

### Module Overview

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This module identifies and describes strength/spacing requirements, types, and installation of pipe hangers, supports, restraints, and guides. It covers earthquake bracing, sleeving, and firestopping. Cutting hangers to specified lengths is also included.

### Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed the *Core Curriculum* and *Sprinkler Fitting Level One*.

### Objectives

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

1. Identify and describe strength requirements of pipe hangers, supports, restraints, and guides.
2. Identify and describe spacing requirements of pipe hangers, supports, restraints, and guides.
3. Identify and describe types of pipe hangers, supports, restraints, and guides.
4. Install pipe hangers, supports, restraints, guides, and anchors.
5. Identify and explain types of earthquake bracing.
6. Install earthquake bracing.
7. Describe and explain sleeving and firestopping.
8. Cut a hanger rod to a specified length.

### Performance Tasks

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

1. Install a drop-in anchor.
2. Install a hanger on a wood joist.
3. Make up and install an earthquake brace.
4. Cut a hanger rod to a specified length.

### Materials and Equipment

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Multimedia projector and screen

*Sprinkler Fitting Level Two*

PowerPoint® Presentation Slides  
(ISBN 978-0-13-272925-3)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Various pipe hangers:

Adjustable ring/band hangers

Adjustable clevis

Trapeze hangers

Manufacturer's literature on load ratings for pipe hangers and supports

Various pipe hanger connecting units:

Eye rods

All-thread rods

Rod couplings

Beam clamps

Wall support straps

Various pipe supports and attachments:

Ceiling flanges

U-bolts

Toggle bolts

Pipe stands

Riser clamps

Various types of hangers for wood:

Lag bolts and coach screw rods

Drive screws

Specialty fasteners

U-hooks

Various types of concrete fasteners:

Concrete inserts

Expansion shields and drop-in anchors

Powder-driven tool training program (optional)

Powder-driven tools and accessories (optional)

*NFPA 13*

Earthquake bracing

Mechanical firestops

*continued*

Various firestopping products  
Samples of pipe  
Hacksaws  
Vises  
Cutting oil  
Templates  
½-inch hammer drill  
¼-inch drill motor  
Masonry drill bits  
Standard drill bits  
Extension cords  
Grout

Screwdrivers  
Adjustable wrenches  
Channel locks  
Torpedo level  
Soapstones  
Measuring tapes  
Rigging devices  
Ladders or scaffolding  
Quick Quiz\*  
Module Examinations\*\*  
Performance Profile Sheets\*\*

\* 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

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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 may require trainees to work with powder-driven tools. Ensure all trainees are briefed on appropriate safety procedures.

## Additional Resources

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

*ACI-318, Building Code Requirements for Structural Concrete*, Latest Edition. Farmington Hills, MI: American Concrete Institute.

*Pipe Hanger Catalog*. Portsmouth, NH: Anvil International Inc.

*Pipe Hanger Design and Engineering*. Portsmouth, NH: Anvil International Inc.

*How to Successfully Install Plastic Fire Sprinkler Pipe*, Video, American Fire Sprinkler Association, 1987, 33 mins.

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 13D, Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, Latest Edition. Quincy, MA: National Fire Protection Association.

*Underwriters Laboratories Standard 203*, Latest Edition: Northbrook, IL: Underwriters Laboratories, Inc.

## Teaching Time For This Module

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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 *Hangers, Supports, Restraints, and Guides*. 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
<b>Sessions I and II. Introduction; Requirements for Pipe Hangers and Supports</b>	
A. Introduction	_____
B. Strength and Spacing Requirements for Pipe Hangers	_____
C. Field Placement of Hangers	_____
D. General Rules	_____
E. Identification of Pipe Hangers and Supports	_____
F. Hanger Connecting Units and Attachments	_____
G. Laboratory	_____
Have trainees practice cutting hanger rods. This laboratory corresponds to Performance Task 4.	
H. Hangers for Wood	_____
I. Laboratory	_____
Have trainees practice installing a hanger on a wood joist. This laboratory corresponds to Performance Task 2.	
<b>Session III. Installation of Pipe Hangers and Supports</b>	
A. Pipe Supports and Attachments	_____
B. Hangers for Concrete	_____
C. Laboratory	_____
Have trainees practice installing a drop-in anchor. This laboratory corresponds to Performance Task 1.	
<b>Session IV. Earthquake Bracing</b>	
A. Types of Earthquake Bracing	_____
B. Floor and Wall Penetrations	_____
C. Seismic Separation Assembly	_____
D. Bracing and Other Concerns	_____
E. Laboratory	_____
Have trainees practice installing earthquake bracing. This laboratory corresponds to Performance Task 3.	
<b>Session V. Firestopping</b>	
A. Firestopping Materials and Devices	_____
B. Floor and Wall Penetrations	_____
C. Specifications	_____
D. Specific Products	_____

