Module Overview

This module discusses the use of equivalent and conversion tables and explains how to use right angle trigonometry to calculate takeouts. The module also explains how to calculate the weight of objects that boilermakers may have to install.

Objectives

Upon completion of this module, the trainee will be able to do the following:
1. Use tables of equivalents.
2. Use unit conversion tables.
3. Perform right angle trigonometry.
4. Calculate the weight of objects.
5. Calculate takeouts using trigonometry.

Performance Tasks

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

Materials and Equipment

Multimedia projector and screen
*Boilermaking Level Four* PowerPoint® Presentation Slides
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Straight-edge rulers
A selection of basic right triangle exercises
(with answers for the instructor)
A selection of piping-based math exercises
(with answers for the instructor)
A selection of object weight math exercises
(with answers for the instructor)
Scientific calculators

Module Examinations*

* 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 that the trainees visit job sites. Ensure that trainees are briefed on site safety policies prior to any site visits.

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 15 hours are suggested to cover *Advanced Mechanical Trade Math*. 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. Introduction; Tables of Equivalents; Unit Conversion Tables</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Tables of Equivalents</td>
<td></td>
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<tr>
<td>C. Unit Conversion Tables</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions II–IV. Trigonometry</strong></td>
<td></td>
</tr>
<tr>
<td>A. Trigonometry</td>
<td></td>
</tr>
<tr>
<td>1. Pythagorean Theorem</td>
<td></td>
</tr>
<tr>
<td>2. Trigonometric Functions</td>
<td></td>
</tr>
<tr>
<td>3. Triangle Calculation</td>
<td></td>
</tr>
<tr>
<td>4. Determining Angles When Side Lengths Are Known</td>
<td></td>
</tr>
<tr>
<td>5. Interpolation</td>
<td></td>
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<tr>
<td>6. Law of Sines</td>
<td></td>
</tr>
<tr>
<td><strong>Session V. Calculating Takeouts Using Trigonometry; Calculating the Weight of an Object</strong></td>
<td></td>
</tr>
<tr>
<td>A. Calculating Takeouts Using Trigonometry</td>
<td></td>
</tr>
<tr>
<td>1. Takeouts</td>
<td></td>
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<tr>
<td>2. Odd Angles</td>
<td></td>
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<tr>
<td>B. Calculating the Weight of an Object</td>
<td></td>
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<tr>
<td><strong>Session VI. Review and Testing</strong></td>
<td></td>
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<tr>
<td>A. 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 Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
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</tr>
</tbody>
</table>
Module Overview

Boilermakers often work with heavy equipment and components that must be lifted into place. This module introduces the principles of load and stability and their effect on rigging. This module explains how to determine the center of gravity and use various types of rigging equipment.

Objectives

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

1. Explain how the center of gravity of the load affects the rigging.
2. Explain how the weight of the load and the position of the crane boom affect the capacity of the crane.
3. Explain how cribbing is used to support loads.
4. Select the appropriate spreader bars or equalizer beam for a given load.
5. Demonstrate the ability to determine the center of gravity for an asymmetrical load.
6. Given a particular load, select the appropriate sling(s) for a lift.
7. Describe how grip hoists and skids are used to move loads laterally.

Performance Tasks

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

1. Select the appropriate spreader bars or equalizer beam for a given load.
2. Determine the center of gravity for an asymmetrical load.
3. Select the appropriate sling(s) for a given lift.

