

Module Overview

This module identifies sprinkler fitter career opportunities and looks at typical work environments. It examines trade-specific safety hazards and workplace safety. It covers the correct use of common tools.

Prerequisites

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

Objectives

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

1. Identify specific codes and standards that apply to the fire sprinkler industry.
2. Define the typical work environment of a sprinkler fitter.
3. Identify career opportunities in the fire sprinkler industry.
4. Describe the personal responsibilities of sprinkler fitters.
5. Recognize safety hazards that you may come across as a sprinkler fitter.
6. Describe procedures to best handle and store trade materials.
7. Recognize drawings typically seen by sprinkler fitters in the field.
8. Identify basic tools, materials, and fire sprinkler systems used in the sprinkler fitter trade.

Performance Tasks

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

1. Correctly use pipe wrenches to remove and install fittings.
2. Show the proper use and care of pliers.
3. Demonstrate using a torpedo level to check horizontal and vertical piping.
4. Cut different types of piping material with a hacksaw.

Materials and Equipment

Multimedia projector and screen	<i>NFPA 22</i>
<i>Sprinkler Fitting Level One</i>	<i>NFPA 24</i>
PowerPoint® Presentation Slides (ISBN 978-0-13-272924-6)	<i>NFPA 25</i>
Computer	<i>OSHA Safety and Health Standards for the Construction Industry</i>
Whiteboard/chalkboard	Copy of an employee manual
Markers/chalk	Pipe wrenches
Pencils and scratch paper	Offset pipe wrench
Appropriate personal protective equipment	Chain wrench
Job announcements for sprinkler fitters from local newspapers (want ads)	Strap wrench
NCCER Apprentice Training Recognition Forms	Sprinkler head wrench
<i>NFPA 13, The Standard for the Installation of Sprinkler Systems</i>	Torque wrench
Installation drawings	Pliers
Copies of local building codes	Torpedo levels
Copies of several standards	Hacksaws
<i>NFPA 13D</i>	Pipe and fittings
<i>NFPA 13R</i>	Different types of piping
<i>NFPA 20</i>	Module Examinations*
	Performance Profile Sheet*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly.

Additional Resources

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

Multimedia Apprenticeship Training Supplement for Fire Sprinkler Fitters. (CD set; Level 1 through Level 4). American Fire Sprinkler Association. www.sprinklernet.org.

NFPA 13, Standard for the Installation of Sprinkler Systems, 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, Standards 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.

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 5 hours are suggested to cover *Orientation to the Trade*. 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. The Sprinkler Fitter Trade	
A. Introduction	_____
B. Fire Sprinkler Systems	_____
C. Codes and Standards	_____
D. Sprinkler Fitter Careers	_____
E. Employee Responsibility and Human Relations	_____
F. Safety	_____
Session II. Tools; Review and Testing	
A. Tools of the Trade	_____
B. Laboratory	_____
Have trainees practice using pipe wrenches, pliers, torpedo levels, and hacksaws. This laboratory corresponds to Performance Tasks 1 through 4.	
C. Your Training Program	_____
D. Review	_____
E. 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.	
F. Performance Testing	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.	

Module Overview

This module covers some of the basic components of a sprinkler system, including sprinklers, underground and aboveground pipe, valves, alarms, hangers, bracing and restraints. It provides an overview of the major types of sprinkler systems and the code requirements for the installation of these systems.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Sprinkler Fitting Level One*, Module 18101-13.

Objectives

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

1. Define the term *Listed* and explain how the term relates to sprinkler systems.
2. Explain the purpose of a Listing agency.
3. Describe the characteristics of common sprinklers.
4. State the important characteristics of aboveground pipe, including wall thickness and joining methods.
5. Define C-factor and list the advantages of a higher C-factor.
6. Describe the types of pipe hangers and sway bracing.
7. Identify the characteristics of control valves, check valves, water flow alarms, and fire department connections.

Performance Tasks

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

Materials and Equipment

Multimedia projector and screen	Several sizes of steel pipe
<i>Sprinkler Fitting Level One</i>	Samples of copper tubing and CPVC pipe
PowerPoint® Presentation Slides (ISBN 978-0-13-272924-6)	Various fittings
Computer	Steel pipe used in underground applications
Whiteboard/chalkboard	Several types of hangers
Markers/chalk	Various types of valves
Pencils and scratch paper	Water flow alarm
Appropriate personal protective equipment	Fire department connections
<i>NFPA 13, The Standard for the Installation of Sprinkler Systems</i>	Quick Quiz*
Upright, pendent, sidewall, and conventional sprinklers	Module Examinations**

* Located at the back of this module.

