

MODULE OVERVIEW

This module describes the use and inspection of the basic equipment and hardware used in rigging, including slings, wire ropes, chains, and attaching hardware. It also explains sling angles and describes the use of tuggers, jacks, hoists, and come-alongs.

PREREQUISITES

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

OBJECTIVES

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

1. Identify and describe the uses of common rigging hardware and equipment.
2. Perform a safety inspection on hooks, slings, and other rigging equipment.
3. Describe common slings and determine sling capacities and angles.
4. Select, inspect, use, and maintain special rigging equipment, including:
 - Simple block and tackle
 - Chain hoists
 - Come-alongs
 - Jacks
 - Tuggers
5. Inspect heavy rigging hardware.
6. Tie knots used in rigging.

PERFORMANCE TASKS

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

1. Perform a safety inspection on hooks, slings, and other rigging equipment.
2. Select, inspect, use, and maintain special rigging equipment, including:
 - Block and tackle
 - Chain hoists
 - Come-alongs
 - Jacks
 - Tuggers
3. Tie knots used in rigging.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Various rigging hooks with wear, cracks, and corrosion
Transparencies	Manufacturer's literature on shackles
Blank acetate sheets	Various types of shackles
Transparency pens	Various eyebolts
Whiteboard/chalkboard	Various lifting lugs
Markers/chalk	Turnbuckles
Pencils and scratch paper	Manufacturer's literature on plate clamps
Appropriate personal protective equipment	Various rigging plates and links
Manufacturer's literature on different rigging hooks	Various types of slings

Rigging pocket guide
*29 CFR Section 1926.251, Rigging Equipment for
Material Handling*
Samples of wire rope that have failed inspection
Rope for tying knots
Block and tackle lifting system
Sample loads for lifting
Spur-gearred chain hoist
Electric chain hoist

Ratchet-lever hoist or come-along
Ratchet jack
Screw jack
Hydraulic jack
Tugger
Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in the back of this module

**Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to use various types of hoists, jacks, and tuggers. Ensure that all trainees are briefed on lifting safely and any other shop safety procedures. 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 work is suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task training.

Occupational Safety and Health Standards for the Construction Industry, 29 CFR Part 1926. Washington, DC: OSHA Department of Labor, U.S. Government Printing Office.

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

Topic	Planned Time
Session I. Introduction and Rigging Hardware	
A. Introduction	_____
B. Rigging Hardware	_____
Session II. Slings and Tag Lines	
A. Slings	
B. Laboratory – Trainees practice performing a safety inspection on hooks, slings, and other rigging equipment. This laboratory corresponds to Performance Task 1.	_____
C. Tag lines	_____
D. Laboratory – Trainees practice tying knots used in rigging. This laboratory corresponds to Performance Task 3.	_____
Session III. Block and Tackle and Hoists	
A. Block and Tackle	_____
B. Chain Hoists	_____
C. Ratchet-Lever Hoists and Come-Alongs	_____
D. Jacks	_____
E. Tuggers	_____
F. Laboratory – Trainees practice selecting, inspecting, and using special rigging equipment. This laboratory corresponds to Performance Task 2.	_____

Session IV. Review, Module Examination, and Performance Testing

A. Module Review

B. Module Examination

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

C. Performance Testing

1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

Annotated Instructor's Guide**MODULE OVERVIEW**

This module describes basic rigging and crane hazards and related safety procedures, provides an overview of personnel lift lifting and lift planning, and introduces load charts and load balancing. It includes instructions for rigging and lifting pipe.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Module 08301-07.*

OBJECTIVES

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

1. Identify and use the correct hand signals to guide a crane operator.
2. Identify basic rigging and crane safety procedures and determine the center of gravity of a load.
3. Identify the pinch points of a crane and explain how to avoid them.
4. Identify site and environmental hazards associated with rigging.
5. Properly attach rigging hardware for routine lifts and pipe lifts.
6. Identify the components of a lift plan.