## Session VI. Review and Testing

A. Review

B. Module Examination

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

C. Performance Testing

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

## Module Overview

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This module covers the various types of valves and valve applications used in the sprinkler industry, including service procedures for standard valves. The trainee learns how to install OS&Y valves, butterfly grooved valves, and tamper switches. Procedures to disassemble, service, and reassemble check valves are also included.

## Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Sprinkler Fitting Level One*; and *Sprinkler Fitting Level Two*, Module 18201-13.

## Objectives

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

1. Identify the basic types of valves.
2. Demonstrate the ability to service different types of valves.
3. Define the general purpose of a backflow preventer.
4. Install outside screw and yoke (OS&Y) valves.
5. Install a tamper switch.
6. Install butterfly grooved valves.
7. Disassemble, service, and reassemble a check valve.

## Performance Tasks

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

1. Install outside screw and yoke (OS&Y) valves.
2. Install a tamper switch.
3. Install butterfly grooved valves.
4. Disassemble, service, and reassemble a check valve.

## Materials and Equipment

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Multimedia projector and screen

*Sprinkler Fitting Level Two*

PowerPoint® Presentation Slides  
(ISBN 978-0-13-272925-3)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Indicating valves

Gate valves

Post indicators

Wall-post indicators

Outside screw and yoke (OS&Y) valves

Ball lever valves

Globe valves

Sample discs

Clappers

Angle valves

Y-type valves

Butterfly grooved valves

Safety valves

Check valves

Swing check valves

Hose valves

Hose-gate valves

Pressure-reducing valves

Pressure-relief valves

Manufacturers' literature on pressure-relief valves

Backflow preventer

Supervisory switches and manufacturer's  
instructions

Tamper switches

Piping drawings

Pipe stands

Packing puller

Packing

*continued*

Pipe thread compound  
Mechanical fasteners  
Lubricant  
Replacement discs  
Gasket material  
Basic sprinkler fitter's tools  
Wrenches

Socket wrenches  
Torque wrenches  
Bolts and nuts  
Copies of the Quick Quizzes\*  
Module Examinations\*\*  
Performance Profile Sheets\*\*

\* 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**

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Ensure that trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module may require trainees to visit construction sites or utility areas. Ensure that they are briefed on site safety procedures. This module requires trainees to work with hand tools and valves. Ensure that all trainees are properly briefed on hand tool and lifting safety.

## **Additional Resources**

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

*Automatic Sprinkler Handbook*, Latest Edition. Milosh T. Puchovsky, P.E. Quincy, MA: National Fire Protection Association.

American Water Works Association (AWWA), Denver, CO.

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 14*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 25*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 72, National Fire Alarm and Signaling Code*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 1963*, Latest Edition. Quincy, MA: National Fire Protection Association.

*FM Global Approval Guide*, Latest Edition. Norwood, MA: FM Global.

*Underwriters Laboratories Fire Protection Equipment*, Latest Edition. Northbrook, IL: Underwriters Laboratories Inc.