** Single-module AIG purchases include the printed exam. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly.

Additional Resources

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

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

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

The Pipe Fitters Blue Book, 2002. Graves. Webster, TX: W.V. Graves Publishing Company.

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

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 *Introduction to Components and Systems*. 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. Sprinkler Systems	
A. Introduction	_____
B. Listing Agencies	_____
C. Sprinkler Systems	_____
Session II. Pipe, Fittings, and Hangers	
A. Aboveground Pipe and Tube	_____
B. Underground Pipe	_____
C. Hangers, Bracing, and Restraint-of-System Piping	_____
Session III. Valves, Review, and Testing	
A. Valves	_____
B. Water Flow Alarms	_____
C. Fire Department Connections	_____
D. Review	_____
E. Module Examination	_____
1. Trainees must score 70% or higher to receive recognition from NCCER.	
2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.	

Module Overview

This module describes the materials used in steel piping systems and the tools used to cut and thread steel pipe. It explains how to determine pipe lengths between fittings (takeouts). It describes methods to cut, thread, and groove pipe. It covers threaded, plain-end, and flanged fittings and discusses grooved pipe fittings and installation techniques.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Sprinkler Fitting Level One*, Modules 18101-13 and 18102-13.

Objectives

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

1. Follow basic safety precautions for preparing and installing steel pipe.
2. Identify types of steel pipe and fittings.
3. Recognize tools for cutting and threading steel pipe.
4. Calculate takeouts.
5. Set up equipment, including power threading machines.
6. Measure, cut, ream, and thread steel pipe.
7. Assemble threaded, grooved, and plain-end pipe.
8. Check for correctness of pipe-end preparation.
9. Read a fitting.

Performance Tasks

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

1. Cut pipe using steel pipe cutters.
2. Ream pipe.
3. Thread pipe using a manual pipe threader.
4. Set up a power threading machine.
5. Assemble threaded and grooved piping.
6. Read a fitting.
7. Apply pipe thread compound to the end of steel pipe.
8. Make up several types of fittings.
9. Identify appropriate gaskets for fittings.
10. Calculate pipe length between fittings.

Materials and Equipment

Multimedia projector and screen

Sprinkler Fitting Level One

PowerPoint® Presentation Slides
(ISBN 978-0-13-272924-6)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper,

Appropriate personal protective equipment

Various sizes and types of steel pipe

ASTM A53

Steel pipe cutters

Hinged cutters

Manual pipe threader and dies

Assorted elbows

Couplings

Unions

Bushings

Caps and plugs

Mechanical tees

Nipples

Plain end fittings

Coupling with grippers

Groovers

continued

Hole cutting tools
Grooved couplings
Flanged fittings
Flanges
Gaskets
Gasket lubricant
Examples of various pipe threads
Thread and ring gauges
Fitting manufacturer's makeup chart
Fitting manufacturer's takeout chart
Pipe drawings
Power threading machine
Cutting oil
Pipe stand
Vises

Reamers
Pipe cleaning tool
3/8-inch to 3/4-inch sets of open-end wrenches
Adjustable wrenches
Channel-lock pliers
Drift pins
Framing squares
Measuring tape
Soapstones
Torque wrenches
Liquid Teflon®
Teflon® tape
Pipe dope
Module Examinations*
Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to work with hand and power tools. Ensure that they are briefed on shop safety procedures.

Additional Resources

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

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

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

Standard USAS (ASME) B1.20.1. New York, NY: American National Standards Institute Inc.

The Handbook of Steel Pipe, Latest Edition. Washington, DC: American Iron and Steel Institute.

The Pipefitters Blue Book, 2002. W.V. Graves. Webster, TX: Graves Publishing Company.

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

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 22½ hours are suggested to cover *Steel Pipe*. 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. Threaded Piping Systems	
A. Introduction	_____
B. Materials Used in Threaded Piping Systems	_____
C. Cutting Tools	_____
D. Laboratory	_____
Have trainees practice cutting and reaming steel pipe. This laboratory corresponds to Performance Tasks 1 and 2.	
Sessions II and III. Threads	
A. Threads	_____
B. Manual Pipe Threader	_____
C. Laboratory	_____
Have trainees practice threading pipe with a manual pipe threader. This laboratory corresponds to Performance Task 3.	
D. Power Threading Machine	_____
E. Laboratory	_____
Have trainees practice setting up a power threading machine. This laboratory corresponds to Performance Task 4.	
Sessions IV and V. Assembly Techniques	
A. Pipe Joint Compound	_____
B. Laboratory	_____
Have trainees practice applying pipe joint compound. This laboratory corresponds to Performance Task 7.	
C. Laboratory	_____
Have trainees practice assembling threaded piping. This laboratory corresponds to Performance Task 5.	
D. Selecting Threaded Fittings	_____
E. Laboratory	_____
Have trainees practice reading a fitting. This laboratory corresponds to Performance Task 6.	
F. Making Up Pipe and Fittings	_____
G. Laboratory	_____
Have trainees practice making up the pipe and fitting. This laboratory corresponds to Performance Task 8.	