Materials and Equipment

<table>
<thead>
<tr>
<th>Markers/chalk</th>
<th>Selection of slings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pencils and paper</td>
<td>A cardboard box and books to give it weight,</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>several appropriate slings</td>
</tr>
<tr>
<td>Multimedia projector and screen</td>
<td>Selection of spreader bars and equalizer beams</td>
</tr>
<tr>
<td>Computer</td>
<td>Wire rope, grip hoists, and a safety hook</td>
</tr>
<tr>
<td>Appropriate personal protective equipment</td>
<td>Module Examinations*</td>
</tr>
<tr>
<td>A saw horse, suitable length of board, and several books or bricks</td>
<td>Performance Profile Sheets*</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 working on rigging, especially with heavy equipment. 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. 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 *Advanced Rigging*. 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. Introduction; Load Dynamics</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Load Dynamics</td>
<td></td>
</tr>
<tr>
<td>1. Rotational Forces or Moments</td>
<td></td>
</tr>
<tr>
<td>2. Crane Stability</td>
<td></td>
</tr>
<tr>
<td>C. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>Have trainees determine the center of gravity for an asymmetrical load. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions III and IV. Special Equipment Used in Heavy Rigging; Slings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Special Equipment Used in Heaving Rigging</td>
<td></td>
</tr>
<tr>
<td>1. Cribbing</td>
<td></td>
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<tr>
<td>2. Inclined Planes</td>
<td></td>
</tr>
<tr>
<td>B. Slings</td>
<td></td>
</tr>
<tr>
<td>1. Sling Types</td>
<td></td>
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<tr>
<td>2. Sling Angles</td>
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<tr>
<td>3. Sling Stress</td>
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<tr>
<td>4. Derating Factors of Slings</td>
<td></td>
</tr>
<tr>
<td>5. Rigging Symmetrical Loads</td>
<td></td>
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<tr>
<td>6. Rigging Asymmetrical Loads</td>
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<tr>
<td>7. Basket Hitches</td>
<td></td>
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<tr>
<td>8. Choker Hitches</td>
<td></td>
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<tr>
<td>C. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>Have trainees select the appropriate sling(s) for a lift. This laboratory corresponds to Performance Task 3.</td>
<td></td>
</tr>
</tbody>
</table>
Sessions V and VI. Using Beams; Rigging Bundles and Loose Timbers
A. Using Beams
   1. Adjustable Beams
   2. Equalizer Beams
B. PT/Laboratory
   Have the trainees select the appropriate spreader bars or equalizer beam for a given load. This laboratory corresponds to Performance Task 1.
C. Rigging Bundles and Loose Timbers
   1. Unloading Procedure
   2. Hoisting Equipment

Session VII. Moving Loads Laterally
A. Moving Loads Laterally
   1. Skids
   2. Grip Hoists

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.
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 covers P&IDs, plan views, section views, isometric drawings, and spool drawings. It teaches the trainee to work through a set of drawings and extract the information from one drawing that is necessary to interpret other drawings. It explains how to use plan views to draw isometrics and use isometrics to put together spools. The supplied drawings fit together to design a main steam line for a power plant.

Objectives

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

1. Identify symbols and abbreviations on piping and instrumentation drawings (P&IDs).
2. Identify piping arrangement drawings.
3. Read and interpret the following:
   - GPS coordinates, control points, and elevation
   - P&IDs, plan views, and section views
   - Isometric drawings
   - Spool drawings taken from isometric drawings
   - Boiler plan views, section views, and details
4. Draw isometric drawings.
5. Calculate the total line length from an ISO.

Performance Tasks

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

1. Calculate the total line length from an ISO.
2. Sketch an ISO from a plan view.

Materials and Equipment

<table>
<thead>
<tr>
<th>Multimedia projector and screen</th>
<th>ISO drawing paper</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Boilermaking Level Four</em></td>
<td>Access to all types of level-checking tools</td>
</tr>
<tr>
<td><em>PowerPoint® Presentation Slides</em></td>
<td>Access to an operational GPS system</td>
</tr>
<tr>
<td>Computer</td>
<td>Access to all types of boiler-related drawings</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Module Examinations*</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Performance Profile Sheets*</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td></td>
</tr>
<tr>
<td>A selection of distance-measuring tools</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. This module may require that the trainees visit job sites. Ensure that trainees are briefed on site safety policies prior to any site visits.
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 Advanced Boilermaking Construction Drawings. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Introduction; Block Diagrams; Piping and Instrumentation Drawings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Block Diagrams</td>
<td></td>
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<tr>
<td>C. Piping and Instrumentation Drawings</td>
<td></td>
</tr>
<tr>
<td>1. Process Piping</td>
<td></td>
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<tr>
<td>2. Piping Components</td>
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<tr>
<td>3. Process Equipment</td>
<td></td>
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<tr>
<td>4. Instrumentation</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions III and IV. Piping Arrangement Drawings; Reading and Interpreting P&amp;IDs and Piping Arrangement Drawings; Reading and Interpreting Isometric Drawings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Piping Arrangement Drawings</td>
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<tr>
<td>1. General Arrangement Drawings</td>
<td></td>
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<tr>
<td>2. As-Built Drawings</td>
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<tr>
<td>3. Piping and Instrumentation Drawings (P&amp;IDs)</td>
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<tr>
<td>4. Sectional View Drawings</td>
<td></td>
</tr>
<tr>
<td>5. Other Piping Arrangement Drawings and Aids</td>
<td></td>
</tr>
<tr>
<td>B. Reading and Interpreting P&amp;IDs and Piping Arrangement Drawings</td>
<td></td>
</tr>
<tr>
<td>1. Mechanical Symbology Page</td>
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<tr>
<td>2. Instrumentation Symbology Page</td>
<td></td>
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<tr>
<td>3. General Arrangement Pages</td>
<td></td>
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<tr>
<td>C. Reading and Interpreting Isometric Drawings</td>
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<tr>
<td>1. Isometrics</td>
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<tr>
<td>2. Spool Drawings</td>
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<tr>
<td>3. Vessel or Unit Drawings</td>
<td></td>
</tr>
</tbody>
</table>
Session V. Following a Single Line
A. Following a Single Line
   1. Getting an ISO from a Plan View
   2. From ISO to Spool Sheet
B. PT/Laboratory
   Have trainees practice calculating a total line length from an ISO. This laboratory
corresponds to Performance Task 1.

