Pipefitting Level Three

Course Planning Tools
Module Six (00106) identifies different types of rigging slings and hardware and describes how those items are used. It explains how to properly inspect slings and hardware items. It also examines different types of hoists used in rigging, and it describes common rigging hitches and how to make the Emergency Stop hand signal. Note that no level of certification or competency is awarded to trainees after completing this module; the content is designed strictly for familiarization.

NOTE: This module is an elective.
It is not required for successful completion of the Core Curriculum.

Objectives

Learning Objective 1
- Identify and describe various types of rigging slings, hardware, and equipment.
  a. Identify and describe various types of slings.
  b. Describe how to inspect various types of slings.
  c. Identify and describe how to inspect common rigging hardware.
  d. Identify and describe various types of hoists.
  e. Identify and describe basic rigging hitches and the related Emergency Stop hand signal.

Performance Tasks

Performance Task 1
(Learning Objective 1)
- Demonstrate the proper ASME Emergency Stop hand signal.

Teaching Time: 7.5 hours
(Three 2.5-Hour Classroom Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites
Core Curriculum

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the written examinations and performance profile sheets from www.nccerirc.com. The passing score for submission into NCCER’s Registry is 70% or above for the written examination; performance testing is graded pass or fail.
**Safety Considerations**
This module requires that trainees handle common types of rigging equipment. Included in this equipment are synthetic, alloy steel chain, and wire rope slings; rigging hardware, such as shackles, eyebolts, lifting clamps, and hooks; and different types of hoists. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to the hazards associated with rigging equipment and activities.

**Classroom Equipment and Materials**
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- *Core Curriculum PowerPoint® Presentations*
- DVD player
- LCD projector and screen
- Computer
- Internet access during class *(optional)*
- Copies of the Module Examination and Performance Profile Sheets

**Equipment and Materials for Laboratories and Performance Testing**
- Appropriate PPE:
  - Safety glasses
  - Work gloves
  - Damaged synthetic slings
  - Damaged alloy steel chain slings
  - Damaged wire rope slings
  - Several types of shackles, some of which are damaged
  - Several types of eyebolts, some of which are damaged
  - Several types of lifting clamps, some of which are damaged
  - Several types of hooks, some of which are damaged

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


There are a number of on-line resources available for trainees who would like more information on safety practices, guidelines, and requirements related to rigging. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
The Lesson Plan for this module is divided into three 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**

Session One introduces slings used in rigging and the types of defects to look for during their inspection prior to each use. Common criteria used to determine if a sling is safe for use are presented.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to build interest in the topic of rigging.
3. Describe common types of synthetic, alloy steel chain, and wire rope slings.
4. Explain how to properly inspect all types of slings. Identify and discuss common defects that require each type of sling to be removed from service.

**SESSION TWO**

Session Two presents common types of rigging hardware used for connecting a load to a lifting device. Various types of hoists and rigging hitches are introduced. Trainees also learn the Emergency Stop hand signal.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to identify factors related to rigging hardware that contribute to death, injuries, and equipment damage.
3. Identify and discuss various types of shackles, eyebolts, lifting clamps, and hooks.
4. Explain how to inspect rigging hardware.
5. Identify and describe common types of hoist mechanisms.
6. Examine common hitch configurations used.
7. Demonstrate how to perform the ASME Emergency Stop hand signal.

**SESSION THREE**

Session Three is a review and testing session. Have trainees complete the Module Review and Trade Terms Quiz. Go over the Module Review and Trade Terms Quiz in class prior to the exam and answer any questions that the trainees may have.

1. Trainees practice and/or complete the tasks associated with Performance Task 1.
2. Have trainees complete the written examination. Any outstanding performance testing must be completed during this session as well.
3. Record the testing results on the Registration of Training Modules Form, and submit the report to your Training Program Sponsor.
## Materials Checklist for Module 00106-15, Introduction to Basic Rigging

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td></td>
</tr>
<tr>
<td>Safety glasses</td>
<td>Damaged synthetic slings</td>
</tr>
<tr>
<td>Work gloves</td>
<td>Damaged wire rope slings</td>
</tr>
<tr>
<td>Safety glasses</td>
<td>Damaged alloy steel chain strips</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td></td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Several types of hooks, some of which are damaged</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td></td>
</tr>
<tr>
<td>DVD player</td>
<td>Several types of eyebolts, some of which are damaged</td>
</tr>
<tr>
<td>LCD projector and screen</td>
<td></td>
</tr>
<tr>
<td>Internet access during class (optional)</td>
<td>Several types of lifting clamps, some of which are damaged</td>
</tr>
<tr>
<td>Computer</td>
<td></td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile sheets</td>
<td></td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 38102 presents basic rigging, which refers to the preparation of a load for movement, as well as the preparation of hardware and other components used to connect the load to the crane. Rigging must be completed safely and effectively, resulting in a reliable connection to the load. An understanding of rigging fundamentals is essential to safely operate cranes and move/position heavy equipment, components, and structures.

