

# American Fire Sprinkler Association

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## Applied Sprinkler Technology Training Program for Fire Sprinkler Designers

### Series E, Book I

Upon completion of Book I, the trainee will be awarded 21.6 CEUs (216.0 Credit Hours)  
Required Hours of Instruction

#### Module A

##### Introduction to Applied Sprinkler Technology

##### Lesson 1 Some Basic Things About Your Job as a Sprinkler Designer

Upon completion of this lesson the trainee will be able to:

Define management considerations; Explain how a contracting company operates; Provide reasons to become a designer; Explain how to make the pipe fit; Recognize the sprinkler designer as a team member; Describe the roles of the designers, layout technicians and engineers; Describe the role of NICET; Demonstrate how to communicate with AHJ's; Describe the proper attitude and perception you can feel good about your job

##### Lesson 2 An Overview of Fire Protection and Fire Protection Sprinkler Systems

Upon completion of this lesson the trainee will be able to:

Identify the elements of a fire; Explain the function of a sprinkler system; Explain the philosophical bases of fire protection; Describe the role of the NFPA; Explain how sprinkler systems become a requirement; Explain the importance of the codes and standards of a fire sprinkler system

##### Lesson 3 History and Evolution of the Automatic Fire Sprinkler

Upon completion of this lesson the trainee will be able to:

Describe what methods were used to put out fires before sprinkler systems; Identify open sprinklers; Identify the first automatic sprinklers and other early sprinklers; Identify link and lever sprinklers; Explain sprinkler basics; Explain how to identify a sprinkler; Recognize the different sprinkler components; Identify orientation and sprinkler patterns; Identify fast response sprinklers; Identify finishes, types, and ornamental sprinklers

##### Lesson 4 Types of Systems

Upon completion of this lesson the trainee will be able to:

Identify wet pipe sprinkler systems; Identify dry pipe sprinkler systems; Identify pre-action systems; Identify deluge systems; Identify combined dry pipe and pre-action systems; Identify anti-freeze systems; Identify circulating closed loops system

#### Module B

##### Piping Materials

##### Lesson 5 Overhead Piping Materials

Upon completion of this lesson the trainee will be able to:

Describe general information about steel pipe; Describe methods of manufacture; Identify American standard pipe thread; Describe thread engagement

##### Lesson 6 Piping Materials and Joints

Upon completion of this lesson the trainee will be able to:

Identify threaded connections; Identify flanged connections; Identify grooved connections; Identify POZ-LOK; Recognize pressfit

### **Lesson 7 Copper Tubing**

Upon completion of this lesson the trainee will be able to:

Explain the history of copper tubing; Identify Standard D Tubes; Identify tempers; Understand ASTM standards; Recognize manufacturing methods of copper tubing; Recognize standard fittings; Understand ANSI standards; Recognize joining methods

### **Lesson 8 Polybutylene Piping Systems**

Upon completion of this lesson the trainee will be able to:

Recognize high temperature performance; Understand corrosion resistance; Explain flow capacity; Describe the freeze tolerance; Recognize the flexibility of polybutylene; Describe quick simple joining methods; Describe polybutylene manufacturing methods; Explain pipe color coding; Recognize standard pipe and understand ASTM standards; Identify standard fittings; Demonstrate installation of polybutylene pop in residential systems; Explain testing procedures

### **Lesson 9 CPVC Plastic Piping Systems**

Upon completion of this lesson the trainee will be able to:

Understand the listings and approvals of BlazeMaster CPVC piping systems; Explain where and how to use a BlazeMaster system; Describe BlazeMaster specifications; Understand product ratings and capabilities; Identify support hangers and recommendations; Identify vertical restraint; Explain system riser installation requirements; Identify joining BlazeMaster pipe systems;

## **Module C**

### **Piping Supports**

#### **Lesson 10 Hangers and Supports**

Upon completion of this lesson the trainee will be able to:

Recognize the different types of hangers; Explain the general rules of hangers; Understand the strength of hangers; Identify trapeze hangers; Understand the specific guidelines of hangers in concrete construction; Understand the specific rules of hangers in wood; Understand the specific rules of branch line hangers; Understand the rules of hanging main piping;