PERFORMANCE TASKS

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

1. Determine the center of gravity of a load.
2. Properly attach rigging hardware for routine lifts.
3. Use and interpret hand signals.
4. Determine sling tension.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	29 CFR 1926.550
Transparencies	Completed lift plan
Blank acetate sheets	Crane manufacturer's literature
Transparency pens	Typical teeter-totter and weights
Whiteboard/chalkboard	Various lifting eyebolts
Markers/chalk	Rigging hardware
Pencils and scratch paper	Quick Quiz*
Appropriate personal protective equipment	Module Examinations**
Walkie-talkies	Performance Profile Sheets**
Throat microphone	
Hardwired communication system	
<i>ASME B30.5 Consensus Standard</i>	

* Located in the back of this module

** Located in the Test Booklet.

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 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.

Crane Safety on Construction Sites, 1998. Task Committee on Crane Safety on Construction Sites. Reston, VA: ASCE.

Rigging Handbook, 2003. Jerry A. Klinke. Stevensville, MI: ACRA Enterprises, Inc.

TEACHING TIME FOR THIS MODULE

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

Topic	Planned Time
Session I. Introduction, Communication, and Safety	
A. Introduction	_____
B. Methods of Communication	_____
C. Laboratory – Trainees practice using and interpreting hand signals. This laboratory corresponds to Performance Task 3.	_____
D. General Rigging Safety	_____
E. Working Around Power Lines	_____
F. Site Safety	_____
G. Emergency Response	_____
Session II. Lifting Loads	
A. Using Cranes to Lift Personnel	_____
B. Lift Planning	_____
C. Crane Load Charts	_____
D. Center of Gravity	_____
E. Laboratory – Trainees practice determining the center of gravity of a load. This laboratory corresponds to Performance Task 1.	_____
F. Sling Tension	_____
G. Laboratory – Trainees practice performing sling tension calculations. This laboratory corresponds to Performance Task 4.	_____
Session III. Rigging and Unloading	
A. Rigging Pipe	_____
B. Rigging Valves	_____
C. Guidelines for Unloading and Yarding Materials	_____
D. Laboratory – Trainees practice properly attaching rigging hardware for routine lifts. This laboratory corresponds to Performance Task 2.	_____

Session IV. Review, Module Examination, and Performance 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 explains how to read and interpret pipefitting standards, codes, and specifications. It describes how to identify pipe and components according to specifications.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three*, Modules 08301-07 and 08302-07.

OBJECTIVES

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

1. Understand and interpret pipefitting standards and codes.
2. Read and interpret pipefitting specifications.
3. Identify pipe and components according to specifications.

PERFORMANCE TASKS

This is a knowledge-based module. There are no Performance Tasks.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	<i>ASME Boiler and Pressure Vessel Code</i>
Transparencies	<i>ANSI/ASME Code for Pressure Piping B31</i>
Blank acetate sheets	<i>AWS Structural Welding Code D1.1</i>
Transparency pens	Change order
Whiteboard/chalkboard	Sample weld
Markers/chalk	Samples of pipe with ASTM identification numbers
Pencils and scratch paper	Marked valves
Appropriate personal protective equipment	Sets of blueprints with corresponding numbered valves
Specification books	Module Examinations*
Blueprints	
Sample codes and standards	

* Located in the Test Booklet.

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 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.

American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018, (212) 642-4900

The American Society of Mechanical Engineers (ASME), 345 East 47th Street, New York, NY 10017, (212) 705-7000.

Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS), 127 Park Street N.E., Vienna, VA 22180, (703) 281-6613.

National Institute of Standards and Technology (NIST), US Department of Commerce, Gaithersburg, MD, (301) 975-2000.

Spring Manufacturers Institute, Inc. (SMI), 380 West Palatine Road, Wheeling, IL 60090, (847) 520-3290.