## Teaching Time for This Module

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

Topic	Planned Time
<b>Sessions I and II. Introduction; Valve Identification</b>	
A. Introduction	_____
B. Indicating Valves	_____
C. Globe Valves	_____
D. Check Valves	_____
E. Laboratory	_____
Have trainees practice disassembling, servicing, and reassembling a check valve. This laboratory corresponds to Performance Task 4.	
F. Hose, Pressure-Reducing, and Pressure-Relief Valves	_____
<b>Sessions III and VI. Installing Valves</b>	
A. Installing Threaded Valves	_____
B. Installing Grooved Valves	_____
C. Laboratory	_____
Have trainees practice installing butterfly grooved valves. This laboratory corresponds to Performance Task 3.	
D. Installing Flanged Valves	_____
E. Laboratory	_____
Have trainees practice installing OS&Y valves. This laboratory corresponds to Performance Task 1.	
<b>Session V. Installing Supervisory Switches</b>	
A. Installing a Supervisory Switch	_____
B. Laboratory	_____
Have trainees practice installing a tamper switch. This laboratory corresponds to Performance Task 2.	
C. Summary	_____
<b>Session VI. Review and Testing</b>	
A. Module 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

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This module explains basic math principles and how to solve everyday problems, including converting quantities from the English system to the metric system and vice versa. It covers specific sprinkler fitting problems such as calculating 45-degree offsets and tank volume; centering sprinkler heads using the target, square offset, and geometric methods; and problems relating to changes in elevation, sprinkler discharge, and hanger sizing.

### Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed the *Core Curriculum*; *Sprinkler Fitting Level One*; and *Sprinkler Fitting Level Two*, Modules 18201-13 and 18202-13.

### Objectives

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

1. Use basic math principles to solve problems.
2. Convert fundamental measurement quantities from the English system to the metric system, and from metric to English.
3. Recognize the effects of temperature on sprinkler systems.
4. Use temperature scales to solve sprinkler rating problems.
5. Calculate 45-degree offsets and tank volume.
6. Center sprinkler heads using the target, square offset, and geometric methods.
7. Solve sprinkler system problems relating to changes in elevation, sprinkler discharge, and hanger sizing.

### Performance Task

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

1. Fill in a time sheet.

### Materials and Equipment

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Multimedia projector and screen  
*Sprinkler Fitting Level Two*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-272925-3)

Computer  
Whiteboard/chalkboard  
Markers/chalk  
Pencils and scratch paper  
Measuring devices  
Graph paper  
Containers to demonstrate units of measure:  
Bottle of oil or soda  
Paper

Scissors  
Rulers (English and metric)  
Architect's rule  
Measuring tape  
Temperature-pressure chart  
Scientific calculator  
Pressure gauges with SI and English units  
Tables commonly used by sprinkler fitters  
Thermometers  
Copies of the Quick Quiz\*  
Module Examinations\*\*  
Performance Profile Sheet\*\*

\* 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.



## Additional Resources

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

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*Handbook of Applied Mathematics*, D. Van Nostrand Co., Inc.

## Teaching Time For This Module

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

Topic	Planned Time
<b>Sessions I and II. Introduction; General Trade Math</b>	
A. Introduction	_____
B. Mathematical Symbols	_____
C. Laboratory	_____
Have trainees practice filling out a time card. This laboratory corresponds to Performance Task 1.	
D. Higher Functions	_____
E. Geometry	_____
<b>Sessions III and IV. Measurement Systems</b>	
A. Basic and Practical Measures	_____
B. The U.S. English System of Measurement	_____
C. The Metric System	_____
D. The International System of Units	_____
E. Using Tables	_____
<b>Session V. Temperature Scales and Applications</b>	
A. Thermometers	_____
B. Thermometer Scales	_____
C. Temperature Conversion	_____
<b>Sessions VI and VII. Mathematical Applications</b>	
A. Centering Methods	_____
B. Calculating Floor Area	_____
C. Calculating Sprinkler Head Spacing	_____
D. Calculating Pitch	_____
E. Calculating the Third Side of a Triangle	_____
F. Discharge of a Sprinkler	_____
G. Calculating the Volume of a Piping System	_____

## Session VIII. Review and Testing

A. Review

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B. Module Examination

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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

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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

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This module explains how to read the drawing legend and identify drawing symbols, including common structural and standard sprinkler system symbols. It covers how to read drawings to identify materials, calculate the square footage and number of sprinklers required, lay out sprinkler hanger locations, and identify sprinkler orifice sizes from drawings. It describes how to identify pipe sizes and cut lengths shown on installation drawings.

### Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed the *Core Curriculum; Sprinkler Fitting Level One*; and *Sprinkler Fitting Level Two*, Modules 18201-13 through 18203-13.