Sessions VI and VII. Specialty Pipe

A. Plain Ends

B. Grooved Pipe

C. Laboratory

Have trainees practice assembling grooved pipe. This laboratory corresponds to Performance Task 5.

D. Flanged Pipe

E. Laboratory

Have trainees practice identifying appropriate gaskets for fittings. This laboratory corresponds to Performance Task 9.

Session VIII. Determining Pipe Length

A. Determining Pipe Length Between Fittings

B. Laboratory

Have trainees practice determining pipe length between fittings. This laboratory corresponds to Performance Task 10.

Session IX. 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

This module describes the handling and storage of CPVC pipe and outlines methods and tools for cutting, chamfering, and cleaning CPVC pipe, including calculating takeouts. It identifies CPVC safety concerns. Joining techniques are described, particularly the solvent-cement (one-step) method. The rules for using plastic pipe hangers are also explained.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Sprinkler Fitting Level One*, Modules 18101-13 through 18103-13.

Objectives

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

1. Follow basic safety precautions for preparing and installing CPVC pipe.
2. Recognize chemical compatibility issues when joining CPVC pipe to other materials.
3. Identify approved types of CPVC pipe and fittings.
4. Recognize tools for cutting and chamfering CPVC pipe.
5. Calculate takeouts.
6. Set up equipment.
7. Cut, chamfer, and clean CPVC pipe.
8. Properly prepare pipe ends.
9. Join and cure CPVC pipe.

Performance Tasks

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

1. Calculate takeouts for CPVC pipe.
2. Connect CPVC pipe to other materials.
3. Prepare work area.
4. Prepare and join CPVC pipe and fittings.
5. Cut, chamfer, and cement CPVC pipe.
6. Cure CPVC.

Materials and Equipment

Multimedia projector and screen

Sprinkler Fitting Level One

PowerPoint® Presentation Slides
(ISBN 978-0-13-272924-6)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

Manufacturer's literature on CPVC

Samples of CPVC pipe

Various CPVC fittings

Sample restraints

Depth gauge/cold ring

Manufacturer's installation instructions

Solvent-cement and applicator

Directions for using solvent-cement

MSDS for solvent-cement

Thread sealant

Primer

Rags

CPVC pipe cutting tools:

CPVC pipe saw

Tubing cutters

Chop saw

Ratchet shears

Anvil cutter

continued

Reamers
Deburring tools
Manufacturer's charts for set and cure times
Hangers

Escutcheons
Module Examinations*
Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to work with hand and power tools. Ensure that they are briefed on shop safety procedures. This module requires trainees to work with chemicals. Ensure all trainees are briefed on HazCom and chemical safety procedures including first aid, ventilation, and personal protective equipment.

Additional Resources

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

BlazeMaster® Online Training Program, www.blazemastertraining.com.

Multimedia Apprenticeship Training Supplement for Fire Sprinkler Fitters (CD set: Level 1 through Level 4). American Fire Sprinkler Association. www.sprinklernet.org.

NFPA 13, Standard for the Installation of Sprinkler Systems, 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.

Standard 203, Standard for Pipe Hanger Equipment for Fire Protection Service, Latest Edition. Northbrook, IL: Underwriters Laboratories.

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 *CPVC Pipe and Fittings*. 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. CPVC Piping Systems and Fittings	
A. Introduction	_____
B. CPVC Pipe	_____
C. CPVC Fittings	_____
D. Calculating Takeouts	_____
E. Laboratory	_____
Have trainees practice calculating takeouts for CPVC pipe. This laboratory corresponds to Performance Task 1.	

Session II. Preparing CPVC Pipe

A. Preparing the Work Area

B. Laboratory

Have trainees practice preparing the work area. This laboratory corresponds to Performance Task 3.

C. Cutting CPVC

D. Chamfering and Cleaning CPVC

E. Cementing CPVC

F. Laboratory

Have trainees practice cutting, chamfering, and cementing CPVC pipe. This laboratory corresponds to Performance Task 5.

Session III. Assembly Techniques

A. Joining CPVC Pipe

B. Laboratory

Have trainees practice preparing and joining CPVC pipe and fittings. This laboratory corresponds to Performance Task 4.