Underwriters Laboratories (UL), 333 Pfingsten Road, Northbrook, IL 60062, (847)272-8800.

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 7½ hours are suggested to cover *Standards and Specifications*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

Topic	Planned Time
Session I. Introduction, Standards, Codes, and Sponsors	
A. Introduction	_____
B. Standards and Codes	_____
C. Sponsors	_____
D. Code Changes	_____
E. Commonly Used Codes	_____
Session II. Specifications	
A. Information Required	_____
B. Change Orders	_____
C. Welding Procedure Specifications	_____
Session III. Identification of Pipe and Components, RFIs, Review, and Testing	
A. Identification of Pipe and Components	_____
B. RFIs	_____
C. Review	_____
D. 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.	

MODULE OVERVIEW

This module discusses the use of equivalent and conversion tables and explains how to use right angle trigonometry to calculate takeouts.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Modules 08301-07 through 08303-07.*

OBJECTIVES

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

1. Use tables of equivalents.
2. Perform right angle trigonometry.
3. Calculate takeouts using trigonometry.

PERFORMANCE TASKS

This is a knowledge-based module. There are no Performance Tasks.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk

Pencils and scratch paper
Scientific calculators
The Pipe Fitters Blue Book
Quick Quiz*
Module Examinations**

* Located in the back of this module

** Located in the Test Booklet.

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 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.

Pipe Fitter's Math Guide, 1989. Johnny Hamilton. Clinton, NC: Construction Trade Press.

Applied Construction Math, Latest Edition. Upper Saddle River, NJ: Prentice Hall Publishing.

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 Trade Math*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

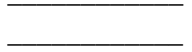
Topic	Planned Time
Session I. Introduction, Table of Equivalents, and Unit Conversions	
A. Introduction	_____
B. Table of Equivalents	_____
C. Laboratory – Trainees practice using the Table of Equivalents.	_____
D. Unit Conversions	_____
E. Laboratory – Trainees practice converting units.	_____
Session II. Trigonometry I	
A. Pythagorean Theorem	_____
B. Trigonometric Functions	_____
C. Sine	_____
D. Laboratory – Trainees practice using sine to solve right triangles.	_____
Sessions III and IV. Trigonometry II	
A. Cosine	_____
B. Tangent	_____
C. Laboratory – Trainees practice using cosine and tangent to solve right triangle problems.	_____
Sessions V and VI. Trigonometry III	
A. Triangle Calculation	_____
B. Converting to Angles	_____
C. Obtuse Triangles	_____
D. Determining Angles When Side Lengths Are Known	_____
E. Interpolation	_____
Sessions VII. Take-Outs	
A. Calculating Takeouts Using Trigonometry	_____
B. Takeouts	_____
C. Odd Angles	_____
D. Interpolation	_____

Session VIII. Review and Module Examination

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.



MODULE OVERVIEW

This module covers the applications and safety requirements of drain cleaners, manlifts, and cable lifts.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Modules 08301-07 through 08304-07.*

OBJECTIVES

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

1. Identify and explain types of manlifts.
2. Explain manlift safety rules and hazards.
3. Inspect scissors-type manlifts and telescoping boom manlifts.
4. Explain the use of cable lifts
5. Identify and explain the use of drain cleaners.

PERFORMANCE TASKS

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

1. Describe an aerial lift inspection.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Manlift

Manlift operator's manual

Cable lift

Cable lift operator's manual

Hydraulic torque wrenches

Hydraulic torque wrench operator's manual

Drain cleaners

Drain cleaner operator's manual

Assorted drain cleaner end tools

Quick Quiz*

Module Examinations**

Performance Profile Sheets**

*Located in the back of this module

**Located in the Test Booklet.

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. This module may require trainees to inspect and operate manlifts. Ensure all trainees are briefed on all safety precautions.

ADDITIONAL RESOURCES

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

Scaffolding, Latest Edition. Upper Saddle River, NJ: Prentice Hall Publishing.

