American Fire Sprinkler Association
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Contren® Learning Series

Apprenticeship Training Program for Fire Sprinkler Fitters

(Published jointly by American Fire Sprinkler Association and the National Center for Construction Education and Research.)

Series H, Level I – 15 Modules

(H5) Upon completion of Level I the trainee will be awarded 16.0 CEUs (160 Credit Hours).

Module 00101-09 Basic Safety (12.5 Hours)
Complies with OSHA-10 training requirements. Explains the safety obligations of workers, supervisors, and managers to ensure a safe workplace. Discusses the causes and results of accidents and the impact of accident costs. Reviews the role of company policies and OSHA regulations. Introduces common job-site hazards and identifies proper protections. Defines safe work procedures, proper use of personal protective equipment, and working with hazardous chemicals. Identifies other potential construction hazards, including hazardous material exposures, welding and cutting hazards, and confined spaces.

Lesson 1 (Sections 1.0.0 through 10.2.0)
Lesson 2 (Sections 10.3.0 through Summary)

Module 00102-09 Introduction to Construction Math (10 Hours)
Reviews basic mathematical functions such as adding, subtracting, dividing, and multiplying whole numbers, fractions, and decimals, and explains their applications to the construction trades. Explains how to use and read various length measurement tools, including standard and metric rulers and tape measures, and the architect's and engineer's scales. Explains decimal-fraction conversions and the metric system, using practical examples. Also reviews basic geometry as applied to common shapes and forms.

Lesson 3 (Sections 1.0.0 through 4.8.0)
Lesson 4 (Sections 5.0.0 through Summary)

Module 00103-09 Introduction to Hand Tools (10 Hours)
Introduces trainees to hand tools that are widely used in the construction industry, such as hammers, saws, levels, pullers, and clamps. Explains the specific applications of each tool and shows how to use them properly. Also discusses important safety and maintenance issues related to hand tools.

Lesson 5 (All sections)

Module 00104-09 Introduction to Power Tools (10 Hours)
Provides detailed descriptions of commonly used power tools, such as drills, saws, grinders, and sanders. Reviews applications, proper use, safety, and maintenance. Many illustrations show power tools used in on-the-job settings.

Lesson 6 (All sections)

Module 00105-09 Introduction to Construction Drawings (10 Hours)
Familiarizes trainees with basic terms for construction drawings, components, and symbols. Explains the different types of drawings (civil, architectural, structural, mechanical, plumbing/piping, electrical, and fire protection) and instructs trainees on how to interpret and use drawings dimensions. Four oversized drawings are included.

Lesson 7 (All sections)

Module 00106-09 Basic Rigging (15 Hours)

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Explains how ropes, chains, hoists, loaders, and cranes are used to move material and equipment from one location to another on a job site. Describes inspection techniques and load-handling safety practices. Also reviews American National Standards Institute (ANSI) hand signals.

Lesson 8 (All sections)

Module 00107-09 Basic Communication Skills (7.5 Hours)
Provides trainees with techniques for communicating effectively with co-workers and supervisors. Includes practical examples that emphasize the importance of verbal and written information and instructions on the job. Also discusses effective telephone and email communication skills.

Module 00108-09 Basic Employability Skills (7.5 Hours)
Identifies the roles of individuals and companies in the construction industry. Introduces trainees to critical thinking and problem-solving skills and computer systems and their industry applications. Also reviews effective relationship skills, effective self-presentation, and key workplace issues such as sexual harassment, stress, and substance abuse.

Lesson 9 (All sections in both modules)

Module 00109-09 Introduction to Materials Handling (5 Hours)
Recognizes hazards associated with materials handling and explains proper materials handling techniques and procedures. Also introduces materials handling equipment, and identifies appropriate equipment for common job-site tasks.

Lesson 10 (All sections)

Module 18101-07 – Orientation to the Trade (5 hours)
Upon completion of this module, the trainee will be able to identify career opportunities in the Sprinkler Fitting industry, define the typical work environment of a sprinkler fitter, identify basic tools and materials of the trade, identify trade-specific safety hazards, identify plans specific to the sprinkler fitting industry, and define how to best organize job-site materials.