### Objectives

#### Learning Objective 1
- Identify and describe various types of rigging hardware.
  - Identify and describe various hooks, shackles, eyebolts, and clamps.
  - Identify and describe various lugs, turnbuckles, plates, and spreader beams.

#### Learning Objective 2
- Identify and describe various types of slings and sling hitches.
  - Identify and describe wire-rope slings and their proper care.
  - Identify and describe synthetic slings and their proper care.
  - Identify and describe chain slings and their proper care.
  - Explain the significance of sling angles and describe common hitches.
  - Describe how to properly rig and handle piping materials and rebar.
  - Identify and describe how to use taglines and knots for load control.
  - Identify common rigging-related safety precautions.

#### Learning Objective 3
- Identify and describe how to use various types of hoisting and jacking equipment.
  - Identify and describe how to use manual and powered hoisting equipment.
  - Identify and describe how to use jacks.

### Performance Tasks

#### Performance Task 1 (Learning Objectives 1 and 2)
- Inspect various types of rigging components and report on the condition and suitability for a task.

#### Performance Task 2 (Learning Objective 2)
- Configure a sling to produce a single-wrap basket hitch.

#### Performance Task 3 (Learning Objective 2)
- Configure a sling to produce a double-wrap basket hitch.

#### Performance Task 4 (Learning Objective 2)
- Configure a sling to produce a single-wrap choker hitch.

#### Performance Task 5 (Learning Objective 2)
- Configure a sling to produce a double-wrap choker hitch.

#### Performance Task 6 (Learning Objective 2)
- Select the correct tagline for a specified application.

#### Performance Task 7 (Learning Objective 2)
- Tie specific instructor-selected knots.

#### Performance Task 8 (Learning Objective 3)
- Select, inspect, and demonstrate the safe use of the following rigging equipment:
  - Block and tackle
  - Chain hoist
  - Ratchet-lever hoist
  - One or more types of jack
**Recommended Teaching Time: 20 Hours**

This Lesson Plan (LP) is divided into sections that correspond to the sections in the Trainee Guide module. As you plan your class times, review the objectives, content, and lesson plan outline for the section you plan to teach. Allow sufficient class time for demonstrations, laboratories, field trips, and testing. Each class period should also include time for administrative tasks and periodic breaks.

Be sure to gather the required equipment, materials, visual aids, and answer keys. Using your access code, download the PowerPoint® presentations and Performance Profile Sheets for this module from NCCER’s Instructor Resource Center at [www.nccerirc.com](http://www.nccerirc.com).

It is advisable to assign the reading of a module section prior to the classroom instruction. The Section Review and Module Review questions may be assigned as homework. At their discretion, instructors may assign additional homework to meet the teaching objectives.

Performance Testing may be administered at any suitable time in the course of the module training. Tasks are graded pass/fail. Trainee performance and proficiency during practice sessions that meets or exceeds the standards for a task can be accepted as Performance Task completion. Complete the Performance Profile Sheet for each trainee.

The final class is generally reserved for a brief review of the module and administering the module examination. For information about accessing the Module Examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER’s Registry is 70% or above for the module exam. Submit the testing results for each trainee to your Training Program Sponsor through the Registry system.