Sessions VI and VII. Boiler and Tower Prints; Drawing ISOs
A. Boiler and Tower Prints
   1. Reading Plan, Section, and Detail Views
   2. Tower/Column Prints
B. Drawing ISOs
C. PT/Laboratory
   Have trainees practice sketching an ISO from a plan view. This laboratory
corresponds to Performance Task 2.

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.
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 presents various piping offsets: three-line, 45-degree, equal spread offsets around a vessel, and three-line, 45-degree, unequal offsets. It also covers how to fabricate tank coils; three, four, and five-piece mitered turns; 45-degree laterals using both references; and contour markers, dummy legs out of both pipe and structural steel, and mitering procedures.

Objectives

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

1. Calculate simple piping offsets.
2. Calculate three-line, 45-degree, equal-spread offsets around a vessel.
3. Calculate three-line, 45-degree, unequal-spread offsets.
4. Fabricate tank heating coils.
5. Perform mitering procedures.
7. Lay out 45-degree laterals, using references or a calculator.
8. Fabricate dummy legs and trunions out of pipe, using references.
9. Perform geometric layout of pipe laterals and supports.
10. Lay out and fabricate a fishmouth.
11. Lay out and fabricate a wye.

Performance Tasks

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

1. Solve a simple piping offset.
2. Calculate a three-line, 45-degree, equal-spread offset.
3. Calculate a three-line, 45-degree, unequal-spread offset.
4. Calculate and lay out a tank coil.
5. Lay out and fabricate a three-piece mitered turn, degree to be determined by the instructor.
6. Lay out and fabricate a four-piece, 90-degree, mitered turn.
7. Lay out and fabricate a 45-degree lateral, using reference charts.
8. Lay out and fabricate a type 1 pipe support.
9. Lay out a 45-degree lateral by performing geometric layout.
10. Lay out and fabricate a fishmouth.
11. Lay out and fabricate a wye.

Materials and Equipment

Multimedia projector and screen
Boilermaking Level Four
PowerPoint® Presentation Slides
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Appropriate personal protective equipment
14-inch half-round bastard files
24-inch spirit levels
Angle iron
Ball-peen hammers

Center punches
Channel lock pliers
Combination tri squares
Contour markers
Framing squares
Hacksaws
Jack stands
Oxyacetylene cutting equipment
Pipe Fitters Blue Book
Pipe vises
Portable grinders
Scientific calculators
Soapstones

(continued)
Tape measure  
Torpedo levels  
Wraparounds  
Ruler  
T-square  
45-degree right triangle  
Compass  
Dividers  
Horseshoe

* Located at 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 that trainees fabricate pipe. Ensure all trainees are briefed on fire safety. This module may require that the trainees visit job sites. Ensure that trainees are briefed on site safety policies prior to any site visits.

### 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.

- [www.sosmath.com/trig/trig.html](http://www.sosmath.com/trig/trig.html)
- [www.analyzemath.com/trigonometry.html](http://www.analyzemath.com/trigonometry.html)
- [www.counton.org/alevel/pure/purtuttri.htm](http://www.counton.org/alevel/pure/purtuttri.htm)

### 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 50 hours are suggested to cover *Advanced 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>Session I. Introduction and Calculating Simple Offsets</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Determining Pipe Offsets</td>
<td></td>
</tr>
<tr>
<td>C. PT/Laboratory</td>
<td>Have trainees practice solving a simple piping offset. This laboratory corresponds to Performance Task 1.</td>
</tr>
<tr>
<td><strong>Sessions II and III. Calculating Three-Line Offsets I</strong></td>
<td></td>
</tr>
<tr>
<td>A. Calculating Three-Line, 45-Degree, Equal-Spread Offsets</td>
<td></td>
</tr>
<tr>
<td>B. PT/Laboratory</td>
<td>Have trainees practice calculating three-line, 45-degree, equal-spread offsets. This laboratory corresponds to Performance Task 2.</td>
</tr>
</tbody>
</table>
Sessions IV and V. Calculating Three-Line Offsets II

A. Calculating Three-Line, 45-Degree, Unequal-Spread Offsets

B. PT/Laboratory
Have trainees practice calculating three-line, 45-degree, unequal-spread offsets. This laboratory corresponds to Performance Task 3.