#### **Lesson 11 Protection of Piping Subject to Earthquake**

Upon completion of this lesson the trainee will be able to:

Explain the importance of flexibility; Recognize clearance; Describe sway bracing

## **Module D**

### **Basic Building Layout**

#### **Lesson 12 Design Drawings and Specifications**

Upon completion of this lesson the trainee will be able to:

Understand the different specifications set by the AIA; Identify construction drawings; Recognize common problems with drawings

#### **Lesson 13 Construction Types**

Upon completion of this lesson the trainee will be able to:

Recognize unobstructed construction; Recognize obstructed construction

#### **Lesson 14 Elements of a Building Layout**

Upon completion of this lesson the trainee will be able to:

Identify the common required features of a background; Identify the dimensions; Identify roof, deck, and ceiling height; Identify other common elements of a background; Identify pre-design considerations; Identify running dimensions.

#### **Lesson 15 Drawing of a Background**

Upon completion of this lesson the trainee will be able to:

Recognize drafting; Identify pre-design considerations; Identify the elements of a background; Explain how CAD can make drawings easier to understand

## **Module E**

### **Sprinkler Spacing Rules**

#### **Lesson 16 Occupancies and Hazard Classification**

Upon completion of this lesson the trainee will be able to:

Describe high-piled storage; Describe storage commodity classification; Identify flammable liquids and aerosol storage; Identify miscellaneous storage; Recognize extra hazards; Recognize ordinary hazard, Recognize light hazard; Recognize residential occupancies; Recognize special occupancies

#### **Lesson 17 Standard Sprinkler Spacing**

Upon completion of this lesson the trainee will be able to:

Explain the general rules and basic principles use when trying to locate sprinklers; Explain the maximum distance between sprinklers; Explain the maximum coverage area; Explain how to determine correct spacing; Explain the small room rule; Explain the minimum spacing between sprinklers; Understand spacing under pitched roofs; Explain the minimum clearance between the top storage and the ceiling; Explain the requirements of shafts and stairways; Explain the importance of sprinkler position; Explain the rules of sidewall sprinklers

#### **Lesson 18 Specific Sprinklers – Spacing and Position**

Upon completion of this lesson the trainee will be able to:

Identify ESFR sprinklers; Identify large drop sprinklers; Identify extra large orifice sprinklers; Identify the 2 specific application storage sprinklers

#### **Lesson 19 Other Specific Sprinklers – Spacing, Location and Position**

Upon completion of this lesson the trainee will be able to:

Identify extended coverage sprinklers; Identify extended coverage sprinklers for ordinary hazard; Identify extended coverage sprinklers for light hazard; Identify extended coverage quick response sprinklers light hazard; Identify quick response early suppression; Identify extended coverage sidewall sprinklers; Identify residential sprinklers; Identify institutional sprinklers; Identify dry pendant and dry sidewall sprinklers; Identify attic sprinklers; Identify on-off sprinklers

## **Module F**

### **Fundamentals of Sprinkler System Layout**

#### **Lesson 20 Layout of Sprinklers**

Upon completion of this lesson the trainee will be able to:

Explain the geometry of spacing sprinklers; Explain the sprinkler spacing rules; Explain how to lay out sprinklers given the rules of spacing and area; Explain how to lay out sprinklers in an exposed installation; Identify the ordinary hazard layout; Explain how to space sprinklers in odd shaped rooms; Explain how to space sprinklers above and below a ceiling; Explain how to layout sidewall sprinklers;

#### **Lesson 21 Types of System Configurations**

Upon completion of this lesson the trainee will be able to:

Explain the basic types of configurations; Identify other types of systems; Identify riser location and bulk piping; Explain the hydraulic advantages of each piping configuration

#### **Lesson 22 Preliminary Piping Layout**

Upon completion of this lesson the trainee will be able to:

Explain the steps in preparing preliminary sprinkler drawings; Describe the components of a preliminary drawing; Explain sprinkler line layout and sprinkler main layout; Identify the underground location and the riser locations on a drawing; Explain dimensions on the drawings; Identify elevations; Identify systems rise detail; Recognize the miscellaneous details; Identify pipe sizing; Identify hanger location