### Objectives

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

1. Identify common structural symbols on a shop drawing.
2. Identify cut lengths and sizes of pipe on an installation drawing.
3. Identify the materials to perform an installation from drawings.
4. Identify standard sprinkler system symbols.
5. Interpret a legend and calculate the number of sprinklers to be used in an installation.
6. Identify the orifice size of a sprinkler from drawings.
7. Identify the temperature rating of a sprinkler from a drawing.
8. Calculate the square footage and the number of sprinklers required for a given area.
9. Identify and match the NFPA standards to the title.

### Performance Tasks

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

1. Interpret a legend.
2. Calculate the number of sprinklers to be used in an installation.
3. Calculate the square footage and the number of sprinklers required for a given area.
4. Lay out sprinkler hanger locations.

### Materials and Equipment

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Multimedia projector and screen  
*Sprinkler Fitting Level Two*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-272925-3)

Computer  
Whiteboard/chalkboard  
Markers/chalk  
Pencils and scratch paper  
Appropriate personal protective equipment  
Shop drawings

Measuring tape  
Architectural drawings  
Blueprints  
Change order  
*NFPA 13*  
Legends from several drawings  
Copies of the Quick Quiz \*  
Module Examination\*\*  
Performance Profile Sheet\*\*

\* 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

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Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures.

## Additional Resources

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

*International Building Code*, Latest Edition. Falls Church, VA: International Code Council.

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 170, Standard for Fire Safety and Emergency Symbols*, Latest Edition. Quincy, MA: National Fire Protection Association.

## Teaching Time For This Module

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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 32½ hours are suggested to cover *Shop 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.

Topic	Planned Time
<b>Sessions I and II. Introduction; The Drawing Set</b>	
A. Introduction	_____
B. Types of Drawings	_____
C. Content of a Sprinkler Drawing Package	_____
D. Understanding and Using Drawings	_____
E. Dimensioning	_____
F. Shop Drawings	_____
G. Plans	_____
<b>Sessions III and IV. Sprinkler System Symbols</b>	
A. Sprinkler Symbols	_____
B. Valves, Devices, and Fitting Symbols	_____
C. Hangers, Supports, and Underground Symbols	_____
D. Miscellaneous Notations	_____
E. Laboratory	_____
Have trainees practice reading a legend. This laboratory corresponds to Performance Task 1.	
<b>Sessions V through VII. Sprinkler System Layout, Part One</b>	
A. Technical Layout Procedure	_____
B. Sprinkler Layout Planning	_____
C. Hazard Classification	_____
D. Maximum Sprinkler Spacing	_____
E. Calculating the Number of Sprinklers	_____
F. Laboratory	_____
1. Have trainees practice calculating the number of sprinklers to be used in an installation. This laboratory corresponds to Performance Task 2.	
2. Have trainees practice calculating square footage and the number of sprinklers to be used in a given area. This laboratory corresponds to Performance Task 3.	

**Sessions VIII through X. Sprinkler System Layout, Part Two**

- A. Laying Out Sprinklers
- B. Branching
- C. Selecting and Sizing Piping
- D. Water Supply
- E. Hangers
- F. Laboratory

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Have trainees practice laying out sprinkler hanger locations. This laboratory corresponds to Performance Task 4.

**Sessions XI and XII. Layout and Coordination of Existing Systems**

- A. Three-Dimensional Perspective
- B. Sprinkler Spacing
- C. Installation Information
- D. Coordinating Installations
- E. Fitting Pipe
- F. Layout for Existing Systems
- G. Layout Sequence
- H. Summary

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**Session XIII. 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.

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## Module Overview

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This module explains obstructed and unobstructed sprinkler installations. Standard spray sprinklers are discussed relative to occupancies and maximum coverage calculations. Sprinkler spacing is calculated using the small room rule and the protection area rule. Identification of spray sprinklers using a sprinkler identification number (SIN) is also covered.

## Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed the *Core Curriculum; Sprinkler Fitting Level One*; and *Sprinkler Fitting Level Two*, Modules 18201-13 through 18204-13.