Sessions VI and VII. Laying Out and Fabricating Tank Heating Coils

A. Laying Out and Fabricating Tank Heating Coils

B. PT/Laboratory
Have trainees practice laying out and fabricating tank heating coils. This laboratory corresponds to Performance Task 4.

Sessions VIII and IX. Fabricating Mitered Turns I

A. Laying Out Ordinate Lines

B. Laying Out Cutback Lines

C. Laying Out Mitered Turns

D. Laying Out and Fabricating Three-Piece Mitered Turns

E. PT/Laboratory
Have trainees practice laying out and fabricating a three-piece mitered turn. This laboratory corresponds to Performance Task 5.

Sessions X and XI. Fabricating Mitered Turns II

A. Laying Out and Fabricating Four-Piece Mitered Turns

B. PT/Laboratory
Have trainees practice laying out and fabricating a four-piece mitered turn. This laboratory corresponds to Performance Task 6.

Sessions XII and XIII. Fabricating Mitered Turns III

A. Laying Out Meters Using a Horseshoe

B. Mitering a Wye

C. PT/Laboratory
Have trainees practice laying out and fabricating a wye. This laboratory corresponds to Performance Task 11.

Session XIV. Fishmouth

A. Laying Out and Fabricating a Fishmouth

B. PT/Laboratory
Have trainees practice laying out and fabricating a fishmouth. This laboratory corresponds to Performance Task 10.

Session XV and XVI. Fabricating Using Charts

A. Determining Lateral Dimensions

B. PT/Laboratory
Have trainees practice laying out and fabricating a 45-degree lateral using reference charts. This laboratory corresponds to Performance Task 7.

C. Fabricating Dummy Legs and Trunions Out of Pipe

Session XVII and XVIII. Performing Geometric Layout

A. Laying Out Laterals

B. PT/Laboratory
Have trainees practice laying out a 45-degree lateral by performing geometric layout. This laboratory corresponds to Performance Task 9.
Module Overview

This module introduces the trainee to thermal expansion and how to calculate it. The trainee will learn types of misalignment and its causes, and procedures for stress relief in welded boiler equipment.

Objectives

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

1. Explain and calculate thermal expansion.
2. Describe stress-relief procedures.
3. Explain types of misalignment.

Performance Task

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

1. Calculate the thermal expansion on materials given by the instructor.

Materials and Equipment

- Markers/chalk
- Pencils and paper
- Whiteboard/chalkboard
- Multimedia projector and screen
- Computer
- Appropriate personal protective equipment
- Typical alignment devices
- Typical WPS
- Table of coefficient values
- Sections of small piping, an oxyfuel torch, and a burner
- 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 on heated weldments and using clamping and bracing tools for stability. 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. 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 Stress Relieving. 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>**Session I. Introduction; Distortion from Welding; Distortion from</td>
<td></td>
</tr>
<tr>
<td>Thermal Growth; Calculating Thermal Expansion</td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Distortion from Welding</td>
<td></td>
</tr>
<tr>
<td>1. Causes of Distortion</td>
<td></td>
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<tr>
<td>2. Correlation of Metal Properties and Distortion</td>
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<tr>
<td>3. Controlling Distortion</td>
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<td>C. Distortion from Thermal Growth</td>
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<td>D. Calculating Thermal Expansion</td>
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<tr>
<td>E. PT/Laboratory</td>
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<tr>
<td>Have trainees calculate the thermal expansion on materials given by</td>
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<tr>
<td>the instructor. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>**Sessions II and III. Relieving Pipe Stress; Performing Stress Relief</td>
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<tr>
<td>A. Relieving Pipe Stress</td>
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<tr>
<td>1. Flexibility in Layout</td>
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<tr>
<td>2. Installing Expansion Loops and Joints</td>
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<tr>
<td>3. Cold-Springing Pipe</td>
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<tr>
<td>B. Performing Stress Relief</td>
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<tr>
<td>1. Preheat Temperature</td>
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<td>2. Interpass Temperature</td>
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<td>3. Postheating</td>
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<tr>
<td>**Session IV. Review and Testing</td>
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<tr>
<td>A. Review</td>
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<tr>
<td>B. Module Examination</td>
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<tr>
<td>1. Trainees must score 70% or higher to receive recognition from NCCER.</td>
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<tr>
<td>2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.</td>
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<tr>
<td>C. Performance Testing</td>
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</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>
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<tr>
<td>2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.</td>
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</table>
Module Overview

This module introduces the trainee to the codes and standards that apply to boilers and welding boiler parts and fittings. It explains weld defects, how to identify them, and their causes. Trainees will also be introduced to common methods of destructive testing.