C. Curing CPVC

D. Laboratory

Have trainees practice curing CPVC pipe. This laboratory corresponds to Performance Task 6.

E. Connecting CPVC Pipe to Other Materials

F. Laboratory

Have trainees practice joining CPVC pipe and fittings. This laboratory corresponds to Performance Task 2.

Session IV. Hangers; Review and Testing

A. Rules for Using Hangers on CPVC

B. Module Review

C. Module Examination

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

D. Performance Testing

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

Module Overview

This module describes copper tubing and fittings along with cutting and bending tools. It explains how to measure, cut, ream, clean and solder copper tube. The brazing process is described as are brazing metals, fluxes, and brazing equipment. Support bracing and grooved couplings are also discussed.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Sprinkler Fitting Level One*, Modules 18101-13 through 18104-13.

Objectives

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

1. Follow basic safety precautions for preparing and installing copper tube.
2. Identify approved types of copper tube and fittings.
3. Identify and describe cast bronze fittings.
4. Identify wrought fittings.
5. Identify and select dielectric fittings.
6. Solder and braze copper tubing joints.
7. Calculate takeouts.
8. Set up equipment.
9. Cut, chamfer, and clean copper tube.
10. Properly prepare tube ends.

Performance Tasks

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

1. Identify wrought fittings.
2. Identify and describe cast bronze fittings.
3. Identify and select dielectric fittings.
4. Perform soldering of copper tubing joints.
5. Perform brazing of copper tubing joints.

Materials And Equipment

Multimedia projector and screen	Portable band saws, chop saws, or hacksaws
<i>Sprinkler Fitting Level One</i>	Reaming tool
PowerPoint® Presentation Slides (ISBN 978-0-13-272924-6)	Deburring tool
Computer	Tube-bending equipment
Whiteboard/chalkboard	Various tools used to bend copper tube
Markers/chalk	Grooved couplings
Pencils and scratch paper	Mechanical fasteners
Appropriate personal protective equipment	T-drill
Various sizes and types of copper tube	Drill
Wrought fittings	Tube end notcher
Cast bronze fittings	<i>ASTM B828</i>
Dielectric fittings	Cleaning materials (sandpaper, files)
Fitting manufacturer's takeout chart	Fitting brush
Various types of tube cutters	Soldering torch
	Wire solder

continued

Flux brush and solder paste
Tape measure
Level
Cleaning rags
Manufacturer's makeup chart
Oxyacetylene brazing equipment (compressed gas, regulators, hoses, torch, torch tips)

Friction lighters
Filler rods
Flux and flux brush
Sample hangers
Sample restraints
Module Examinations*
Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to work with hand and power tools. Ensure that they are briefed on shop safety procedures. This module requires trainees to work with torches. Ensure all trainees are briefed on fire safety procedures including fire extinguishers, fire watches, and personal protective equipment.

Additional Resources

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

Cast Copper Solder-Joint Pressure Fittings, ASME B16.18, Current Edition. New York, NY: American Society of Mechanical Engineers.

How to Successfully Install Copper Fire Sprinkler Systems, 1989. Video. American Fire Sprinkler Association.

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

Specification for Seamless Copper Water Tube, ASTM B88, Latest Edition. West Conshohocken, PA: American Society for Testing and Materials International.

Specification for Seamless Copper Pipe, ASTM B42, Latest Edition. West Conshohocken, PA: American Society for Testing and Materials International.

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

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

Victaulic Field Assembly and Installation Instruction Pocket Handbook I-100. Easton, PA: Victaulic Company of America.

Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings, ASME B16.22, Latest Edition. New York, NY: American Society of Mechanical Engineers.

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 *Copper Tube 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 the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
Session I. Copper Tubing and Fittings	
A. Introduction	_____
B. Copper Tubing	_____
C. Wrought Fittings	_____
D. Cast Bronze Fittings	_____
E. Dielectric Fittings	_____
F. Laboratory	_____
Have trainees practice identifying wrought, cast bronze, and dielectric fittings. This laboratory corresponds to Performance Tasks 1 through 3.	
G. Takeouts	_____
Session II. Preparing and Soldering Copper Tubing	
A. Cutting Copper Tube	_____
B. Bending Copper Tube	_____
C. Preparing Tubing and Fittings for Soldering	_____
D. Soldering	_____
E. Laboratory	_____
Have trainees practice soldering copper tubing joints. This laboratory corresponds to Performance Task 4.	
Session III. Brazing	
A. Brazing Metals and Fluxes	_____
B. Preparing Tubing and Fittings for Brazing	_____
C. Equipment Setup	_____
D. Brazing Techniques	_____
E. Laboratory	_____
Trainees practice brazing copper tubing joints. This laboratory corresponds to Performance Task 5.	
Session IV. Support; Review and Testing	
A. Support for Copper Tubing	_____
B. Grooved Couplings For Copper Tube	_____
C. Module Review	_____
D. 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.	
E. Performance Testing	_____
1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.	
2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.	