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 *Motorized Equipment II*. 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 and II. Manlifts	
A. Introduction	_____
B. Manlift Safety	_____
C. Inspecting Manlifts	_____
D. Laboratory – Trainees practice describing an aerial lift inspection. This laboratory corresponds to Performance Task 1.	_____
Session III. Other Types of Motorized Equipment	
A. Cable Lift Setup	_____
B. Cable Lift Safety	_____
C. Hydraulic Torque Wrenches	_____
D. Drain Cleaners	_____
Session IV. Review, Module Examination, and Performance 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 identifies the types of pipe, flanges, gaskets, and bolts used in aboveground pipe installation. It also includes step-by-step procedures for installing pipe sleeves and floor penetrations.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Modules 08301-07 through 08305-07.*

OBJECTIVES

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

1. Store pipe and materials.
2. Identify types of flanges.
3. Identify types of gaskets used with flanges.
4. Lay out and cut gaskets.
5. Explain the location of flange bolt holes.
6. Install pipe with flanged connections.
7. Lay out and install pipe sleeves and floor penetrations.
8. Read and interpret spool sheets.
9. Explain how to erect spools in a piping system.

PERFORMANCE TASKS

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

1. Identify the following types of flanges:
 - Weld neck
 - Slip-on
 - Blind
 - Socket weld
 - Threaded
 - Lap-joint
 - Cast iron
2. Identify types of gaskets.
3. Identify types of flange bolts.
4. Install flanged piping systems.
5. Lay out floor penetrations.
6. Read spool sheets.
7. Lay out and fabricate a gasket.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Assorted flange bolts and nuts
Blind flanges
Bluing ink
Cast iron flanges
Cord gaskets
Drift pins
Dividers
Expanded PTFE gaskets
Flanged pipe
Flat-faced pipes
Flat ring gaskets
Full-face gaskets
Lap-joint gaskets
Various types of gasket materials
Levels
Male and female flanges
Metal ring gaskets
Pipe jacks and vises
Raised-face gaskets
Ring joint type flanges
Slip-on flanges
Slip-on reducing flanges
Soapstones
Socket weld flanges
Squares
Stub ends
Teflon[®] gaskets
Threaded flanges
Tin snips
Tongue and groove flanges
Torque wrenches
Weld neck flanges
Isometric drawings
Spool sheets
Scissors
Solvent for cleaning gaskets
Solvents for cleaning machine flats
Straightedge
Manufacturer's color coding chart for gaskets
Utility knife
Torque wrench
Pipe sleeves
Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in the back of this module

**Located in the Test Booklet.

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. This module requires trainees to fabricate gaskets. Ensure all trainees are briefed on hand tool safety, chemical handling, and shop safety procedures.

ADDITIONAL RESOURCES

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

Pipeline Mechanical. National Center for Construction Education and Research. Upper Saddle River, NJ: Prentice Hall Publishing.

The most famous aboveground pipeline has a website at <http://www.alyeska-pipe.com/default.asp>.

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 *Introduction to Aboveground Pipe Installation*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Flanges	
A. Introduction	_____
B. Storing Pipe and Materials	_____
C. Flanged Piping Systems	_____
D. Laboratory – Trainees practice identifying flanges. This laboratory corresponds to Performance Task 1.	_____
Session II. Gaskets I	
A. Gasket Materials	_____
B. Types of Flange Gaskets	_____
C. Laboratory – Trainees practice identifying gaskets. This laboratory corresponds to Performance Task 2.	_____
Sessions III and IV. Gaskets II	
A. Fabricating Gaskets	_____
B. Laboratory – Trainees practice laying out and fabricating a gasket. This laboratory corresponds to Performance Task 7.	_____
Session V. Pipe Flanges	
A. Installing Pipe Flanges	_____
B. Cleaning Parts	_____
C. Aligning Parts	_____
D. Installing Gaskets	_____
E. Tightening Flange Bolts	_____
D. Laboratory – Trainees practice identifying flange bolts. This laboratory corresponds to Performance Task 3.	_____
F. Grooved Pipe and Fittings	_____
G. Laboratory – Trainees practice installing a flanged piping system. This laboratory corresponds to Performance Task 4.	_____

