

# Sprinkler Fitter Level 2

## **Sprinkler Fitter**

### **UNIT: B1 ORGANIZES WORK**

**Subunit: B1a Job Planning II**

**Level:** Two

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

**Overview:**

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to plan and organize jobs and to produce material take-off lists.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe the procedures used to interpret and extract information from drawings.	25%
2. Identify the purpose of submittals and shop drawings, and describe the procedures used to interpret them.	25%
3. Identify the types of material take-off lists and describe their applications and the procedures used to produce them. a. Material estimation b. Material installation	25%
4. Describe the procedures used to prepare work sites. a. Erecting barricades and flagging b. Identifying hazards c. Locating service points d. Locating isolation points	25%

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## Sprinkler Fitter

**Subunit: B1b Blueprint Reading and Sketching II**

**Level:** Two

**Duration:** 30 hours

Theory: 15 hours

Practical: 15 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to read and interpret information pertaining to sprinkler systems found in construction drawings, and to perform basic orthographic and isometric sketching.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Identify divisions of blueprints and describe their purpose.</b>	<b>10%</b>
a. Architectural	
b. Structural	
c. Mechanical	
d. Electrical	
e. Plot	
f. Specifications and schedules	
<b>2. Identify views and drawings of a building and describe their purpose.</b>	<b>25%</b>
a. Plans	
• Floor	
• Reflected ceiling	
b. Elevations	
c. Sections	
d. Details	
<b>3. Interpret sprinkler systems information found on drawings.</b>	<b>15%</b>
a. Grades and elevations	
b. Dimensioning and scaling	
c. Cutting plane lines	
d. Extension lines	
e. Symbols and abbreviations	
f. Single line pipe drawings	
<b>4. Describe the procedures used to interpret metric and imperial scaling.</b>	<b>10%</b>
<b>5. Describe the procedures used to prepare orthographic and isometric sketches.</b>	<b>10%</b>

- 6. Describe the procedures used to prepare single line pipe drawings. 10%**
- a. Orthographic
    - 45° fittings
    - 90° fittings
  - b. Detail drawings (spool sheet) with north arrow indicators
    - Orthographic North to isometric North
    - North orientation
    - Cut sheets
- 7. Demonstrate the ability to read and interpret information pertaining to sprinkler systems found in construction drawings, and to perform basic orthographic and isometric sketching. 20%**

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## Sprinkler Fitter

**UNIT: B2 COMMISSIONS SYSTEM**

**Subunit: B2a Commissioning Water Supply Systems**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to commission water supply systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe knowledge of the procedures to commission water supply systems.</b>	<b>50%</b>
a. Define terminology associated with commissioning of water supply systems	
b. Identify workplace hazards and describe safe work practices pertaining to the commissioning of water supply systems	
c. Interpret codes, standards and regulations pertaining to the commissioning of water supply systems.	
d. Interpret information pertaining to the commissioning of water supply systems found on drawings and specifications	
e. Identify tests to be performed on water supply systems	
f. Describe the procedures used to commission water supply systems.	
g. Calculate flow rates and discharge pressures.	
<b>2. Demonstrate commissioning of water supply systems.</b>	<b>50%</b>

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## Sprinkler Fitter

**Subunit: B2b Commissioning Fire Protection Systems**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to commission fire protection systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe knowledge of the procedures to commission fire protection systems.</b>	<b>50%</b>
a. Define terminology associated with commissioning of fire protection systems	
b. Identify workplace hazards and describe safe work practices pertaining to the commissioning of fire protection systems	
c. Interpret codes, standards and regulations pertaining to the commissioning of fire protection systems	
d. Interpret information pertaining to the commissioning of fire protection systems found on drawings and specifications	
e. Identify tests and checks to be performed on fire protection systems	
f. Describe the procedures used to commission fire protection systems.	
<b>2. Demonstrate commissioning of fire protection systems.</b>	<b>50%</b>