Lesson 11 (Sections 1.0.0 through 5.10.0)
Lesson 12 (Sections 6.0.0 through Summary)

Module 18102-07 – Introduction to Components & Systems (7.5 hours)
Upon completion of this module, the trainee will be able to define the term Listed and explain how the term relates to sprinkler systems, explain the purpose of a Listing agency, describe the characteristics of common sprinkler heads, state the important characteristics of aboveground pipe, including wall thickness and joining methods, define C-factor and list the advantages of a higher C-factor, describe the types of pipe hangers and sway bracing, and identify the characteristics of control valves, check valves, water flow alarms, and fire department connections.

Lesson 13 (Sections 1.0.0 through 3.5.0)
Lesson 14 (Sections 4.0.0 through Summary)

Module 18103-07 – Steel Pipe (22.5 hours)
Upon completion of this module, the trainee will be able to follow basic safety precautions for the preparation and installation of steel pipe, identify types of steel pipe, calculate take-outs, set up equipment, measure and cut steel pipe, assemble threaded, grooved, and plain-end pipe, and check for correctness of end preparation.

Lesson 15 (Sections 1.0.0 through 4.2.0)
Lesson 16 (Sections 5.0.0 through 6.4.0)
Lesson 17 (Sections 7.0.0 through 8.4.5)
Lesson 18 (Sections 8.4.6 through Summary)

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Module 18104-07 – CPVC Pipe and Fittings (10 hours)
Upon completion of this module, the trainee will be able to follow basic safety precautions for the preparation and installation of CPVC pipe, identify approved CPVC pipe, calculate take-outs, set up equipment, join and cure CPVC pipe, and check for correctness of end preparation.

Lesson 19 (Sections 1.0.0 through 3.3.0)
Lesson 20 (Sections 4.0.0 through Summary)

Module 18105-07 – Copper Tube Systems (10 hours)
Upon completion of this module, the trainee will be able to follow basic safety precautions for the preparation and installation of plastic pipe, identify approved types of copper pipe, calculate take-outs, set up equipment, cut, chamfer, and clean copper pipe, and check for correctness of end preparation.

Lesson 21 (Sections 1.0.0 through 5.6.0)
Lesson 22 (Sections 6.0.0 through Summary)

Module 18106-07 – Underground Pipe (17.5 hours)
Upon completion of this module, the trainee will be able to identify types and properties of soil, explain excavation safety, explain sloping requirements for different types of soil, explain digging trenches, describe excavation support systems, describe types of bedding material, identify and describe types of underground pipe, describe thrust blocks and restraints, identify and describe hydrants, yard valves, hydrant houses, and associated appurtenances, explain testing, inspection, and chlorinating of underground pipe, and fill out an Underground Test Certificate.

Lesson 23 (Sections 1.0.0 through 6.1.4)
Lesson 24 (Sections 6.2.0 through 8.15.0)
Lesson 25 (Sections 9.0.0 through Summary)

Series H, Level II – 7 Modules

(H6) Upon completion of Level II the trainee will be awarded 15.25 CEUs (152.5 Credit Hours).

Module 18201-07 – Hangers, Supports, Restraints, and Guides (15 hours)
Upon completion of this module, the trainee will be able to identify and describe strength requirements of pipe hangers, supports, restraints, and guides, identify and describe spacing requirements of pipe hangers, supports, restraints, and guides, identify and describe types of pipe hangers, supports, restraints and guides, install pipe hangers, supports, restraints, guides, and anchors, identify and explain types of earthquake bracing, install earthquake bracing, describe and explain sleeving and firestopping, and cut a hanger to a specified length.

Lesson 1 (Sections 1.0.0 through 2.5.4)
Lesson 2 (Sections 3.0.0 through 4.4.0)
Lesson 3 (Sections 5.0.0 through Summary)

Module 18202-07 – General Purpose Valves (15 hours)
Upon completion of this module, the trainee will be able to identify the basic types of valves, demonstrate the ability to service different types of valves, define the general purpose of a backflow preventer, install outside stem and yoke (OS&Y) valves, install a tamper switch, install butterfly grooved valves, and disassemble, service, and reassemble a check valve.

Lesson 4 (Sections 1.0.0 through 3.1.2)
Lesson 5 (Sections 3.1.3 through 4.4.0)
Lesson 6 (Sections 5.0.0 through Summary)

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Module 18203-07 – General Trade Math (20 hours)
Upon completion of this module, the trainee will be able to use basic math principles to solve problems, convert fundamental measurement quantities from the English system to the metric system, and from metric to English, recognize the effects of temperature on sprinkler systems, calculate 45-degree offsets and tank volume, center sprinkler heads using the target, square offset, and geometric methods, and solve sprinkler system problems relating to changes in elevation, sprinkler, discharge, and hanger sizing.