Session VI. Sleeves and Floor Penetrations

- A. Laying Out Sleeves and Floor Penetrations _____
- B. Installing Sleeves and Floor Penetrations _____
- C. Laboratory – Trainees practice laying out floor penetrations. This laboratory corresponds to Performance Task 5. _____

Session VII. Spool Sheets

- A. Reading and Interpreting Spool Sheets _____
- B. Erecting Spools _____
- C. Laboratory – Trainees practice reading spool sheets. This laboratory corresponds to Performance Task 6. _____

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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- C. Performance Testing _____
 - 1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
 - 2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module explains how to secure the work area and determine field run specifications, load weights for erection equipment, and support needs. It also covers how to erect vessel trim.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Modules 08301-07 through 08306-07.*

OBJECTIVES

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

1. Secure the work area.
2. Determine field run specifications.
3. Determine the required rigging equipment based on weight, location, and configuration.
4. Determine the load weight for erection equipment.
5. Determine support needs.
6. Select and install erection materials.
7. Fabricate the field run of pipe.
8. Erect vessel trim.

PERFORMANCE TASKS

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

1. Determine spool specifications for field-routing activities.
2. Determine the load weight for erection equipment.
3. Install test blinds.
4. Install temporary hydrotest spools.
5. Identify vessel trim.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Grinders
Transparencies	Level controllers
Blank acetate sheets	Levels
Transparency pens	Pipe jacks and vises
Whiteboard/chalkboard	Pipe joint compound
Markers/chalk	Pipe wrenches
Pencils and scratch paper	Plumb bobs
Appropriate personal protective equipment	Rigging equipment
Assorted flange bolts and nuts	Soapstones
Assorted lengths of piping	Socket weld fittings
Butt weld pipe fittings	Spool sheets
Flange spreaders	Squares
Framing squares	Teflon [®] tape
Gaskets	Tape measures

Temporary hydrotest spools

Test blinds

Thread cutting oil

Threaded fittings

Threading machines

Vessel trim components

 Vents

 Drains

* Located in the back of this module

** Located in the Test Booklet.

Pressure-relief valves

Instruments

Welding rods

Wrenches

Quick Quiz*

Module Examinations**

Performance Profile Sheets**

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. This module requires trainees to work with flanged pipe. Ensure all trainees are briefed on hand tool safety and shop safety procedures.

ADDITIONAL RESOURCES

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

Parker instrumentation has literature on pipe and vessel instrumentation at <http://www.parker.com/ead/cm2.asp?cmid=177>

Instrumentation. National Center for Construction Education and Research. Upper Saddle River, NJ: Prentice Hall Publishing.

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 *Field Routing and Vessel Trim*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction and Preparation	
A. Introduction	_____
B. Securing the Work Area	_____
C. Determining Field Run Specifications	_____
D. Laboratory – Trainees practice determining spool specifications for field-routing activities. This laboratory corresponds to Performance Task 1.	_____
E. Determining Load Weight	_____
F. Laboratory – Trainees practice determining the load weight for erection equipment. This laboratory corresponds to Performance Task 2.	_____
Session II. Erection Materials and Test Blinds	
A. Selecting and Installing Erection Materials	_____
B. Fabricating the Field Run	_____
C. Transporting and Erecting Piping	_____
D. Installing Test Blinds	_____
E. Laboratory – Trainees practice installing test blinds. This laboratory corresponds to Performance Task 3.	_____
F. Installing Temporary Hydrotest Spools	_____
G. Laboratory – Trainees practice installing temporary hydrotest spools. This laboratory corresponds to Performance Task 4.	_____