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## **Sprinkler Fitter**

### **UNIT: B3 UNDERGROUND WATER SUPPLY**

**Subunit: B3a Underground Water Supply Awareness**

**Level:** Two

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

#### **Overview:**

Upon completion of this Subunit the apprentice will demonstrate an awareness of the procedures to install and connect underground piping and components from a predetermined water source to provide a reliable and adequate water supply to fire protection systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe the procedures for supervising trenching and backfilling.	34%
2. Describe the procedures to install underground piping and components	33%
3. Describe the procedures to flush underground system.	33%

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## Sprinkler Fitter

### UNIT: B4 FIRE DEPARTMENT CONNECTIONS

**Subunit: B4a Water Supply, Hydrants and Fire Department Connections**

**Level:** Two

**Duration:** 18 hours

Theory: 15 hours

Practical: 3 hours

#### Overview:

Upon completion of this Subunit of instruction the apprentice will demonstrate knowledge of water source connections and of fire department equipment and hydrants and their installation procedures in accordance with codes and regulations.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with water supply, hydrants and fire department connections.	3%
2. Identify hazards and describe safe work practices pertaining to water supply, hydrants and fire department connections. a. Personal safety b. Safety of infrastructure c. Environmental requirements	3%
3. Interpret codes, standards and regulations pertaining to water supply, hydrants and fire department connections.	5%
4. Interpret information pertaining to water supply, hydrants and fire department connections, found on drawings and specifications.	2%
5. Identify tools and equipment relating to water supply, hydrants and fire department connections and describe their applications and procedures for use.	3%
6. Identify types of water supplies used for sprinkler and hose systems and describe their characteristics and applications. a. Municipal b. Limited • Tanks • Reservoirs c. Raw water	5%
7. Identify types of pressure and gravity tanks and describe their characteristics, principles of operation and applications. a. Locations b. Tank sizes and pressure	5%



- 8. Describe the procedures used to install, test, service and maintain pressure and gravity tanks. 5%**
- a. Installation
    - Piping, valves, trim and accessories
    - Electrical requirements
    - Requirements for the discharge and drainage pipe
    - Water supply requirements
  - b. Testing
  - c. Servicing
  - d. Maintenance
- 9. Explain the purpose and requirements for return bends on raw water sources. 5%**
- 10. Describe the procedures used to install underground water mains. 1%**
- a. Joining
  - b. Controlling thrust
  - c. Trenching and shoring
  - d. Bedding and backfilling
  - e. Leakage testing
  - f. Chlorination/disinfection
  - g. Flushing
  - h. Completing documentation
- 11. Identify types of water supply connections and their associated components. 5%**
- 12. Describe the procedures used to connect water supplies to sprinkler systems inside the building. 5%**
- 13. Identify types of water connections and their associated components. 5%**
- a. Sprinkler valves
  - b. Cross connection control
- 14. Identify the requirements of cross connection control. 10%**
- a. Programs
  - b. Testers certification
  - c. Responsibilities
    - Manufacturer
    - Installer
    - Tester
    - Building owner
    - Authority having jurisdiction (AHJ)
  - d. Equipment selection
- 15. Explain the consequences of back flow and cross connection. 5%**
- a. Liability
  - b. Health hazards
  - c. Effect on system design
- 16. Describe the procedures used for testing protection devices. 5%**
- 17. Identify types of fire department connections, and describe their purpose and installation requirements. 5%**
- a. Requirements for check valves