**Prerequisites**

*Core Curriculum*

---

**Safety Considerations**

This module requires require trainees to work with and around rigging equipment including various slings, hoists, and jacks. Work in the vicinity of mobile cranes is also possible. Safety must be emphasized at all times. Gloves should be worn at all times when working with slings. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to rigging and the mobile crane environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

**Equipment, Materials, and Resources**

- Whiteboard
- Dry-erase markers
- Pencils and paper
- PowerPoint® presentations for Module 38102
- LCD projector and screen
- Computer (Internet access optional)
- Module Review answer key
- Module Examinations
- Performance Profile sheets
- Appropriate PPE as directed by the instructor or training facility provider, including but not limited to:
  - Safety glasses
  - Proper footwear
  - Hearing protection
  - Hard hat
- A varied selection of wire-rope slings (some damaged)
- A varied selection of synthetic web slings (some damaged)
- A varied selection of chain slings (some damaged)
- A varied selection of lifting hooks (some damaged)
- A varied selection of shackles (some damaged)
- Lengths of rope sufficient for tying knots
- Block and tackle (simple or compound)
- Chain hoist
- Ratchet-lever hoist
- Various types of jacks, including a ratchet jack, bottle jack, and a hydraulic jack with an external pump
- Portable gantry or suitable permanent structure from which hoists can be suspended
**Additional Resources**

This module presents thorough resources for task training. The following reference material is recommended for further study.


**NCCER Module 00106-15, Introduction to Basic Rigging.**


The following websites offer resources for products and training:

- Occupational Safety and Health Administration (OSHA), [www.osha.gov](http://www.osha.gov)
- North American Crane Bureau, Inc. website offers resources for products and training, [www.cranesafe.com](http://www.cranesafe.com)

There are many online resources available for trainees who would like more information about rigging fundamentals. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan to ensure their usability before using them. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Numerous videos related to the topic are available on the Internet. These can be located by searching crane rigging or similar terms and using the Video tab on the results page of your preferred search engine. Note that The Crosby Group, a leading manufacturer of rigging equipment and hardware, has many videos available on their website at [www.thecrosbygroup.com](http://www.thecrosbygroup.com). Their videos and other resources can be found under the Resources/Tools tab.

Instructors are encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the presentations throughout the program.
Overview

Standards and codes set the stage for the specifics of how pipefitting is conducted. They indicate what kinds of materials to use, how to identify those materials, and what procedures to follow in using them. Understanding these areas is just as important as knowing how to cut and join pipe, because pipefitters must follow the law as outlined in the codes and standards. When expectations change over the course of a project, it is essential to get agreements in writing before modifications are made. Staying in compliance is achievable with an understanding of common rules, applications, and methods of conducting business.

Learning Objective 1

Successful completion of this module prepares trainees to:
Understand state standards and codes relevant to pipefitting and their importance to the craft.

- a. Explain the basis for standards and codes and how they are managed by various organizations.
- b. Describe the coding systems for boiler and pressure vessels, pressure piping, and structural welding.

Learning Objective 2

Successful completion of this module prepares trainees to:
Describe the content of specifications and how piping components are identified.

- a. Describe the content of specifications and how they might be changed as work progresses.
- b. Describe the content of welding procedure specifications.
- c. Describe how piping components are identified in specifications.

Performance Tasks

This is a knowledge-based module; there are no Performance Tasks.
Recommended Teaching Time: 10.0 hours
Classroom Equipment and Materials

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 08303
- A variety of standard marker sizes
- Poster board
- Flip chart
- LCD projector and screen
- Computer with Internet access
- Module Review answer key
- Module Examinations
Overview
Pipefitters use geometry, trigonometry, and algebra to calculate takeouts, to lay out angled cuts, and to determine the lengths of the sides of figures and offsets. Knowing which formula to use, and at what time, is central to a craftsperson’s success. Pipefitting calculators are specially designed to assist with each of these functions, yet it is still important to know how the manual process for times when equipment is not available. Precise calculations, no matter how they are realized, form the basis for producing a high-quality pipeline.

Learning Objective 1
Successful completion of this module prepares trainees to:
Use trigonometric formulas to determine pipe angles and offsets.

a. Use the Pythagorean theorem to calculate right triangle line lengths.
b. Use trigonometric functions to calculate sines, cosines, and tangents.
c. Use trigonometric functions to calculate other properties of triangles.
d. Determine angles in triangles when side lengths are known.
e. Use interpolation to determine numerical values and angles.
f. Calculate piping takeouts and odd angles using trigonometry.