Session III. Vessel Trim

- A. Vents _____
- B. Drains _____
- C. Valves to Relieve Pressure _____
- D. Instruments _____
- E. Erecting Vessel Trim _____
- F. Laboratory – Trainees practice identifying vessel trim. This laboratory corresponds to Performance Task 5. _____

Session IV. Review, Module Examination, and Performance 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 explains how to identify, select, and install pipe hangers and supports, including spring can supports.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Modules 08301-07 through 08307-07.*

OBJECTIVES

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

1. Identify types of pipe hangers and supports.
2. Identify and interpret pipe support drawings and symbols.
3. Determine field placement of hangers.
4. Identify and install concrete fasteners.
5. Fabricate angle iron brackets to support pipe.
6. Identify and explain the types of spring can supports.
7. Identify and explain the types of variable spring can supports.
8. Identify and explain the types of constant spring can supports.
9. Explain the storing and handling procedures for spring can supports.
10. Explain how to install spring can supports.
11. Maintain spring can supports.

PERFORMANCE TASKS

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

1. Identify types of pipe hangers.
2. Identify types of connecting units and attachments.
3. Identify types of pipe supports.
4. Read and interpret pipe support drawings and symbols.
5. Install nonexpanding concrete fasteners.
6. Install expanding concrete fasteners.
7. Install toggle bolts.
8. Lay out and mark the cut lines required to fabricate a one-piece 45-degree angle iron bracket.
9. Lay out and mark the cut lines required to fabricate a one-piece 30- by 60-degree angle iron bracket.
10. Identify spring can support types.
11. Read and interpret spring can support detail sheets.
12. Install spring can supports.
13. Remove the travel stops from a spring can support.
14. Adjust a spring can support to the cold position.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Various pipe hangers
 Adjustable rings
 Adjustable clevis
 Double-bolt pipe clamps
 Trapeze hangers
 Job-fabricated pipe hangers
Manufacturer's literature on load ratings for pipe hangers and supports
Various pipe hanger connecting units
 Eyebolts
 Turnbuckles
 Threaded rods
 Rod attachments
 Beam clamps
 C-clamps
 Welded beam attachments
Various pipe supports
 U-bolts
 Pipe roll supports
 Pipe saddles
 Extension riser clamps
 Wall support clamps
 Job-fabricated supports
 Piping drawings
Detail sheets
Concrete inserts
Expanding concrete fasteners
Adhesive anchors
Nonexpanding concrete fasteners

Washers
Nuts
Toggle bolts
Templates
½ inch hammer drill
¼-inch drill motor
Extension cords
Grout
Adjustable wrenches
Masonry drill bits
Standard drill bits
Torpedo level
Soapstones
Measuring tapes
Screwdrivers
Angle irons
Cutting torch
Hacksaws
Grinder and accessories
Variable spring can supports
Constant spring can supports
Detail sheets for spring can supports
Rigging devices
Ladders or scaffolding
Erection materials
 Double bolt pipe clamps
 Hex nuts
 Thread rods
 Welded beam attachments
 Weldless eye nuts
Snubbers
Sway braces
Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in the back of this module.

** Located in the Test Booklet.

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. This module requires trainees to work with pipe hangers and supports. Ensure all trainees are briefed on hand tool safety and shop safety procedures. This module requires trainees to work with cutting torches. Ensure all trainees are briefed on torch safety and shop fire safety procedures.