- b. Placement of fire department connections
  - c. Requirements for drainage of fire department connections
  - d. Requirements for hose thread connections (AHJ)
- 18. Identify types of fire hydrants and associated equipment and describe their characteristics. 5%**
- a. Types
    - Wall
    - Yard
    - Roof
  - b. Materials
  - c. Purpose and location
  - d. Sizes of hydrants and hose outlets
  - e. Thread types/connections
- 19. Identify the installation requirements for hydrants and related equipment. 1%**
- a. Spacing of hydrants
    - Type
    - Control valve
    - Valve box
    - Valve cover
  - b. Setting and support of hydrants
  - c. Thrust box
  - d. Drainage
  - e. Frost protection
  - f. Physical damage protection
- 20. Describe the procedures used to maintain and repair hydrants and related equipment and components. 5%**
- 21. Identify types of hydrant houses and components and describe their installation requirements. 1%**
- 22. Identify types of test equipment and describe their applications and procedures of use. 5%**
- 23. Describe flow test procedures used to determine water flow data for sprinkler systems. 1%**
- 24. Demonstrate knowledge of water source connections and of fire department equipment and hydrants and their installation procedures in accordance with codes and regulations. 5%**

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## Sprinkler Fitter

### UNIT: B5 PIPING COMPONENTS

**Subunit: B5a System Component Valves**

**Level:** Two

**Duration:** 18 hours

Theory: 14 hours

Practical: 4 hours

#### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of system component valves, their characteristics, purpose, applications and operation, and of the procedures to install and maintain system component valves.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with system component valves.	5%
2. Identify hazards and safe work practices pertaining to system component valves.	5%
3. Interpret codes, standards and regulations pertaining to system component valves.	10%
4. Interpret information found on drawings and specifications pertaining to system component valves.	5%
5. Identify tools and equipment pertaining to system component valves and describe their applications and procedures for use.	5%
6. Identify types of system component valves and describe their characteristics, purpose and operation. <ul style="list-style-type: none"> <li>a. Control</li> <li>b. Test connection</li> <li>c. Drain</li> <li>a. Check</li> <li>b. Pressure relief</li> <li>c. Pressure reducing</li> <li>c. Hose</li> </ul>	25%
7. Identify the considerations when selecting and installing system component valves.	5%
8. Describe the procedures used to install system component valves.	5%
9. Identify common maintenance issues related to system component valves.	5%

- 10. Describe the procedures used to maintain system component valves. 5%
- 11. Demonstrate the procedures to install and maintain system component valves. 25%

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## Sprinkler Fitter

**Subunit: B5b Pipe Design and Installation**

**Level:** Two

**Duration:** 34 hours

Theory: 21 hours

Practical: 13 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to design and install piping assemblies and their components according to code requirements.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with pipe design and installation.	10%
2. Identify hazards and describe safe work procedures pertaining to pipe design and installation.	5%
3. Interpret codes, standards and regulations pertaining to pipe design and installation for sprinkler systems. a. Pipe layout and installation b. Water supply requirements c. Testing	20%
4. Interpret information pertaining to pipe design and installation found on drawings and specifications.	5%
5. Identify tools and equipment relating to pipe design and installation, and describe their applications and procedures for use.	5%
6. Explain the effect of electrolysis on piping materials.	5%
7. Explain friction loss as it applies to pipe schedules and hydraulically calculated systems.	5%
8. Explain freezing protection of sprinkler controls and systems.	5%
9. Identify the design considerations for piping assemblies. a. Pipe size b. Hazard classifications c. Drainage, grading and layout d. Materials e. System design f. Flushing connections	20%

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|---|-----------|
| <b>10. Describe the procedures used to size and install piping sleeves.</b>   | <b>5%</b> |
| <b>11. Describe the procedures used to install piping assemblies.</b>   | <b>5%</b> |
| <b>12. Describe the procedures and materials used to prepare, paint and label pipe.</b>   | <b>5%</b> |
| <b>13. Demonstrate the ability to design and install piping assemblies and their components according to code requirements.</b> | <b>5%</b> |