Objectives

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

1. Identify and explain codes governing welding and boilers.
2. Identify and explain weld imperfections and their causes.
3. Identify and explain nondestructive examination practices.
4. Identify and explain welder qualification tests.
5. Explain the importance of quality workmanship.
6. Identify common destructive testing methods.
7. Perform a visual inspection of fillet welds.

Performance Task

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

1. Perform a visual inspection of fillet welds.

Materials and Equipment

Markers/chalk
Pencils and paper
Whiteboard/chalkboard
Boilermaking Level Four
   PowerPoint® Presentation Slides
Multimedia projector and screen
Computer
Appropriate personal protective equipment
Filled out welding procedure and PQR
Samples of welds with discontinuities:
   Porosity discontinuities
   Inclusions
   Metal and base cracks
   Incomplete joint penetration
   Incomplete fusion
Appropriate welding specification and a sample of an undercut weld
Selection of acceptable and unacceptable fillet weld samples
Selection of welding gauges, welding specifications, and various kinds of welds
If possible, provide a magnetic particle yoke, magnetic powder, and a ferromagnetic part with a defective weld
If possible, provide a portable UT and monitor and several welds with appropriate discontinuities
Copy of Section IX of the ASME Boiler and Pressure Vessel Code
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 on boilers and with welding equipment. 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. 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 Quality Assurance. 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>Session I. Introduction; Codes Governing Welding; Governing Organizations’ Jurisdictions; Basic Elements of Welding Procedure Specifications</strong></td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Codes Governing Welding</td>
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<tr>
<td>1. American Society of Mechanical Engineers</td>
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<td>2. National Board of Boiler and Pressure Inspectors</td>
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<td>3. American Welding Society</td>
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<td>4. American Petroleum Institute</td>
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<td>5. American National Standards Institute</td>
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<td>6. Nuclear Regulatory Commission</td>
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<td>7. National Fire Protection Association</td>
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<tr>
<td>C. Governing Organizations’ Jurisdictions</td>
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<tr>
<td>D. Basic Elements of Welding Procedure Specifications</td>
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<tr>
<td>1. Welder Performance Qualification</td>
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<td>2. Welding Procedure Qualification</td>
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<td>3. Welder Operator Qualification</td>
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</tbody>
</table>
Session II. Weld Discontinuities and Their Causes

A. Weld Discontinuities and Their Causes
   1. Porosity
   2. Inclusions
   3. Cracks
   4. Incomplete Joint Penetration
   5. Incomplete Fusion
   6. Undercut
   7. Arc Strikes
   8. Spatter
   9. Acceptable and Unacceptable Weld Profiles

B. PT/Laboratory
   Have trainees perform a visual inspection of fillet welds. This laboratory corresponds to Performance Task 1.

Session III. Nondestructive Examination (NDE) Practices; Destructive Testing; Welder Performance Qualification Tests; Quality Workmanship

A. Nondestructive Examination (NDE) Practices
   1. Visual Inspection
   2. Liquid Penetrant Inspection
   3. Magnetic Particle Inspection
   4. Radiographic Inspection
   5. Ultrasonic Inspection
   6. Electromagnetic (Eddy Current) Inspection
   7. Leak Testing

B. Destructive Testing

C. Welder Performance Qualification Tests
   1. Welding Positions Qualification
   2. AWS Structural Steel Code
   3. ASME Code
   4. Welder Qualification Tests

D. Quality Workmanship
   1. Typical Site Organization
   2. Chain of Command

Session IV. 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 introduces the trainee to the materials and procedures involved in the maintenance of heat exchangers, and to the special safety precautions necessary when performing such work.

Objectives

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

1. Identify exchangers and components.
2. Explain how to pull an exchanger bundle.
3. Explain the inspections and the types of testing used with exchangers.
4. Explain how to replace a flange and a nozzle on an exchanger.

Performance Tasks

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

1. Identify exchangers and components.
2. Tear down, inspect, clean, and reassemble a heat exchanger.
3. Remove and replace a heat exchanger flange or nozzle.