## Objectives

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

1. Identify unobstructed and obstructed construction on a drawing and explain why these construction types are obstructed or unobstructed.
2. Calculate maximum coverage area of standard sprinklers for various occupancies.
3. Calculate spacing using the small room rule.
4. Determine sprinkler temperatures by examining different sprinklers.
5. Calculate the maximum spacing of sidewall sprinklers using the protection area rule.
6. Referencing a sprinkler identification number (SIN), identify the manufacturer and sprinkler type.

## Performance Tasks

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

1. Calculate maximum coverage area of standard sprinklers for various occupancies.
2. Calculate spacing using the small room rule.
3. Calculate the maximum spacing of sidewall sprinklers using the protection area rule.

## Materials and Equipment

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Multimedia projector and screen	Manufacturer's data sheets
<i>Sprinkler Fitting Level Two</i>	Design drawings
PowerPoint® Presentation Slides (ISBN 978-0-13-272925-3)	Construction drawings
Computer	Sprinkler blueprints
Whiteboard/chalkboard	Calculators
Markers/chalk	Standard spray sprinklers
Pencils and scratch paper	<i>NFPA 13</i>
Appropriate personal protective equipment	Sidewall sprinklers
Sprinkler wrenches	Copies of the Quick Quiz *
Sprinkler fitter hand tools	Module Examination**
	Performance Profile Sheet**

\* 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

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Ensure that trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures.

## Additional Resources

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

*Automatic Sprinkler Systems Handbook*, 2007. Christian Dubay. Quincy, MA: National Fire Protection Association.

*FM Global Approval Guide*, Latest Edition. Norwood, MA: FM Global.

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 13D*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 13R*, Latest Edition. Quincy, MA: National Fire Protection Association.

*Underwriters Laboratories Fire Protection Equipment*, Latest Edition. Northbrook, IL: Underwriters Laboratories Inc.

## Teaching Time for This Module

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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 *Standard Spray Fire Sprinklers*. 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 trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
<b>Session I. Introduction; Standard Sprinklers</b>	
A. Introduction	_____
B. Automatic Sprinkler Characteristics	_____
C. Automatic Sprinkler Temperature Ratings	_____
D. Orifice Size and K-factor	_____
E. Sprinkler Location, Spacing, and Position	_____
F. Sprinkler Identification Number	_____
<b>Session II. Types of Occupancies</b>	
A. Light Hazard	_____
B. Ordinary Hazard	_____
C. Extra Hazard	_____
D. Storage	_____
E. Residential Occupancies	_____
<b>Session III. Types of Construction</b>	
A. Unobstructed	_____
B. Obstructed	_____

**Sessions IV and V. Standard Coverage Upright and Pendent Sprinklers**

- A. Maximum Coverage Area \_\_\_\_\_
- B. Laboratory \_\_\_\_\_  
Have trainees practice calculating maximum coverage area of standard sprinklers for various occupancies. This laboratory corresponds to Performance Task 1.
- C. Determining Correct Spacing \_\_\_\_\_
- D. Small Room Rule \_\_\_\_\_
- E. Laboratory \_\_\_\_\_  
Have trainees practice calculating spacing using the small room rule. This laboratory corresponds to Performance Task 2.
- F. Minimum Spacing Requirements \_\_\_\_\_
- G. Sprinkler Position and Deflector Distance \_\_\_\_\_
- H. Obstructions \_\_\_\_\_

**Session VI. Standard Coverage Sidewall Sprinklers**

- A. Written Specifications \_\_\_\_\_
- B. Area of Coverage and Maximum Spacing \_\_\_\_\_
- C. Laboratory \_\_\_\_\_  
Have trainees practice calculating the maximum spacing of sidewall sprinklers using the protection area rule. This laboratory corresponds to Performance Task 3.
- D. Positioning Sidewall Sprinklers \_\_\_\_\_
- E. Clearance and Other Considerations \_\_\_\_\_
- F. Summary \_\_\_\_\_

**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

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This module explains the purpose, function, and operations of wet system components. It describes riser check valves, alarm check valves, and trim; flow, tamper, and pressure switches; fire department connections and hose stations; antifreeze systems; faulty pressure gauges; inspector's test connections and auxiliary drains; and hydrostatic testing and test pumps. The trainee learns how to trim an alarm check valve, perform a hydrostatic test, calculate the specific gravity of an antifreeze solution, and complete a contractor's materials and test certificate.

## Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed the *Core Curriculum; Sprinkler Fitting Level One; and Sprinkler Fitting Level Two*, Modules 18201-13 through 18205-13.

## Objectives

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

1. Describe riser check, alarm check valves, and trim.
2. Trim an alarm check valve and replace the faceplate gasket.
3. Identify and describe flow switches, tamper switches, and pressure switches.
4. Install a tamper switch and a flow switch and set the retard device on a flow switch.
5. Identify and explain fire department connections and hose stations.
6. Explain inspector's test connections and auxiliary drains.
7. Explain hydrostatic testing and test pumps.
8. Perform a hydrostatic test using a pump.
9. Describe antifreeze systems.
10. Calculate the specific gravity of an antifreeze solution.
11. Complete a contractor's material and test certificate.

## Performance Tasks

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

1. Trim an alarm check valve and replace the faceplate gasket.
2. Install a flow switch and set the retard device.
3. Perform a hydrostatic test using a pump.
4. Calculate the specific gravity of an antifreeze solution.
5. Complete a contractor's material and test certificate.
6. Identify a faulty pressure gauge and replace it.

## Materials and Equipment

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Multimedia projector and screen

*Sprinkler Fitting Level Two*

PowerPoint® Presentation Slides  
(ISBN 978-0-13-272925-3)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Wall-mounted fire department connection

Hose station components and accessories

Manufacturer's literature on hose stations

Inspector's test connection

Sprinkler fitter hand tools

Hole saw

Drill

Catch basin

Continuity tester

Hydrometer

Fluid measuring device

*continued*

Fire department connections  
Hand test pump  
Sample valves  
Alarm check valves  
Aboveground test certificate  
Gaskets  
Water motor gong  
Excess pressure pump  
Inspection checklist  
Caps and plugs  
Retard chambers  
Gasket sealant  
Troubleshooting chart  
Site-specific drawings  
Tamper switches

Pressure switches  
Sample aboveground drawing  
Flow switches  
Antifreeze  
55-gallon drum  
Antifreeze MSDS sheets  
Valves and drips  
Hydrostatic pump and testing equipment  
Contractor's material and test certificate  
Pressure gauges  
Sections of fire hoses  
Copies of the Quick Quiz \*  
Module Examination\*\*  
Performance Profile Sheet\*\*

\* 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

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Ensure that trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures. This module requires trainees to perform a hydrostatic test. Ensure all trainees are properly briefed on safety procedures. This module requires trainees to work with valves. Ensure all trainees are briefed on proper tool and lifting safety.

## Additional Resources

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

*Automatic Sprinkler Handbook*, Latest Edition. Christian Dubay, P.E. Quincy, MA: National Fire Protection Association.

*FM Global Approval Guide*. Latest Edition. Norwood, MA: FM Global.

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 13D*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 13R*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 1963, Standard for Fire Hose Connections*, Latest Edition. Quincy, MA: National Fire Protection Association.

*Underwriters Laboratories Fire Protection Equipment Directory*, Latest Edition. Northbrook, IL: Underwriters Laboratories Inc.

## Teaching Time for This Module

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

Topic	Planned Time
<b>Sessions I and II. Introduction; Alarm Check Valves and Trim</b>	
A. Introduction	_____
B. Alarm Check Valve Requirements	_____
C. Function of Alarm Check Valves	_____
D. Alarm Check Valve Operation	_____
E. Shotgun Riser Assembly	_____
F. Laboratory	_____
Have trainees practice trimming an alarm check valve and replacing the faceplate gasket. This laboratory corresponds to Performance Task 1.	
<b>Sessions III and IV. Flow, Tamper, and Pressure Switches</b>	
A. Switch Operation	_____
B. Current and Voltage Ratings	_____
C. Paddle-Type Flow Switches	_____
D. Pressure Switches	_____
E. Tamper Switches	_____
F. Laboratory	_____
Have trainees practice installing a flow switch and setting the retard device. This laboratory corresponds to Performance Task 2.	
<b>Sessions V and VI. Fire Department Connections; Hose Stations</b>	
A. Components	_____
B. Installation Requirements	_____
C. Capacity and Maintenance	_____
D. Hose Stations	_____
E. Hose Station Components	_____
F. Hose Station Maintenance	_____
<b>Session VI. Test Connections; Auxiliary Drains</b>	
A. Installation Problems	_____
B. Inspector's Test Connection	_____
C. Auxiliary Drains	_____

**Sessions VII and VIII. Hydrostatic Testing; Test Pumps**

A. *NFPA 13* Requirements \_\_\_\_\_

B. Laboratory \_\_\_\_\_

Have trainees practice completing a contractor's material and test certificate.  
This laboratory corresponds to Performance Task 5.