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## Sprinkler Fitter

**Subunit: B5c Standard Spray Sprinkler Heads**

**Level:** Two

**Duration:** 7 hours

Theory: 5 hours

Practical: 2 hours

### Overview:

Upon completion of this Subunit, the apprentice will demonstrate knowledge of standard spray sprinkler head selection and installation according to code and manufacturers' specifications.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with standard spray sprinkler heads.	5%
2. Identify hazards and describe safe work practices pertaining to standard spray sprinkler heads.	5%
3. Identify types of standard spray sprinkler heads and describe their characteristics and applications.	15%
a. Pendant	
b. Upright	
c. Sidewall	
4. Interpret codes, standards and regulations pertaining to standard spray sprinkler heads.	15%
a. Minimum and maximum distance between sprinklers	
b. Minimum and maximum distance off wall	
c. Minimum and maximum distance from ceiling	
d. Maximum areas of protection	
e. Obstruction rules	
f. Types of construction	
g. Temperature ratings	
5. Interpret information pertaining to standard spray sprinkler heads found on drawings, specifications and listings.	5%
6. Identify tools and equipment relating to standard spray sprinkler heads and describe their applications and procedures for use.	5%
7. Explain the importance of correct locations for standard spray sprinkler heads.	5%
8. Identify location requirements of standard spray sprinkler heads.	5%
a. Bays	
b. Beams	

- c. Girders
  - d. Joists
  - e. Open bar joists
  - f. Open ceilings
  - g. Trusses
- 9. Identify required distances between standard spray sprinkler heads based on hazard class. 5%**
- 10. Identify standard spray sprinkler deflector orientation and location. 5%**
- a. Pitched roofs
  - b. Partitions
  - c. Peaks
  - d. Stairs and ramps
- 11. Identify clearances required between piled storage materials and standard spray sprinkler deflectors. 5%**
- 12. Identify code installation requirements for standard spray sprinkler heads for special situations. 5%**
- 13. Describe the procedures used to install standard spray sprinkler heads. 5%**
- 14. Demonstrate the ability to select and install standard spray sprinkler heads according to code and manufacturers' specifications. 15%**

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## Sprinkler Fitter

**Subunit: B5d Extended Coverage Sprinkler Heads**

**Level:** Two

**Duration:** 7 hours

Theory: 5 hours

Practical: 2 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of extended coverage sprinkler head selection and installation according to code and manufacturers' specifications.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with extended coverage sprinkler heads.	5%
2. Identify hazards and describe safe work practices pertaining to extended coverage sprinkler heads.	5%
3. Identify types of extended coverage sprinkler heads and describe their characteristics and applications.	15%
a. Pendant	
b. Upright	
c. Sidewall	
4. Interpret codes, standards and regulations pertaining to extended coverage sprinkler heads.	15%
a. Minimum and maximum distance between sprinklers	
b. Minimum and maximum distance off wall	
c. Minimum and maximum distance from ceiling	
d. Maximum areas of protection	
e. Obstruction rules	
f. Types of construction	
g. Temperature ratings	
5. Interpret information pertaining to extended coverage sprinkler heads found on drawings, specifications and listings.	5%
6. Identify tools and equipment relating to extended coverage sprinkler heads, and describe their applications and procedures for use.	5%
7. Explain the importance of correct locations for extended coverage sprinkler heads.	5%
8. Identify location requirements of extended coverage sprinkler heads.	5%
a. Bays	

- b. Beams
- c. Girders
- d. Joists
- e. Open bar joists
- f. Open ceilings
- g. Trusses

- 9. Identify required distances between extended coverage sprinkler heads based on hazard class. 5%**
- 10. Identify extended coverage sprinkler deflector orientation and location. 5%**
  - a. Pitched roofs
  - b. Partitions
  - c. Peaks
  - d. Stairs and ramps
- 11. Identify clearances required between piled storage materials and extended coverage sprinkler heads. 5%**
- 12. Identify code installation requirements for extended coverage sprinkler heads for special situations. 5%**
- 13. Describe the procedures used to install extended coverage sprinkler heads. 5%**
- 14. Demonstrate the ability to select and install extended coverage sprinkler heads according to code and manufacturers' specifications. 15%**

