valve Markings and Nameplate Information
A. Valve Selection, Types, and Applications
   1. Valve Selection
   2. Valve Types and Applications
B. Valve Markings and Nameplate Information
   1. Rating Designation
   2. Trim Identification
   3. Size Designation
   4. Tread Markings
   5. Valve Schematic Symbols

Session VII. Flanged Piping Systems; Flange Gaskets
A. Flanged Piping Systems
   1. Types of Flanges
   2. Flange Facings
B. Flange Gaskets
   1. Gasket Materials
   2. Types of Flange Gaskets

Session VIII. Review and Testing
A. Review
B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module introduces the drawings used by maritime pipefitters. In this module, trainees will learn to recognize the symbols, abbreviations, and lines used on drawings. The module covers the types of drawings used by maritime pipefitters, including arrangement drawings, P&IDs, isometric drawings, spool sheets, and detail sheets. Trainees will learn to prepare isometric and orthographic sketches.

Prerequisites

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

Objectives

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

1. Identify parts of drawings.
2. Identify types of drawings.
3. Identify drawings used by maritime pipefitters.

Performance Tasks

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

1. Sketch basic isometric and orthographic piping sections.
2. Identify types of drawings and parts of a drawing.

Materials and Equipment

- Multimedia projector and screen
- Computer
- Whiteboard/chalkboard
- Markers/chalk
- Appropriate personal protective equipment
- Plan views
- Elevation and section drawings
- General arrangement drawing
- Equipment arrangement drawing
- P&ID
- Isometric drawing
- Spool drawing
- Equipment drawing
- Pipe support drawings
- Orthographic drawings
- Standard set of sketching tools:
  - Pencils
  - Sketch pad
  - Rulers
  - Templates or protectors
- Calculators
- Several sets of maritime piping drawings
- Small object such as a pipe fitting, valve, or coffee mug for sketching
- Assorted diameters of pipe
- 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.

**Additional Resources**

This module presents thorough resources for task training. The following resource material is suggested for further study.


**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 *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>
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</thead>
<tbody>
<tr>
<td><strong>Sessions I and II.</strong> Introduction; Common Drawing Elements</td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Common Drawing Elements</td>
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<tr>
<td>1. Title Blocks</td>
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<tr>
<td>2. Scales and Measurements</td>
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<tr>
<td>3. Lines</td>
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<tr>
<td>4. Symbols and Abbreviation Legends</td>
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<tr>
<td>5. Notes</td>
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<tr>
<td>6. Revision block</td>
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<tr>
<td><strong>Session III.</strong> Reference Lines</td>
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<tr>
<td>A. Reference Lines</td>
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<tr>
<td>1. Compartment Identification</td>
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<tr>
<td><strong>Session IV.</strong> Orthographic Projections</td>
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<tr>
<td>A. Orthographic Projections</td>
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<tr>
<td>1. Plan Views</td>
<td></td>
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<tr>
<td>2. Elevation Views</td>
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<tr>
<td>3. Section Views</td>
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<tr>
<td><strong>Session V.</strong> Types of Drawings</td>
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<tr>
<td>A. Types of Drawings</td>
<td></td>
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<tr>
<td>1. General Arrangement Plan</td>
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<tr>
<td>2. Equipment Arrangement Drawings</td>
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<tr>
<td>3. Piping and Instrumentation Drawings</td>
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<td>4. Isometric Drawings</td>
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<td>5. Spool Drawings</td>
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<td>6. Equipment (Vendor) Drawings</td>
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<tr>
<td>7. Pipe Support Drawings and Detail Sheets</td>
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<tr>
<td>B. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>Have trainees practice identifying types of drawings and parts of drawings. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
</tbody>
</table>
Sessions VI and VII. Making Field Sketches
A. Making Field Sketches
   1. Making Orthographic Sketches
   2. Making Isometric Sketches
B. PT/Laboratory
   Have trainees practice making isometric and orthographic sketches. This laboratory corresponds to Performance Task 1.

Session VIII. Review and Testing
A. Review
B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on 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 Training Report Form 200, and submit the results to the Training Program Sponsor.