C. Purpose of Testing \_\_\_\_\_

D. System Inspection \_\_\_\_\_

E. Preliminary Testing \_\_\_\_\_

F. Testing Hazards \_\_\_\_\_

G. Test Pumps \_\_\_\_\_

H. Testing Procedures \_\_\_\_\_

I. Laboratory \_\_\_\_\_

Have trainees practice performing a hydrostatic test using a pump.  
This laboratory corresponds to Performance Task 3.

**Session IX. Antifreeze Systems; Troubleshooting**

A. Antifreeze System Components and Limitations \_\_\_\_\_

B. Filling the Antifreeze System \_\_\_\_\_

C. System Maintenance \_\_\_\_\_

D. Laboratory \_\_\_\_\_

Have trainees practice calculating the specific gravity of an  
antifreeze solution. This laboratory corresponds to Performance Task 4.

E. Troubleshooting \_\_\_\_\_

F. Laboratory \_\_\_\_\_

Have trainees practice identifying a faulty pressure gauge and replacing it.  
This laboratory corresponds to Performance Task 6.

G. Summary \_\_\_\_\_

**Session X. Review and Testing**

A. Module Review \_\_\_\_\_

B. Module Examination \_\_\_\_\_

1. Trainees must score 70% or higher to receive recognition from NCCER.
2. Record the testing results on 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

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This module explains the purpose, function, and operation of components used in a dry-pipe system. It discusses dry-pipe valves and trim, air supplies, accelerators and exhausters, and fire department connections. It covers installation of pressure gauges on alarm valves and accelerators, setting up and adjusting air maintenance devices, and resetting and troubleshooting dry-pipe systems. Dry-pipe pitch is also covered.

### Prerequisites

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Prior to training with this module, it is recommended that the trainee shall have successfully completed: *Core Curriculum; Sprinkler Fitting Level One*; and *Sprinkler Fitting Level Two*, Modules 18201-13 through 18206-13.

### Objectives

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

1. Identify and explain dry-pipe systems and why and where dry-pipe systems are used.
2. Identify dry-pipe valves and trim.
3. Install pressure gauges on an alarm valve.
4. Identify and explain air supplies.
5. Identify and explain accelerators and exhausters.
6. Perform an installation of an accelerator.
7. Explain why an exhauster is a quick-opening device (QOD) and identify possible locations where an exhauster could be installed in a dry-pipe system.
8. Explain pitching sprinkler piping and auxiliary drains in dry-pipe systems.
9. Calculate pitch for dry-pipe systems.
10. Identify and explain fire department connections with respect to dry-pipe systems.
11. Install, set, and adjust an air maintenance device.
12. Reset and troubleshoot a dry-pipe system.
13. Remove and install a faceplate and faceplate gasket.

### Performance Tasks

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

1. Fill out an Aboveground Test Certificate for a hydrostatic test.
2. Install pressure gauges on an alarm valve.
3. Perform an installation of an accelerator.
4. Calculate pitch for dry-pipe systems.
5. Connect an air compressor to a dry-pipe system.
6. Reset and troubleshoot a dry-pipe system.
7. Remove and install a faceplate gasket.