ADDITIONAL RESOURCES

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

Cooper B-Line provides information on pipe supports at <http://www.cooperbline.com/product/PDFLibrary/PipeHangers/index.com>

Anvil International provides information on mechanical supports and hangers at http://www.anvilintl.com/ps_hangers/afs/15060_10032214_01_SD_13656.pdf

NIBCO provides information on hangers, including Tolco products, at <http://www.nibco.com/cms>

Piping Technology and Products provides information on spring cans, hangers, and supports at http://www.pipingtech.com/product/pipe_supports.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 25 hours are suggested to cover *Pipe Hangers and Supports*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Introduction to Pipe Hangers and Supports	
A. Introduction	_____
B. Types of Pipe Hangers	_____
C. Laboratory – Trainees practice identifying types of pipe hangers. This laboratory corresponds to Performance Task 1.	_____
D. Hanger Connecting Units and Attachments	_____
E. Laboratory – Trainees practice identifying types of connecting units and attachments. This laboratory corresponds to Performance Task 2.	_____
F. Pipe Supports	_____
G. Laboratory – Trainees practice identifying types of pipe supports. This laboratory corresponds to Performance Task 3.	_____
Session II. Pipe Support Drawings and Symbols	
A. Pipe Support Drawings and Symbols	_____
B. Laboratory – Trainees practice reading and interpreting pipe support drawings and symbols. This laboratory corresponds to Performance Task 4.	_____
C. Field Placement of Hangers	_____

Sessions III and IV. Concrete Fasteners

- A. Concrete Inserts _____
- B. Nonexpanding Concrete Fasteners _____
- C. Laboratory – Trainees practice installing nonexpanding concrete fasteners. This laboratory corresponds to Performance Task 5. _____
- D. Adhesive Anchors _____
- E. Expanding Concrete Fasteners _____
- F. Laboratory – Trainees practice installing expanding concrete fasteners. This laboratory corresponds to Performance Task 6. _____
- G. Toggle Bolts _____
- H. Laboratory – Trainees practice installing toggle bolts. This laboratory corresponds to Performance Task 7. _____

Session V and VI. Fabricating Brackets

- A. Fabricating 45-Degree Angle Iron Brackets _____
- B. Laboratory – Trainees practice fabricating angle iron. This laboratory corresponds to Performance Tasks 8 and 9. _____

Sessions VII. Identifying Spring Can Supports

- A. Variable Spring Can Supports _____
- B. Constant Spring Can Supports _____
- C. Laboratory – Trainees practice identifying spring can support types. This laboratory corresponds to Performance Task 10. _____
- D. Storing and Handling Procedures _____

Sessions VIII and IX. Installing Spring Can Supports

- A. Identifying Allocation of Supports _____
- B. Laboratory – Trainees practice reading and interpreting spring can support detail sheets. This laboratory corresponds to Performance Task 11. _____
- C. Installing Spring Can Supports _____
- D. Laboratory – Trainees practice installing spring can supports. This laboratory corresponds to Performance Task 12. _____
- E. Removing Travel Stops _____
- F. Laboratory – Trainees practice removing the travel stops from a spring can support. This laboratory corresponds to Performance Task 13. _____
- G. Adjusting Spring Can Supports _____
- H. Laboratory – Trainees practice adjusting a spring can support to the cold position. This laboratory corresponds to Performance Task 14. _____
- I. Maintaining Variable Spring Can Supports _____
- J. Replacing Variable Spring Can Supports _____

Session X. Review, Module Examination, and Performance 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 explains how to perform pretests, service tests, head pressure tests, hydrostatic tests, and steam blow tests.

PREREQUISITES

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following: *Core Curriculum; Pipefitting Level One; Pipefitting Level Two; and Pipefitting Level Three, Modules 08301-07 through 08308-07.*

OBJECTIVES

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

1. Perform pretest requirements.
2. Perform service and flow tests.
3. Perform head pressure tests.
4. Perform hydrostatic tests.
5. Explain how to perform steam blow tests.
6. Explain nondestructive examinations (NDE).