Materials and Equipment

Markers/chalk
Pencils and paper
Whiteboard/chalkboard
Boilermaking Level Four
  PowerPoint® Presentation Slides
Multimedia projector and screen
Computer
Appropriate personal protective equipment
Examples of different types of heat exchangers
A collection of TEMA drawings of different types of shell-and-tube exchangers
Examples of new and used heat exchanger components
A collection of heat exchangers to be used for lab exercises
Samples of job safety analyses related to heat exchangers
Access to rigging, lifting, pulling, and transporting equipment for heat exchanger work

Samples of packing and sealing rings
Access to torquing tools (both manual and pneumatic)
Access to common mechanic’s hand tools
Access to heat exchanger tube-testing equipment
A supply of cleaning and drying materials
Containers for waste liquids generated from heat exchanger testing
Lights for inspecting exchanger interiors and exteriors
Access to tube-cutting and tube-rolling tools
Access to tube plugs
A supply of heat exchanger replacement tubing
A supply of heat exchanger nozzles and flanges
Access to welding machines suitable for heat exchanger tube welding
Access to different heat exchanger repair drawings
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 on pre-engineered systems and the dangers involved in erecting them. 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. 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 *Advanced Exchangers.* 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>Sessions I–III. Introduction; TEMA Standards; Identifying Exchangers/Condensers; Pulling and Installing Exchanger Bundles</strong></td>
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<tr>
<td>A. Introduction</td>
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<td>B. TEMA Standards</td>
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<tr>
<td>C. Identifying Exchangers/Condensers</td>
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<tr>
<td>1. Exchanger Types</td>
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<td>2. Exchanger Components</td>
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<tr>
<td>D. Pulling and Installing Exchanger Bundles</td>
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<tr>
<td>1. Preparations</td>
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<tr>
<td>2. Lifting and Pulling Equipment</td>
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<tr>
<td>E. PT/Laboratory</td>
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<tr>
<td>Have trainees identify exchangers and components. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Session IV. Swapping Out Heat Exchangers</strong></td>
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<td>A. Swapping Out Heat Exchangers</td>
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<tr>
<td>1. Preparing to Swap Out Heat Exchangers</td>
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<tr>
<td>2. Removal of Connecting Piping</td>
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<td>3. Dismounting Exchangers</td>
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<td>4. Transporting Exchangers</td>
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<td>5. Installing a Replacement Exchanger</td>
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<td>6. Reconnecting Exchanger Piping</td>
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<tr>
<td>7. Closing the Job</td>
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</tbody>
</table>
Sessions V–IX. Heat Exchanger Testing; Performing Repair Work on Exchangers/Condensers

A. Heat Exchanger Testing
   1. Positive Pressure Testing
   2. Vacuum Testing
   3. Hydro Testing

B. Performing Repair Work on Exchangers/Condensers
   1. Cleaning and Inspections
   2. Re-Rolling Tubes
   3. Installing Plugs
   4. Replacing Tubes
   5. PT/Laboratory
      Have trainees tear down, inspect, clean, and reassemble a heat exchanger.
      This laboratory corresponds to Performance Task 2.
   6. Replacing Nozzles/Flanges
   7. PT/Laboratory
      Have trainees remove and replace a heat exchanger flange or nozzle.
      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 introduces the trainee to the materials and procedures involved in the maintenance of distillation towers.

Objectives

Upon completion of this module, the trainee will be able to do the following:
1. Identify types of towers and their components.
2. Explain how to install structured packing and random packing.
3. Explain how to make field repairs to trays.
4. Explain how to remove a distributor for maintenance.

Performance Tasks

Under the supervision of the instructor, the trainee should be able to do the following:
1. Install and remove random packing.
2. Install and remove structured packing.
3. Make field repairs to distillation tower equipment.

Materials and Equipment

Multimedia projector and screen
Boilermaking Level Four
PowerPoint® Presentation Slides
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Access to PPE needed for distillation tower/column work
Access to different types of distillation towers (or tower simulators)
A collection of tower drawings showing component locations
A collection of tower drawings showing how to install tower and tray components
Examples of new and used distillation tower components