Performance Tasks
This is a knowledge-based module; there are no Performance Tasks.
Recommended Teaching Time: 25 hours

Classroom Equipment and Materials

• Whiteboard and markers
• Pencils and paper
• PowerPoint® Presentations for Module 08304
• A variety of standard marker sizes
• Poster board
• Flip chart
• LCD projector and screen
• Computer with Internet access
• Module Review answer key
• Module Examinations
Overview
Specialized pieces of motorized equipment, including various types of lifts and rigs, are commonly used in pipefitting work. Fall protection measures must be taken prior to starting any job that involves elevation and trained, certified personnel are required for setup and operation at these sites. Each lift presents its own set of safety considerations, but with careful planning, the risks may be managed.
When working with equipment for cleaning drains and sewer lines, a variety of end tools are available to meet the tasks at hand. After determining the source of a stoppage, a skilled pipefitter will select the most efficient type of equipment and attachment to get things running smoothly again. In both scenarios – using lifts and rigs and cleaning drains and sewer lines – attention to the details of safety and the environment are keys to productive and successful operations.

Learning Objective 1
Successful completion of this module prepares trainees to:
Identify personnel lift safety and inspection requirements.

a. State personnel lift safety requirements.
b. Identify personnel lift inspection requirements.

Learning Objective 2
Successful completion of this module prepares trainees to:
Identify cable lift safety and inspection requirements.

a. State cable lift safety requirements.
b. Identify cable lift inspection requirements.

Learning Objective 3
Successful completion of this module prepares trainees to:
Identify and describe other motorized equipment used by pipefitters.
a. Identify and describe motorized drain-cleaning equipment.
b. Identify and describe hydraulic torque wrenches.

Performance Tasks

1. Describe an aerial lift inspection.

Recommended Teaching Time: 10 hours

Classroom Equipment and Materials

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 08305
- A variety of standard marker sizes
- Poster board
- Flip chart
- LCD projector and screen
- Computer with Internet access
- Module Review answer key
- Module Examinations
- Appropriate PPE as directed by the instructor or training facility provider
- Personnel lift (optional)
- Preoperational inspection form relevant to the personnel lift in use (optional)
Introduction to Aboveground Pipe Installation

Pipefitting

Overview
Installing aboveground pipe calls for careful planning and communication regarding the measurement, calculation, cutting, and assembly tasks involved in creating fully-functional runs. Aboveground lines do not have the advantage of being supported by the earth of a trench, as with buried pipe, and they often have to be raised to avoid obstructions. Because of these two factors, understanding when, where, and how to apply fundamental pipefitting skills becomes more important than ever.

Learning Objective 1
Successful completion of this module prepares trainees to:
Identify and describe various flanges and flange facings, and how to store such materials.

a. Identify and describe various flanges.
b. Identify and describe various flange facings.
c. Explain how to store and protect piping materials.

Learning Objective 2
Successful completion of this module prepares trainees to:
Identify various flange gaskets and explain how to fabricate a gasket.

a. Identify and describe the applications for various gasket materials.
b. Identify and describe various types of flange gaskets.
c. Explain how to fabricate a gasket.

Learning Objective 3
Successful completion of this module prepares trainees to:
Explain how to assemble and install pipe flanges and grooved joints.

a. Explain how to assemble pipe flanges.
b. Explain how to assemble grooved pipe joints.
c. Explain how to layout pipe sleeves and floor penetrations.

**Learning Objective 4**

*Successful completion of this module prepares trainees to:*
Describe the fabrication and installation process of pipe spools.

a. Explain how to read and interpret spool sheets.
b. Describe the pipe-spool installation process.

**Performance Tasks**

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. Lay out and fabricate a gasket.
4. Install flanged piping systems.
5. Lay out floor penetrations.
6. Read spool sheets.

Recommended Teaching Time: 25 hours

**Classroom Equipment and Materials**

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 08306
- A variety of standard marker sizes
- Poster board
- Flip chart
• LCD projector and screen
• Computer with Internet access
• Module Review answer key
• Module Examinations
• Appropriate PPE as directed by the instructor or training facility provider
• Examples of flanges, including the following types:
  ◦ Weld neck
  ◦ Slip-on
  ◦ Blind
  ◦ Socket weld
  ◦ Threaded
  ◦ Lap-joint
  ◦ Cast iron
• Examples of gasket materials and types
• Appropriate PPE as directed by the instructor or training facility provider
• Gasket material of choice
• One or more pipe flanges of a chosen pipe size
• Steel rule
• Dividers
• Protractor
• Gasket cutter
• Hole punch of the proper size for the flange in use
• Scissors and/or snips
• Bluing ink (optional)
• Two sections of pipe, each with a mating flange on one end
• Pipe stands and/or vises
• Appropriate flange hardware and gasket
• Drift pin
• Torque wrench
• Appropriately sized sockets and wrenches
• Example drawing showing piping penetrations through one or more floors.
• Appropriate area where trainees can layout a floor penetration according to the drawing
• Several spool sheet examples
Overview
Field routing and vessel trimming require pipefitters to understand more than pipe assembly. Their decisions play a key role in ensuring the safety and overall success of a job. From initial evaluation of the site and piping run to the selection of the proper erection equipment and vessel trim components, this part of their job requires them to have a thorough understanding of the competencies and skills taught in this module.