Lesson 7 (Sections 1.0.0 through 2.3.3)
Lesson 8 (Sections 2.3.4 through 3.2.0)
Lesson 9 (Sections 3.3.0 through Summary)

Module 18204-07 – Shop Drawings (32.5 hours)
Upon completion of this module, the trainee will be able to identify common structural symbols on a shop drawing, identify cut lengths and sizes of pipe on an installation drawing, identify the materials to perform an installation from drawings, identify standard sprinkler system symbols, interpret a legend and calculate the number of sprinklers to be used in an installation, identify the orifice size of a sprinkler from drawings, identify the temperature rating of a sprinkler from a drawing, calculate the square footage and the number of sprinklers required for a given area, and lay out sprinkler hanger locations.

Lesson 10 (Sections 1.0.0 through 1.3.6)
Lesson 11 (Sections 1.4.0 through 3.2.1)
Lesson 12 (Sections 3.2.2 through Summary)

Module 18205-07 – Standard Spray Fire Sprinklers (20 hours)
Upon completion of this module, the trainee will be able to, using a shop drawing you are currently installing on a project, identify unobstructed and obstructed construction on the drawing, and explain why these construction types are obstructed or unobstructed, calculate maximum coverage area of standard sprinklers for various occupancies, calculate spacing using the small room rule, determine sprinkler temperatures by examining different sprinklers, calculate the maximum spacing of sidewall sprinklers using the protection area rule, and referencing a Sprinkler Identification Number (SIN), identify the manufacturer and sprinkler type.

Lesson 13 (Sections 1.0.0 through 2.1.0)
Lesson 14 (Sections 2.2.0 through 3.2.5)
Lesson 15 (Sections 4.0.0 through 4.5.0)
Lesson 16 (Sections 4.6.0 through Summary)

Module 18206-07 – Wet Pipe Fire Sprinkler Systems (25 hours)
Upon completion of this module, the trainee will be able to describe riser check, alarm check valves, and trim, trim an alarm check valve and replace the faceplate gasket, identify and describe flow switches, tamper switches, and pressure switches, install a flow switch and set the retard device, identify and explain fire department connections and hose stations, explain inspector's test connections and auxiliary drains, explain hydrostatic testing and test pumps, perform a hydrostatic test using a pump, describe antifreeze systems, calculate the specific gravity of an antifreeze solution, and complete a contractor's material & test certificate, and identify a faulty pressure gauge and replace it.

Lesson 17 (Sections 1.0.0 through 3.1.5)
Lesson 18 (Sections 3.2.0 through 4.7.0)
Lesson 19 (Sections 5.0.0 through 6.7.0)
Lesson 20 (Sections 7.0.0 through Summary)

Module 18207-07 – Dry Pipe Systems (25 hours)

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Upon completion of this module, the trainee will be able to identify and explain dry-pipe systems and why and where dry pipe systems are used, identify dry-pipe valves and trim, install pressure gauges on an alarm valve, identify and explain air supplies, identify and explain accelerators and exhausters, perform an installation of an accelerator, explain why an exhauster is a quick-opening device and describe possible locations where an exhauster could be installed in a dry pipe system, explain pitching sprinkler piping and auxiliary drains in dry-pipe systems, calculate pitch for dry-pipe systems, identify and explain fire department connections with respect to dry pipe systems, install, set and adjust an air maintenance device, remove and install a faceplate gasket, and reset and troubleshoot a dry-pipe system.

Lesson 21 (Sections 1.0.0 through 3.1.4)
Lesson 22 (Sections 3.2.0 through 4.4.0)
Lesson 23 (Sections 4.5.0 through 6.0.0)
Lesson 24 (Sections 7.0.0 through Summary)

Series H, Level III – 5 Modules

(H7) Upon completion of Level III the trainee will be awarded 14.75 CEUs (147.5 Credit Hours).

Module 18301-07 – Deluge/Preaction Systems (40 Hours)

Upon completion of this module, the trainee will be able to identify and explain differences between deluge and preaction systems, identify the critical components of a deluge system and preaction system, explain where preaction systems and deluge systems are generally installed, trip and reset a deluge valve, identify the three types of discharge nozzles used with a deluge system, identify and explain various methods of activating electrical release and electrical supervision, demonstrate the procedures to place a Firecycle® system in service, identify and explain non-, single-, and double-interlocked preaction systems, explain the main precautions that must be observed when placing non-, single-, and double-interlock systems into service and describe activation, and perform a hydrostatic test.