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## Sprinkler Fitter

**Subunit: B5e Specialty Sprinkler Heads and Nozzles**

**Level:** Two

**Duration:** 7 hours

Theory: 5 hours

Practical: 2 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of specialty sprinkler heads and nozzles, and their applications and installation requirements according to codes.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark %</u></b>
1. Define terminology associated with specialty sprinkler heads and nozzles.	5%
2. Identify hazards and describe safe work practices pertaining to specialty sprinkler heads and nozzles.	5%
3. Interpret codes, standards and regulations pertaining to specialty sprinkler heads and nozzles.	20%
4. Interpret information pertaining to specialty sprinkler heads and nozzles found on drawings, specifications and listings.	10%
5. Identify tools and equipment relating to specialty sprinkler heads and nozzles, and describe their applications and procedures for use.	10%
6. Identify types of specialty sprinkler heads and nozzles and describe their characteristics and applications.	20%
a. Residential	
b. Institutional	
c. Control mode specific application (CMSA)/large drop	
d. Early suppression fast response (ESFR)	
e. Quick response early suppression (QRES)	
f. In-rack	
g. Attic	
h. Nozzles	
i. Old-style/conventional	
j. Open sprinkler	
k. Spray sprinkler	
l. Window	
m. On/off	
n. Dry	
o. Corrosion resistant	

7. **Describe the procedures used to install specialty sprinkler heads.** 15%
8. **Demonstrate the ability to install specialty sprinkler heads and nozzles according to codes.** 15%

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## Sprinkler Fitter

**Subunit: B5f Copper and Stainless Steel Pipe and Tubing**

**Level:** Two

**Duration:** 14 hours

Theory: 10 hours

Practical: 4 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of copper pipe and copper and stainless steel tubing, and their associated fittings and joining techniques

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with copper and stainless steel pipe and tubing.	5%
2. Identify hazards and describe safe work practices associated with copper and stainless steel pipe and tubing. <ul style="list-style-type: none"> <li>a. Fire prevention</li> <li>b. Hot work procedures</li> </ul>	5%
3. Interpret codes, standards and regulations pertaining to copper and stainless steel pipe and tubing.	5%
4. Interpret information pertaining to copper and stainless steel pipe and tubing found in drawings and specifications.	5%
5. Identify the tools and equipment relating to copper and stainless steel pipe and tubing, and describe their applications and procedures for use.	5%
6. Explain the effect of electrolysis on piping materials.	5%
7. Identify techniques used to join copper and stainless steel pipe and tubing and describe their applications. <ul style="list-style-type: none"> <li>a. Brazing</li> <li>b. Soldering</li> <li>c. Compression</li> <li>d. Flaring</li> <li>e. Grooving</li> </ul>	5%
8. Identify types of copper and stainless steel pipe and tubing, and describe their characteristics and applications. <ul style="list-style-type: none"> <li>a. Types and colour codes</li> <li>b. Pressure ratings</li> <li>c. Sizes and lengths</li> <li>d. Manufacturers' specifications</li> </ul>	10%

- e. Manufacturing techniques
  
- 9. **Identify the types of fittings used on copper and stainless steel pipe and tubing, and describe their characteristics and applications.** 5%
  
- 10. **Identify types of solders and brazing alloys, and describe their characteristics and applications.** 5%
  - a. Pressure rating
  - b. Temperature rating
  
- 11. **Identify types of flux used in soldering or brazing, and describe their purpose, applications and effects.** 5%
  
- 12. **Identify equipment used to solder and braze joints, and describe their applications and procedures for use.** 5%
  
- 13. **Describe the procedures used to prepare and assemble flare and compression joints using hand tools.** 5%
  
- 14. **Describe the procedures used to cut, prepare and join tubing to required dimensions.** 5%
  
- 15. **Describe the procedures used to assemble and tighten joints in accordance with regulations and specifications.** 5%
  
- 16. **Describe the procedures used to join copper and stainless steel pipe and tubing.** 10%
  
- 17. **Demonstrate the procedures used to join copper and stainless steel pipe and tubing.** 10%

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## Sprinkler Fitter

### UNIT: B6 WATER-BASED SYSTEMS

**Subunit: B6a Standpipe Hose Systems**

**Level:** Two

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

#### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of standpipe and hose systems and their installation in accordance with codes and regulations.