Learning Objective 1
Successful completion of this module prepares trainees to:
Explain how to prepare to install piping systems in the field.

   a. Explain how to evaluate the route and materials for a piping run.
   b. Explain how to prepare the work area before starting the job.

Learning Objective 2
Successful completion of this module prepares trainees to:
Describe the process of assembling a field piping run.

   a. Describe the process of transporting and erecting piping.
   b. Describe how to install piping test blanks.
   c. Describe how to install temporary spools for hydrotesting.

Learning Objective 3
Successful completion of this module prepares trainees to:
Identify and describe vessel trim components.

   a. Identify and describe vents, drains, and relief valves.
   b. Identify and describe common vessel-mounted instruments and controls.
c. Identify basic installation procedures for vessel trim.

**Performance Tasks**

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.

Recommended Teaching Time: 15 hours

**Classroom Equipment and Materials**

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 08307
- A variety of standard marker sizes
- Poster board
- Flip chart
- LCD projector and screen
- Computer with Internet access
- Module Review answer key
- Module Examinations
- Appropriate PPE as directed by the instructor or training facility provider
- Appropriate set of piping drawings
- Drawing scales
- Appropriate drawings of spools that contain flanges, valves, and/or similar accessories
- Catalog data for valves and other specialties shown on the drawing, or Internet access for individual research
- Two sections of pipe, each with a mating flange on one end
- Pipe stands and/or vises
- Appropriate flange hardware and gaskets (note the need for longer bolts to accommodate the thickness of the test blind)
- Drift pin
- Flange spreader
- Torque wrench
- Appropriately sized sockets and wrenches
• Two sections of pipe, each with a mating flange on one end
• Short spool with flanges on each end for insertion
• Pipe stands and/or vises
• Appropriate flange hardware and gaskets
• Drift pin
• Torque wrench
• Appropriately sized sockets and wrenches
• An assortment of level, pressure, and temperature sensors
Overview

Pipe hangers and supports must be carefully chosen to coordinate with the pipe they’re designed to support. As with other components of the system, each piece must be installed in a manner reflective of its strengths and limitations, with attention to piping drawings that outline placement of each item. Many installations and maintenance procedures call for special safety considerations, both during the operation and throughout the lifetimes of individual and overall structures. Pipefitters with strong math skills and solid experience in the basics of the craft are ready for these more advanced activities.

Learning Objective 1

Successful completion of this module prepares trainees to:

Understand the methods used to suspend and support pipe and the standards used to communicate the designed methods to the pipefitter.

a. Identify and describe various pipe hangers.
b. Identify and describe various pipe supports.
c. Explain how to determine the placement of pipe hangers and supports.
d. Explain how to interpret pipe hanger and support information found on drawings.

Learning Objective 2

Successful completion of this module prepares trainees to:

Identify and describe common types of pipe hanger and support hardware.

a. Identify and describe common pipe hanger suspension hardware.
b. Identify and describe how to install toggle bolts and concrete anchors.
c. Explain how to fabricate a pipe hanger or support bracket.

Learning Objective 3

Successful completion of this module prepares trainees to:
Identify various spring can supports and explain how to install and maintain spring cans.

   a. Identify and describe variable spring can supports.
   b. Identify and describe constant spring can supports.
   c. Explain how to install spring can supports.
   d. Explain how to maintain and replace spring can supports.

**Performance Tasks**

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 non-expanding concrete fasteners.
6. Install expanding concrete fasteners.
7. Lay out and mark the cut lines required to fabricate a one-piece, 45-degree angle iron bracket.
8. Lay out and mark the cut lines required to fabricate a one-piece, 30- by 60-degree angle iron bracket.
9. Identify spring can support types.
10. Read and interpret spring can support detail sheets.
11. Install spring can supports.
12. Remove the travel stops from a spring can support.
13. Adjust a spring can support to the cold position.