Lesson 1 (Sections 1.0.0 through 2.3.1)
Lesson 2 (Sections 2.3.2 through 2.4.4)
Lesson 3 (Sections 2.4.5 through 3.1.0)
Lesson 4 (Sections 3.2.0 through 3.3.4)
Lesson 5 (Sections 4.0.0 through 4.2.6)
Lesson 6 (Sections 4.3.0 through Summary)

Module 18302-07 – Standpipes (25 Hours)

Upon completion of this module, the trainee will be able to identify the different types and classifications of standpipes, explain the requirements for standpipes for buildings under construction, explain the basic requirements for sizing standpipes hydraulically and by schedule, describe a hose rack assembly and how it works, describe roof manifolds, identify and explain fire department connections, identify types of hose valves and adapters, demonstrate flow test procedures used to validate minimum pressure and flow capability, identify, test, and adjust a pressure-reducing valve (PRV), and demonstrate LINK-SEAL® installation procedures.

Lesson 7 (Sections 1.0.0 through 4.7.0)
Lesson 8 (Sections 5.0.0 through 7.0.0)
Lesson 9 (Sections 8.0.0 through 11.0.0)
Lesson 10 (Sections 12.0.0 through 13.5.3)
Lesson 11 (Sections 13.6.0 through Summary)

Module 18303-07 – Water Supplies (15 Hours)

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Upon completion of this module, the trainee will be able to recognize federal, state, and jurisdictional requirements for supply and disposal of fire sprinkler system water, identify different water supplies for automatic sprinkler systems, explain the three qualities that are critical to the water supply for fire sprinkler systems, identify types of water storage and explain their usage, describe different water main configurations, perform flow test procedures, plot residual and static pressure on a graph, read a flow test results sheet and determine the number of outlets flowed, hydrant outlet size, and static and residual pressure, fill out a flow test summary sheet, identify and describe backflow preventers and methods of installation, and identify and describe meters used in fire sprinkler systems.

Lesson 12 (Sections 1.0.0 through 3.1.2)
Lesson 13 (Sections 3.2.0 through 4.1.3)
Lesson 14 (Sections 5.0.0 through 5.4.0)
Lesson 15 (Sections 6.0.0 through Summary)

Module 18304-07 – Fire Pumps (40 Hours)
Upon completion of this module, the trainee will be able to explain the basic components and types that make up a fire pump system, identify the NFPA standard hat covers the installation of fire pumps, explain the minimum residual pressure in pounds per square inch (psi) that can be used when pumping from a municipal water supply, convert pressure ratings from psi to feet of head and vice versa, explain how to set and align a pump, discuss he different types of and requirements for fire pump controllers, discuss monitoring requirements for fire for the pumps, describe acceptance testing of fire pumps, perform a mechanical check of a fire pump system, measure the flow of a system, and identify potential causes for a malfunctioning fire pump.

Lesson 16 (Sections 1.0.0 through 1.7.2)
Lesson 17 (Sections 2.0.0 through 2.9.0)
Lesson 18 (Sections 3.0.0 through 3.18.2)
Lesson 19 (Sections 4.0.0 through 6.4.0)
Lesson 20 (Sections 6.5.0 through 6.10.0)
Lesson 21 (Sections 7.0.0 through Summary)

Module 18305-07 – Application-Specific Sprinklers and Nozzles (27.5 Hours)
Upon completion of this module, the trainee will be able to identify, describe, and explain application-specific sprinklers, explain area of coverage, positioning, and obstruction requirements, select correct types of sprinklers based on occupancy and obstruction requirements, select proper escutcheon for recess sprinklers, identify and explain nozzles, describe different types of nozzles, size and install dry sprinklers, and size and install an attic sprinkler.

Lesson 22 (Sections 1.0.0 through 2.3.3)
Lesson 23 (Sections 2.4.0 through 2.7.1)
Lesson 24 (Sections 2.8.0 through 2.11.2)
Lesson 25 (Sections 3.0.0 through Summary)

Series H, Level IV – 4 Modules

(H8) Upon completion of Level IV the trainee will be awarded 14.5 CEUs (145 Credit Hours).