* 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 on distillation towers. Emphasize the importance of proper housekeeping.
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 Advanced Towers. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td>Session I. Introduction; Identifying Types of Towers and Their Components; Distillation Tower Packing</td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Identifying Types of Towers and Their Components</td>
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<tr>
<td>1. Distillation Process</td>
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<td>2. Tower Types</td>
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<td>3. Tower Components</td>
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<td>4. Tower Safety</td>
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<td>C. Distillation Tower Packing</td>
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<td>1. Heat Transfers</td>
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<td>2. Flow Changes</td>
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<td>3. Structured Packing</td>
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<td>4. Random Packing</td>
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<td>5. Safety When Handling Packing Materials</td>
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<tr>
<td>Sessions II and III. Hydraulic Torquing and Tensioning</td>
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<td>A. Hydraulic Torquing and Tensioning</td>
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<tr>
<td>1. Torquing and Tensioning Basics</td>
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<td>2. Torquing and Tensioning Devices</td>
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<td>3. Torquing and Tensioning Hazards</td>
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<td>4. Maintenance of Torquing and Tensioning Tools</td>
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<tr>
<td>Session IV. Tower Maintenance in General</td>
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<tr>
<td>A. Tower Maintenance in General</td>
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<tr>
<td>1. Manways</td>
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<td>2. Removing and Replacing Trays and Tray Manways</td>
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<td>3. Removing and Replacing Tray Weirs and Downcomers</td>
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<td>4. Removing and Replacing Tray Valves or Flappers</td>
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<td>5. Removing and Replacing Distributors</td>
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<td>6. Tower Cleaning</td>
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<tr>
<td>Sessions V–IX. PT/Laboratory</td>
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<tr>
<td>A. PT/Laboratory</td>
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<tr>
<td>1. Have trainees install and remove random packing. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>2. Have trainees install and remove structured packing. This laboratory corresponds to Performance Task 2.</td>
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<tr>
<td>3. Have trainees make field repairs to distillation tower equipment. This laboratory corresponds to Performance Task 3.</td>
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</tbody>
</table>
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

Today’s leaders face a complex and challenging workforce, and having a capable leader is essential to the success of any team. This module introduces the trainee to the principles of leadership. Trainees will learn about:

- The construction industry today
- Business organizations
- Team building
- Gender and minority issues
- Communication
- Motivation
- Problem solving
- Decision making
- Safety
- Project control

Prerequisites

There are no prerequisites for this course.

Objectives

Upon completion of this course, the trainee will be able to:

1. Discuss current issues and organizational structure in industry today.
2. Understand and incorporate leadership skills into work habits, including communications, motivation, team building, problem solving, and decision-making skills.
3. Demonstrate an awareness of safety issues, including the cost of accidents and safety regulations.
4. Identify a crew leader’s typical safety responsibilities.
5. Show a basic understanding of the planning process, scheduling, and cost and resource control.

Performance Tasks

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

1. Develop an estimate for a given work activity.
2. Develop and present a look-ahead schedule.

Industry Recognized Credentials

If you’re training through an NCCER-accredited sponsor you may be eligible for credentials from NCCER’s Registry. The ID number for this module is 46101-11. Note that this module may have been used in other NCCER curricula and may apply to other level completions. Contact NCCER’s Registry at 888.622.3720 or go to nccer.org for more information.
Because this module may be used for different industries, materials such as project schedules should be appropriate to the craft where possible.

**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.

**Additional Resources**

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

National Institute of Occupational Safety and Health (NIOSH), www.cdc.gov/niosh.
NCCER Publications:
• _Your Role in the Green Environment_
• _Sustainable Construction Supervisor_
Occupational Safety and Health Administration (OSHA), www.osha.gov.
_USA Today_, www.usatoday.com.

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**Materials and Equipment**

- Markers/chalk
- Pencils and scratch paper
- Whiteboard/chalkboard
- Multimedia projector and screen
- Computer
- Several construction job descriptions, including one that is very vague and one that is overly detailed
- Several MSDSs appropriate to the craft
- Original and as-built drawings of the same project
- A redline drawing
- Sufficient copies of a roofing formwork detail drawing
- Sufficient copies of the worksheet with entries

* Because this module may be used for different industries, materials such as project schedules should be appropriate to the craft where possible.