Recommended Teaching Time: 25 hours

**Classroom Equipment and Materials**

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 08308
- A variety of standard marker sizes
- Poster board
- Flip chart
- LCD projector and screen
- Computer with Internet access
- Module Review answer key
- Module Examinations
• Appropriate PPE as directed by the instructor or training facility provider
• Examples of various pipe hangers
• Examples of various connecting units and attachments
• Examples of various pipe supports
• One or more sets of drawings that identify hanger locations and provide detail drawings of specific assemblies
• Nonexpanding anchors for installation
• Expanding anchors for installation
• Masonry floor or wall suitable for anchor installation
• Hammer drill with appropriate drill bits for the anchors to be installed
• Common hand tools and wrenches appropriate for the anchor hardware
• 1-\(\frac{1}{2}\)" angle iron or a similar size for layout practice
• Tape measures or other suitable measuring tools
• Soapstone
• One or more sets of drawings that contain spring-can support detail sheets
• A variety of variable and constant spring cans (optional). Alternatively, use copies of the spring can images provided in the TG, with the captions omitted.
• Overhead beam(s) that will accommodate spring can installation
• Step ladder (if required)
• Fall protection harnesses (if required)
• Appropriate variable spring cans
• Necessary mounting hardware, including threaded rod is needed
• Section of pipe to suspend
• Portable band saw or other means of cutting threaded rod (optional)
• Common hand tools and wrenches
Overview

Once a piping system is installed, it must be tested before it's ready to use. Like many pipefitting activities, testing introduces a number of hazards that must be addressed. Whether performing hydrostatic, steam blow, or head pressure testing, precautions must be taken to reduce the known risks. A good visual inspection of the system is likely to identify certain sets of problems before testing is even begun. When conducting a test, the use of a test report is essential to guiding the overall process. Pipefitters who have mastered installations and repairs are ready to learn about procedures and protocols for testing systems and equipment.

Learning Objective 1

Successful completion of this module prepares trainees to:

Explain how to visually inspect pipe welds.

  a. Describe the steps in a visual weld inspection and factors involved in determining the acceptability of a weld profile.

Learning Objective 2

Successful completion of this module prepares trainees to:

Explain how visual tests are conducted prior to other testing processes.

  a. Describe the gauges involved in visual weld inspections and how they are used.

Learning Objective 3

Successful completion of this module prepares trainees to:

Explain how to perform various pressure tests before piping systems are placed in service.

  a. State pretest requirements and describe how to prepare for testing.
  b. Explain how piping systems are cleaned prior to testing.
  c. Explain how to perform service and flow tests.
d. Explain how to perform head-pressure tests.
e. Explain how to perform hydrostatic tests.
f. Explain how to perform pneumatic tests.
g. Explain how to perform equipment tests.

Performance Tasks

1. Perform a pretest field inspection using a punch list.
2. Perform service and flow tests and check for leaks.
3. Perform a head pressure test and check for leaks.
4. Prepare for and perform a hydrostatic test on a system or spool.

Recommended Teaching Time: 20 hours

Classroom Equipment and Materials

- Whiteboard and markers
- Pencils and paper
- PowerPoint® Presentations for Module 08309
- A variety of standard marker sizes
- Poster board
- Flip chart
- LCD projector and screen
- Computer with Internet access
- Module Review answer key
- Module Examinations
- Appropriate PPE as directed by the instructor or training facility provider
- Copies of punch-list form to document inspection findings (Figure 10 in this module may be used)
- Piping spool or installed piping system for evaluation
- Drawings for spool or system to be evaluated
- Ladders (if required)
- Fall protection PPE (if required)
- Service-connected low-pressure water system or a section thereof with isolating valves
- Ladders (if required)
- Fall protection PPE (if required)
- Section of installed piping, such as DWV, or a spool piece equipped with an appropriate 10’ stand pipe for head pressure testing
- Sufficient water volume available to fill the system or spool for testing
• Calculators
• Ladders (if required)
• Fall protection PPE (if required)
• Appropriate PPE as directed by the instructor or training facility provider
• Section of installed piping for testing that can be properly isolated, or a spool piece on a test stand
• Test blinds or plugs for isolating the tested area (if required)
• Appropriate hydrostatic test pump (manually operated or powered as necessary) with pressure gauge
• Hoses and/or pipe and fittings for pump connection to the tested system
• Suitable water supply
• Common hand tools for hose and pipe connections
• Ladders (if required)
• Fall protection PPE (if required)