PERFORMANCE TASKS

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

1. Identify the details about a piping system that you can obtain from a piping drawing.
2. Perform a pretest field inspection, using a punchlist.
3. Perform a service test, and check for leaks.
4. Perform a flow test, and check for leaks.
5. Install pneumatic test plugs in a pipeline.
6. Install mechanical test plugs in a pipeline.
7. Perform a head pressure test, and check for leaks.
8. Install a slip blind in a system.
9. Prepare a system for a hydrostatic test.
10. Explain how to perform a hydrostatic test on a piping system or spool.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Hydrostatic test pump
Transparencies	Mechanical test plugs
Blank acetate sheets	Pipe vise
Transparency pens	Piping system or spool to be tested
Whiteboard/chalkboard	Pneumatic test plugs
Markers/chalk	Scaffolding (optional)
Pencils and scratch paper	Slip blinds
Appropriate personal protective equipment	Test plugs
Samples of welds with and without discontinuities	Test tree
Samples of cracked welds	Sample test report
Samples of incomplete joint penetration	Teflon [®] tape
Samples of incomplete fusion	Borescopes

Undercut gauges
Butt weld reinforcement gauges
Liquid penetrant inspection materials
X-ray films of welds
Piping drawings
Pressure gauges
Bleeder valves
Magnetic particle testers

Ultrasonic testers
Holiday testers
Pigs
Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in the back of this module

**Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to test piping systems under pressure. Ensure that all trainees are briefed on safety procedures.

ADDITIONAL RESOURCES

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

The United Kingdom's largest testing and calibrations laboratory for pipe fittings and materials has a website at http://www.wrcnsf.com/plastic_pipe.htm

Pipeline Maintenance. National Center for Construction Education and Research. Upper Saddle River, NJ: Prentice Hall.

Ashtead Technology Rentals describes many types of testing equipment at <http://www.Ashtead-technology.com/?kc=qwRVB>.

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 *Testing Piping Systems and Equipment*. 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 and II. Introduction and Pretest Requirements	
A. Introduction	_____
B. Performing Visual Inspections	_____
C. Nondestructive Examination and Evaluation	_____
D. Identifying Test Boundaries	_____
E. Laboratory – Trainees practice identifying the details about a piping system from a piping drawing. This laboratory corresponds to Performance Task 1.	_____
F. Installing Pressure Gauges	_____
G. Preparing a System for Testing	_____
H. Laboratory – Trainees practice performing a pretest field inspection. This laboratory corresponds to Performance Task 2.	_____
I. Cleaning the System	_____
Session III. Service and Flow Tests	
A. Performing a Service Test	_____
B. Laboratory – Trainees practice performing a service test. This laboratory corresponds to Performance Task 3.	_____
C. Performing a Flow Test	_____
D. Laboratory – Trainees practice performing a flow test. This laboratory corresponds to Performance Task 4.	_____

Session IV. Head Pressure Tests

- A. Head Pressure Testing _____
- B. Pneumatic Test Plugs _____
- C. Laboratory – Trainees practice installing pneumatic test plugs. This laboratory corresponds to Performance Task 5. _____
- D. Mechanical Test Plugs _____
- E. Laboratory – Trainees practice installing mechanical test plugs. This laboratory corresponds to Performance Task 6. _____
- F. Performing Head Pressure Test _____
- G. Laboratory – Trainees practice performing a head pressure test. This laboratory corresponds to Performance Task 7. _____

Sessions V and VI. Hydrostatic Testing

- A. Pretest Requirements _____
- B. Preparing the Pump _____
- C. Laboratory – Trainees practice preparing a system for a hydrostatic test. This laboratory corresponds to Performance Task 9. _____
- D. Sealing the System _____
- E. Laboratory – Trainees practice installing a slip blind. This laboratory corresponds to Performance Task 8. _____
- F. Performing Hydrostatic Testing _____
- G. Laboratory – Trainees practice performing a hydrostatic test. This laboratory corresponds to Performance Task 10. _____

Session VII. Pneumatic, Equipment, and Steam Blow Testing

- A. Pneumatic Testing _____
- B. Equipment Testing _____
- C. Steam Blow Testing _____

Session VIII. Review, Module Examination, and Performance 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.