Module Overview

This module identifies the types and properties of soil. It discusses guidelines for working in or near a trench, including methods for digging trenches and making them safe. It describes underground pipe installation for various types of pipe, including bedding, backfilling, thrust blocks, and restraints. It explains in-building risers, hydrants, yard valves, and hydrant hoses. It covers testing, inspection, flushing, chlorinating, and underground test certificates.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum* and *Sprinkler Fitting Level One*, Modules 18101-13 through 18105-13.

Objectives

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

1. Identify types and properties of soil.
2. Identify trenching safety requirements.
3. Explain sloping requirements for different types of soil.
4. Explain how to dig trenches.
5. Describe excavation support (shoring) systems.
6. Describe types of bedding material.
7. Identify and describe types of underground pipe.
8. Describe thrust blocks and restraints.
9. Identify and describe hydrants, yard valves, hydrant hoses, and associated equipment.
10. Explain testing, inspection, and chlorinating of underground pipe.
11. Fill out an underground test certificate.

Performance Tasks

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

1. Use the bar and block method and lever pullers to fit pipe.
2. Cut different types of pipe.
3. Use service and saddle clamps.
4. Set the target on a post indicator valve.
5. Use spanners and hydrant wrenches to open and close a hydrant.
6. Fill out an underground test certificate.

Materials and Equipment

Multimedia projector and screen

Sprinkler Fitting Level One

PowerPoint® Presentation Slides
(ISBN 978-0-13-272924-6)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

One-Call information cards or brochures

Samples of local soils

Boxes

Scale

Digging tool

Manufacturer's literature on backhoes and wheel
trenchers

Samples of underground pipe and fittings

Various valves used with underground pipe

Fittings-underground

Plastic (PVC) pipe and fittings

Slip joint

Mechanical joint

continued

Retaining gland
 Pry bar
 Blocks of wood
 Lever pullers
 Chain
 Pipe marker
 Hacksaw
 Abrasive saw
 Lubricant
 Underground ratchet
 Tapping sleeve
 Corporation stops

Service clamps
 Saddle clamps
 Hoses
 Eyebolts and T-bolts
 Calculators
 Spanner wrench
 Hydrant wrenches
 Fire hose and nozzle
 Underground Test Certificates
 Module Examinations*
 Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to work with hand and power tools. Ensure that they are briefed on shop safety procedures.

Additional Resources

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

Excavations. Washington, DC: OSHA Publications Office.

Multimedia Apprenticeship Training Supplement for Fire Sprinkler Fitters (CD set: Level 1 through Level 4). American Fire Sprinkler Association. www.sprinklernet.org.

NFPA 13, Installation of Sprinkler Systems, Latest Edition. Quincy, MA: National Fire Protection Association.

NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, Latest Edition. Quincy, MA: National Fire Protection Association.

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 17½ hours are suggested to cover *Underground Pipe*. 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; Trenching	
A. Introduction	_____
B. Trenching Hazards	_____
C. Guidelines for Working in and Near a Trench	_____
D. Indications of an Unstable Trench	_____
E. Digging Trenches	_____
F. Making Trenches Safe	_____

Sessions III and IV. Underground Pipe Installations

- A. Bedding and Backfilling _____
- B. Underground Pipe Installations _____
- C. Laboratory _____
Have trainees practice fitting pipe. This laboratory corresponds to Performance Task 1.
- D. Laboratory _____
Have trainees practice cutting pipe. This laboratory corresponds to Performance Task 2.
- E. Laboratory _____
Have trainees practice using clamps. This laboratory corresponds to Performance Task 3.
- F. Thrust Blocks and Restraints _____

Sessions V and VI. Risers, Valves, and Hydrants; Testing

- A. In-Building Riser _____
- B. Backflow Preventers _____
- C. Hydrants _____
- D. Laboratory _____
Have trainees practice opening and closing a hydrant. This laboratory corresponds to Performance Task 5.
- E. Yard Valves and Related Appurtenances _____
- F. Laboratory _____
Have trainees practice working with post-indicator valves. This laboratory corresponds to Performance Task 4.
- G. Testing and Inspections _____
- H. Laboratory _____
Have trainees practice filling out Underground Test Certificates. This laboratory corresponds to Performance Task 6.

Session VII. 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.