#### **Lesson 23 Coordination**

Upon completion of this lesson the trainee will be able to:

Explain how to coordinate; Explain field coordination; Explain plan coordination

### **Lesson 24 Final Drawings**

Upon completion of this lesson the trainee will be able to:

Explain the process of getting to the final drawing; Describe the process of cutting the piping; Describe the process of cutting the hangers; Describe the process of cutting the system riser; Describe field check and final installation drawing; Recognize the stock list

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## Applied Sprinkler Technology Training Program for Fire Sprinkler Designers

### Series E, Book II

Upon completion of Book I, the trainee will be awarded 18.0 CEUs (180.0 Credit Hours)  
Required Hours of Instruction

#### Module G

##### Introduction to Calculations

###### Lesson 1 Introduction to Basic Hydraulics

Upon completion of this lesson the trainee will be able to:

Explain what hydraulic calculations are; Explain the importance of hydraulic calculations; Explain different design approaches; Explain how hydraulic calculations are performed; Compare the difference between computer calculations and hand calculations; Compare different system configurations; Identify uprights and pendants on the same branch lines; Identify riser location and bulk piping; Explain hydraulic advantages; Develop a working knowledge of the following words and terms: Area of Sprinkler Operation, Area Per Sprinkler, C-Value (C-factor), Density, Design Area, Elevation Loss, End Head Flow, Equivalent Pipe Length, Flow, Friction Loss, GPM, K Factor.

###### Lesson 2 Introduction to Water Supplies

Upon completion of this lesson the trainee will be able to:

Compare different types of water supplies; Explain underground connection; Explain the importance of water flow tests and how they are conducted; Describe how to create a flow graph; Explain how to make adjustments if needed with flow graph results

###### Lesson 3 Water Demand Requirements

Upon completion of this lesson the trainee will be able to:

Describe the area/density method; Explain how to choose a most remote area; Describe the design approach and the room design method; Explain the requirements for both area/density and room design methods; Demonstrate calculations with special sprinklers; Describe water duration

###### Lesson 4 Pipe Schedule Systems

Upon completion of this lesson the trainee will be able to:

Explain the general requirements for sizing a pipe schedule; Determine the water supply needed for pipe schedule systems; Read a pipe schedule table

#### Module H

##### Advanced Calculations

###### Lesson 5 Hand Calculations to End Sprinkler

Upon completion of this lesson the trainee will be able to:

Calculate the area of the end sprinkler; Calculate the layout of the remote area; Determine flow required from end sprinkler; Calculate the pressure required at the end sprinkler; Calculate friction loss; Calculate length of piping to next sprinkler; Calculate pressure required at next sprinkler; Utilize the Hydraulic Calculation form

###### Lesson 6 Hand Calculations – Branch Line to Main

Upon completion of this lesson the trainee will be able to:

Calculate the flow of sprinkler #2; Calculate the combined flow required for both sprinklers; Calculate the friction loss; Calculate the pressure required at the next sprinkler; Calculate the flow through the branch line and down the riser nipple to the main; Calculate down the main to the next branch line

### **Lesson 7 Hand Calculations – Main to Source**

Upon completion of this lesson the trainee will be able to:

Calculate the equivalent K-factor for the branch lines; Calculate the flow at the next branch line; Calculate the friction loss and the pressure at the next branch line; Add in the final branch line; Calculate the pressure at the riser; Calculate pressure at the source; Compare the required pressure to the available pressure;

### **Lesson 8 Computer Calculations and Plan Submittal with Calculations**

Upon completion of this lesson the trainee will be able to:

Identify the difference between hand calculations and computer calculations; Identify the proper input and how to read the output; Demonstrate how to make adjustments to calculations; Demonstrate the final steps in the calculation process

## **Module I**

### **System Types**

#### **Lesson 9 Wet Systems**

Upon completion of this lesson the trainee will be able to:

Explain where wet systems are installed; Describe the system components of a wet system; Explain design considerations; Compare different types of wet system risers; Explain what a port check valve is; Identify straight-gut riser or no check valve riser; Identify wet risers with backflow preventors; Identify installation considerations; Describe the practice of an inspectors test connection