Module 18401-07 – System Layout (45 Hours)
Upon completion of this module, the trainee will be able to explain system design, pipe sizing, and hydraulic calculations, identify and describe the four different system configurations, explain the differences between pipe schedule design and hydraulic design, identify and describe extra

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hazard, ordinary hazard, light hazard, and residential occupancies, identify and explain flow characteristics, explain pressure loss considerations, hydraulically calculate branch lines, perform steps to hydraulically calculate a branch line, calculate main piping hydraulics, and explain how pipe schedule relates to hazard classifications.

Lesson 1 (Covering Sections 1.0.0 through 2.4.0)
Lesson 2 (Covering Sections 2.5.0 through 2.5.6)
Lesson 3 (Covering Sections 2.6.0 through 2.6.3)
Lesson 4 (Covering Sections 2.7.0 through 3.0.0)
Lesson 5 (Covering Sections 3.1.0 through 3.1.6)
Lesson 6 (Covering Sections 3.2.0 through Summary)

Module 18402-07 – Inspection, Testing, and Maintenance (17.5 Hours)
Upon completion of this module, the trainee will be able to describe the reasons for unsatisfactory sprinkler performance, explain initial system testing and inspections for aboveground, underground, and overhead pipe, describe the flushing process for underground piping/mains, describe the importance of periodic inspections of sprinkler systems, explain the report of inspection and how it must relate to the chapters included in *NFPA 25*, explain the difference between warranty repair and owner repair, explain the general preparations for system repair, describe the specific repair considerations for deluge and preaction systems, describe the general preparation procedures for inspection, maintenance, and repair of special systems, explain the required procedures to test all types of valves, perform a main drain test, and complete inspection and testing of water-based and wet standpipe systems and complete the required documentation.

Lesson 7 (Covering Sections 1.0.0 through 2.3.0)
Lesson 8 (Covering Sections 3.0.0 through 4.4.0)
Lesson 9 (Covering Sections 4.5.0 through 5.2.0)
Lesson 10 (Covering Sections 5.3.0 through Summary)

Module 18403-07 – Special Extinguishing Systems (42.5 Hours)
Upon completion of this module, the trainee will be able to describe the three methods of heat transfer, explain the basic principles of exposure protection, identify what piping and fitting materials can be used and where they must be located in an exposure system, explain where water spray systems are typically used, explain the general concepts of using foam as opposed to water as an extinguishing agent, describe the different classes of foam concentrates and foam sprinkler system configurations, explain how to measure density using a refractometer, identify the five basic automatic fire detection methods that can be used for electric release, describe the dangers when working with a carbon dioxide system, and describe the different classes of fire extinguishers and what the rating designations mean.

Lesson 11 (Covering Sections 1.0.0 through 3.4.2)
Lesson 12 (Covering Sections 3.5.0 through 4.3.2)
Lesson 13 (Covering Sections 4.4.0 through 6.1.5)
Lesson 14 (Covering Sections 6.2.0 through 6.5.3)
Lesson 15 (Covering Sections 7.0.0 through 8.4.0)
Lesson 16 (Covering Sections 9.0.0 through 10.3.3)
Lesson 17 (Covering Sections 10.4.0 through Summary)

Module 18404-07 – Introductory Skills for the Foreman (20 Hours)
Upon completion of this module, the trainee will be able to explain the foreman's responsibilities to the project coordinating staff or project owner, explain job safety responsibilities, describe job

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cleanliness and material organization, explain responsibilities for project close-out, describe project layout and coordination, identify and describe the scope of project and the scope letter, describe the job specifications and project drawings, record changes on a shop drawing for as-builts, complete daily, weekly time, and progress reports, and identify and explain materials documentation.

Lesson 18 (Covering Sections 1.0.0 through 3.3.5)
Lesson 19 (Covering Sections 4.0.0 through 5.3.0)
Lesson 20 (Covering Sections 5.4.0 through 5.11.0)
Lesson 21 (Covering Sections 5.12.0 through Summary)

Module 18405-07 – Procedures and Documentation (20 Hours)
Upon completion of this module, the trainee will be able to recognize the consequences of improper system installation, identify the five Cs of project documentation, recognize unsafe acts and conditions on a worksite, identify the hazards associated with specific tasks, discuss the procedures for responding to an accident, describe the procedures for emergency response to water damage, and explain how to handle a water damage claim.

Lesson 22 (Covering Sections 1.0.0 through 3.2.0)
Lesson 23 (Covering Sections 4.0.0 through 4.1.0)
Lesson 24 (Covering Sections 5.0.0 through Summary)

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