**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.

Examples of schedules:
- Bar chart
- Network schedule
- Short-term or look-ahead schedule
- Two or three typical job schedules
- Two job plans and pictures of each site
- Construction drawings of a work platform with a concrete footing, including specifications, to be built on site:
  - Materials cost list including lumber, concrete, and hardware
  - Labor cost list including concrete finishers, carpenters, and masonry workers
  - Photographs of the planned site
- Set of construction drawings
- Module Examinations**
- Performance Profile Sheets**
An outline for use in developing your lesson plan is presented below. This course is designed to be taught in one of two formats: two 8-hour sessions (such as all-day workshops) or eight 2-hour sessions (such as after-work training seminars). Because of this, each session below has a suggested time period of two hours. If leading 8-hour sessions, simply teach four of these 2-hour sessions both times your class meets. All instructors will need to adjust the time required for participant activities and testing based on 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>Session I. Section One – The Basics</strong></td>
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<tr>
<td>A. Industry Today</td>
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<td>1. The Need for Training</td>
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<td>2. Impact of Technology</td>
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<td>B. Gender and Cultural Issues</td>
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<td>1. Communication Styles of Men and Women</td>
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<td>2. Language Barriers</td>
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<td>3. Cultural Differences</td>
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<td>4. Sexual Harassment</td>
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<td>5. Gender and Minority Discrimination</td>
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<tr>
<td>C. Business Organizations</td>
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<tr>
<td>1. Division of Responsibility</td>
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<td>2. Authority, Responsibility, and Accountability</td>
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<td>3. Job Descriptions</td>
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<td>4. Policies and Procedures</td>
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<tr>
<td><strong>Session II. Section Two – Leadership Skills, Part One</strong></td>
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<tr>
<td>A. Introduction to Leadership</td>
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<td>B. The Shift in Work Activities</td>
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<td>C. Becoming a Leader</td>
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<tr>
<td>1. Characteristics of a Leader</td>
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<td>2. Functions of a Leader</td>
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<td>3. Leadership Styles</td>
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<td>4. Ethics in Leadership</td>
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<td>D. Communication</td>
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<td>1. Verbal Communication</td>
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<td>2. Nonverbal Communication</td>
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<td>3. Written or Visual Communication</td>
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<td>4. Communication Issues</td>
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<td>E. Motivation</td>
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<td>1. Employee Motivators</td>
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<td>2. Motivating Employees</td>
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<td>F. Team Building</td>
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<td>1. Successful Teams</td>
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<td>2. Building Successful Teams</td>
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Session III. Section Two – Leadership Skills, Part Two; Section Three – Safety, Part One

A. Getting the Job Done
   1. Delegating
   2. Implementing Policies and Procedures

B. Problem Solving and Decision Making
   1. Decision Making vs. Problems Solving
   2. Types of Decisions
   3. Problem Solving
   4. Special Leadership Problems

C. Safety Overview
   1. Accident Statistics

D. Costs of Accidents
   1. Insured Costs
   2. Uninsured Costs

E. Safety Regulations
   1. Workplace Inspections
   2. Penalties for Violations

Session IV. Section Three – Safety, Part Two

A. Employer Safety Responsibilities
   1. Safety Program

B. Crew Leader Involvement in Safety
   1. Safety Training Sessions
   2. Inspections
   3. First Aid
   4. Fire Protection and Prevention
   5. Substance Abuse
   6. Job-Related Accident Investigations

C. Promoting Safety
   1. Safety Training Sessions
   2. Safety Contests
   3. Incentives and Awards
   4. Publicity

Session V. Section Four – Project Control, Part One

A. Project Control Overview
   1. Development Phase
   2. Planning Phase
   3. Construction Phase

B. Project Delivery Systems
   1. General Contracting
   2. Design-Build
   3. Construction Management

C. Cost Estimating and Budgeting
   1. The Estimating Process

D. PT/Laboratory
   Have the trainees develop an estimate for the work activity. This laboratory corresponds to Performance Task 1.
Session VI. Section Four – Project Control, Part Two

A. Planning  
   1. Why Plan?  
   2. Stages of Planning  

B. PT/Laboratory  
   Have the trainees develop and present a look-ahead schedule based on one of the plans. This laboratory corresponds to Performance Task 2.  

C. The Planning Process  
   1. Establish a Goal  
   2. Identify the Work to Be Done  
   3. Identify Tasks to Be Performed  
   4. Communicating Responsibilities  
   5. Follow-Up Activities  

D. Planning Resources  
   1. Safety Planning  
   2. Materials Planning  
   3. Site Planning  
   4. Equipment Planning  
   5. Tool Planning  
   6. Labor Planning  

Session VII. Section Four – Project Control, Part Three

A. Scheduling  
   1. The Scheduling Process  
   2. Bar Chart Schedule  
   3. Network Schedule  
   4. Short-Term Scheduling  
   5. Updating a Schedule  

B. Cost Control  
   1. Assessing Cost Performance  
   2. Field Reporting System  
   3. Crew Leader's Role in Cost Control  

C. Resource Control  
   1. Materials Control  
   2. Equipment Control  
   3. Tool Control  
   4. Labor Control  

D. Production and Productivity  

Session VIII. Review and Testing

A. Module 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. Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER.  
   2. Record the training results on Training Report Form 200, and submit the results to the Training Program Sponsor.