#### **Lesson 10 Antifreeze Systems**

Upon completion of this lesson the trainee will be able to:

Identify the two distinct piping arrangements – conventional and backflow prevention device; Describe anti-freeze solutions; Calculate the antifreeze concentrate requirement; Calculate concentrate ratios; Identify material compatibility

#### **Lesson 11 Dry Pipe Systems**

Upon completion of this lesson the trainee will be able to:

Explain where to install dry pipe systems; Describe the system components of dry pipe systems; Describe the design limitations; Identify dry pipe valves; Identify dry pipe valve trim connections; Explain what quick opening devices are; Identify system air supplies

#### **Lesson 12 Pre-action Systems**

Upon completion of this lesson the trainee will be able to:

Explain what a pre-action system is; Explain the design considerations; Identify the hardware involved in the system; Explain auxiliary detection issues; Explain piping integrity considerations

#### **Lesson 13 Deluge Systems**

Upon completion of this lesson the trainee will be able to:

Identify and describe deluge systems; Explain design considerations; Determine the applications associated with deluge systems; Identify auxiliary detection systems; Explain the importance of testing

## **Module J**

### **Fundamental Materials**

#### **Lesson 14 Material Takeoff**

Upon completion of this lesson the trainee will be able to:

Describe material takeoff; Recognize the designs of the materials takeoff list; Explain the considerations in completing material takeoff lists;

#### **Lesson 15 Sleeving**

Upon completion of this lesson the trainee will be able to:

Recognize the proper place for penetrations; Describe clearance and sleeving;

#### **Lesson 16 Volumes, Surface Areas, Piping Offsets, etc.**

Upon completion of this lesson the trainee will be able to:

Calculate volumes and areas; Identify cubes and other rectangular solids, cylinders, and angle offsets

**Lesson 17 Drains**

Upon completion of this lesson the trainee will be able to:

Identify drains; Explain drain design considerations; Identify drains serving wet pipe systems; Identify drains serving dry-pipe systems; Describe where a drain is discharged

**Module K****Support Systems****Lesson 18 Standpipes and Hose Connections**

Upon completion of this lesson the trainee will be able to:

Identify the 3 classes of standpipe systems; Identify the types of standpipe systems; Explain the design considerations for standpipe systems; Identify small hose stations supplied from automatic sprinkler systems; Demonstrate standpipe system testing

**Lesson 19 Fire Department Pumper Connections and Inspector's Tests**

Upon completion of this lesson the trainee will be able to:

Explain the purpose of the Inspector's test; Explain the description of the Inspector's test valve (ITV); Explain the description of the fire departments pumper connection; Explain the design considerations for the inspectors test valve; Explain the design considerations for the fire departments pumper connections

**Lesson 20 Underground and Backflow**

Upon completion of this lesson the trainee will be able to:

Identify and describe underground piping supplying fire protection systems; Describe backflow preventors; Explain design considerations for underground piping; Explain design considerations for backflow preventors

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## Applied Sprinkler Technology Training Program for Fire Sprinkler Designers

### Series E, Book III

Upon completion of Book I, the trainee will be awarded 15.3 CEUs (153.0 Credit Hours)  
Required Hours of Instruction

#### Module L

##### General Information

###### Lesson 1 Codes and Standards

Upon completion of this lesson the trainee will be able to:

Explain why we have codes and standards; Identify building codes; Identify fire codes; Identify the NFPA standards; Identify interpretive guides

###### Lesson 2 Metric Units and Conversions

Upon completion of this lesson the trainee will be able to:

Calculate basic measures; Calculate practical measures; Utilize the metric system of measurement; Utilize the SI (Standard International) system of measurement; Utilize temperature scales and conversions; Utilize the English system reference; Calculate practical applications;

#### Module M

##### Pumps and Tanks

###### Lesson 3 Stationary Pumps for Fire Protection

Upon completion of this lesson the trainee will be able to:

Recognize performance and installation standards; Explain fire pump history; Explain basic system considerations; Identify fire pump decision options; Determine basic fire pump selection; Recognize horizontal split case fire pump installation; Recognize vertical turbine pump installation; Determine pump controller selection

###### Lesson 4 Tanks in Fire Protection Design

Upon completion of this lesson the trainee will be able to:

Describe the basic principles of pressure in tanks; Identify miscellaneous tanks; Identify storage tanks for fire protection water supplies; Identify atmospheric pressure water storage tanks; Explain the special considerations with tanks.