### Materials and Equipment

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Multimedia projector and screen  
*Sprinkler Fitting Level Two*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-272925-3)  
Computer  
Whiteboard/chalkboard  
Markers/chalk

Pencils and scratch paper  
Appropriate personal protective equipment  
Dehydrators  
Compressors  
Fire department connections  
Inspector's test valve  
Dry valve spare parts

*continued*

Drum drip components  
Shop air system  
Air tanks  
Nitrogen tanks  
Trainee hand tools  
Dry-pipe valve trim  
Dry-pipe assembly  
Hydrostatic test equipment  
Exhausters  
Accelerators  
Manufacturer's instructions for accelerators  
Quick-opening device  
Hard hat  
Hand test pump  
Caps and plugs  
Inspector's test connection  
Gaskets  
Gauges  
Alarms  
Rubber clapper seal

Catch basin  
Clean rag  
Fine steel wool  
Emery board  
Valve wrench  
Gate wrench  
Anti-flood device  
Valve and drum drips  
Various types of switches  
Sample dry-pipe valves and drips  
Sample dry-pipe system  
Test certificates  
*NFPA 13*  
*NFPA 25*  
Air maintenance devices  
Air compressors  
Copies of the Quick Quizzes\*  
Module Examination\*\*  
Performance Profile Sheet\*\*

\* 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**

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Ensure that trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures. This module requires trainees to work with pressure gauges and air supply equipment. Ensure all trainees are briefed on proper tool and lifting safety.

## **Additional Resources**

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

*Automatic Sprinkler Handbook*, Latest Edition. Quincy, MA: National Fire Protection Association.

*FM Global Approval Guide*, Latest Edition. Norwood, MA: FM Global.

*NFPA 13*, Latest Edition. Quincy, MA: National Fire Protection Association.

*NFPA 25*, Latest Edition. Quincy, MA: National Fire Protection Association.

*Underwriters Laboratories Fire Protection Equipment Directory*, Latest Edition. Underwriters Laboratories, Inc.

## Teaching Time For This Module

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

Topic	Planned Time
<b>Session I. Introduction; Dry-Pipe System Operation</b>	
A. Introduction	_____
B. Dry-Pipe Valve System Operation	_____
C. Dry-Pipe Valves	_____
D. System Requirements	_____
E. Differential Valves	_____
F. Calculating Capacity	_____
G. Air Pressure Precautions	_____
<b>Sessions II and III. Dry-Pipe Trim; Valve Components</b>	
A. Function of Dry-Pipe Valves and Trim	_____
B. Laboratory	_____
Have trainees practice installing pressure gauges on an alarm valve. This laboratory corresponds to Performance Task 2.	
C. Normal Dry-Pipe Valve Conditions	_____
D. Resetting Dry-Pipe Valves	_____
E. Laboratory	_____
Have trainees practice removing and installing a faceplate gasket. This laboratory corresponds to Performance Task 7.	
F. Maintaining and Testing Components	_____
G. Laboratory	_____
Have trainees practice filling out an Aboveground Test Certificate. This laboratory corresponds to Performance Task 1.	
<b>Sessions IV and V. Quick-Opening Devices</b>	
A. Purpose	_____
B. Operation: Accelerators and Exhausters	_____
C. Piping	_____
D. Installation	_____
E. Laboratory	_____
Have trainees practice installing an accelerator. This laboratory corresponds to Performance Task 3.	
F. Maintenance	_____
<b>Session VI. Pitching Dry-Pipe Systems; Auxiliary Drains</b>	
A. Pitch Requirements	_____
B. Calculating Pitch	_____
C. Auxiliary Drains	_____
D. Inspector's Test Connections	_____
E. Laboratory	_____
Have trainees practice calculating pitch for dry-pipe systems. This laboratory corresponds to Performance Task 4.	

**Sessions VII and VIII. Fire Department Connections and Air Devices**

- A. Fire Department Connections
- B. Basics of Compressed Air
- C. Air Maintenance Devices
- D. Tanks and Air Sources
- E. Use of Nitrogen Tanks
- F. Laboratory

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Have trainees practice connecting an air compressor to a dry-pipe system.  
This laboratory corresponds to Performance Task 5.

**Session IX. Troubleshooting**

- A. Determining the Problem
- B. Collecting and Analyzing Data
- C. Deciding on Action
- D. Performing the Action
- E. Laboratory

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Have trainees practice resetting and troubleshooting a dry-pipe system.  
This laboratory corresponds to Performance Task 6.

- F. Summary

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**Session X. Review and Testing**

- A. Module Review
- B. Module Examination
  - 1. Trainees must score 70% or higher to receive recognition from NCCER.
  - 2. Record the testing results on 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.

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