#### Module N

##### Storage Design

###### Lesson 5 Storage Criteria

Upon completion of this lesson the trainee will be able to:

Explain the specialized vocabulary of storage design; Identify commodity classes; Identify classifications of plastics, elastomers and rubber; Demonstrate protecting palletized solid piled, bin box or shelved storage over 12 feet in height; Recognize the plastic design problem; Identify hose stations;

###### Lesson 6 Fire Protection Design for Rack Storage Systems

Upon completion of this lesson the trainee will be able to:

Explain the unique fire protection considerations in storage rack systems; Explain the design considerations; Identify commodity classification; Explain critical storage definitions; Explain major design criteria for rack storage sprinkler systems; Explain ceiling sprinkler considerations; Describe hose demands; Recognize sample design problems

## Module O

### Specialty Systems

#### Lesson 7 Low Expansion Foam Fire Protection

Upon completion of this lesson the trainee will be able to:

Identify low-expansion foam fire protection; Compare foam concentrates; Identify foam system design; Describe system testing

#### Lesson 8 Flow Control Systems

Upon completion of this lesson the trainee will be able to:

Identify flow control systems; Identify Viking Firecycle III system

#### Lesson 9 Exposure Protection

Upon completion of this lesson the trainee will be able to:

Explain exposure protection; Reference NFPA standards regarding exposure protection; Explain NFPA recommended practice for protection of buildings from exterior fire exposure; Explain general design practices

#### Lesson 10 Water Spray Systems

Upon completion of this lesson the trainee will be able to:

Demonstrate applications of water spray systems; Demonstrate system design; Identify the different nozzles to choose from; Recognize the proper calculations for water spray systems; Explain other design considerations; Demonstrate pipe layout and design; Compare different types of detection to acute the system

#### Lesson 11 Special Hazard Fire Suppression Systems: Carbon Dioxide, Clean Agent, Dry Chemical, and Wet Chemical

Upon completion of this lesson the trainee will be able to:

Compare the different types of systems; Identify special hazard detection and control systems; Identify carbon dioxide systems; Identify clean agent systems; Identify wet chemical systems;

#### Lesson 12 Water Mist

Upon completion of this lesson the trainee will be able to:

Demonstrate application and design of water mist systems; Define water mist; Describe pressure and delivery methods; Identify system material- pipe, fittings, and hangers; Compare the different system types; Identify strainers; Describe ventilation; Determine mist delivery rates; Determine the water supply needed for the mist; Identify alarms detection and other electrical devices

#### Lesson 13 Alarm and Detection

Upon completion of this lesson the trainee will be able to:

Identify heat detectors; Identify smoke detectors; Identify flame detectors; Describe other types of supervision

## Module P

### Administrative

#### Lesson 14 Inspection and Maintenance

Upon completion of this lesson the trainee will be able to:

Explain the process of initial testing and inspections; Explain the process of flushing of underground piping; Explain the process of the hydrostatic testing of underground piping; Explain the process of the hydrostatic testing of aboveground piping; Identify and explain the importance of dry system and non and double interlock system air test; Explain the importance of system operational tests; Explain the importance of periodic inspections;

#### Lesson 15 Project Management

Upon completion of this lesson the trainee will be able to:

Explain the history of project management; Explain the fundamentals of project management; Describe project management technology; Recognize human factors in project management; Create a project control system; Explain how to make project management work for you

#### Lesson 16 Introduction to Estimating Automatic Fire Sprinkler Systems

Upon completion of this lesson the trainee will be able to:

Explain the process of estimating automatic fire sprinkler systems; Explain pre-bid activity; Explain post award activity

### **Lesson 17 Contracts, Letter of Proposal, and Change Orders**

Upon completion of this lesson the trainee will be able to:

Review contracts and letters of proposal; Review change orders; Review reverse letters