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
1. Define terminology associated with standpipe and hose systems.	5%
2. Identify hazards and describe safe work practices pertaining to standpipe and hose systems.	5%
3. Interpret codes, standards and regulations pertaining to standpipe and hose systems.	10%
4. Interpret code requirements pertaining to flushing connections in piping systems.	2%
5. Interpret information pertaining to standpipe and hose systems found on drawings and specifications.	5%
6. Identify tools and equipment relating to standpipe and hose systems and describe their applications and procedures for use.	5%
7. Identify the classes and types of standpipe systems and describe their characteristics, operation and applications. a. Class I b. Class II c. Class III	10%
8. Identify types of standpipe systems and describe their operating principles, characteristics and applications. a. Wet pipe systems b. Dry pipe systems c. Manual d. Automatic e. Combined	10%

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|--|------------|
| <b>9. Identify the considerations and requirements to determine standpipe system design.</b>                           | <b>10%</b> |
| a. Pipe sizing   |            |
| b. Flow rate   |            |
| c. Pressures   |            |
| d. Hose valve location   |            |
| e. Hose thread connection (AHJ)  |            |
| f. Gauge location  |            |
| <b>10. Identify types of hose valves and associated fittings, and describe their characteristics and applications.</b> | <b>5%</b>  |
| <b>11. Identify types of hose cabinets.</b>  |            |
| <b>12. Identify types of hose spray nozzles and describe their applications.</b>                                       | <b>5%</b>  |
| <b>13. Describe the procedures used to layout standpipe and hose systems.</b>  | <b>5%</b>  |
| <b>14. Describe the procedures used to install hose cabinets and associated equipment.</b>                             | <b>5%</b>  |
| <b>15. Describe the procedures used to install hose spray nozzles.</b>   | <b>3%</b>  |
| <b>16. Describe the procedures used to test and maintain standpipe systems.</b>  | <b>5%</b>  |
| <b>17. Explain the requirements and procedures for acceptance testing of standpipe and hose systems.</b>               | <b>5%</b>  |
| <b>18. Describe the procedures used to commission standpipe and hose systems.</b>                                      | <b>5%</b>  |

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## Sprinkler Fitter

**Subunit: B6b Outside Exposure Systems**

**Level:** Two

**Duration:** 10 hours

Theory: 10 hours

Practical: 0 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of outside exposure systems, their applications and operating principles, and of the installation requirements and associated test procedures for outside exposure systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with outside exposure systems.	5%
2. Identify hazards and describe safe work practices pertaining to outside exposure systems.	5%
3. Interpret codes, standards and regulations pertaining to outside exposure systems.	5%
4. Interpret information pertaining to outside exposure systems found on drawings and specifications.	10%
5. Identify tools and equipment relating to outside exposure systems, and describe their applications and procedures for use.	5%
6. Identify outside exposure systems, their operating principles and applications.	10%
7. Identify the installation requirements for outside exposure systems. <ul style="list-style-type: none"> <li>a. Water service requirements</li> <li>b. Methods of actuation</li> <li>c. Sprinkler heads/nozzles</li> <li>d. Strainers and trim</li> </ul>	15%
8. Identify the requirements for drainage of the outside exposure system.	10%
9. Describe the procedures used to install system controls required for outside exposure systems.	10%
10. Describe the procedures used to install outside exposure systems and components.	10%
11. Describe the procedures used to service and maintain outside exposure systems.	5%

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|-----------|--|-----------|
| <b>12</b> | <b>Explain the requirements and procedures for acceptance testing of outside exposure systems.</b> | <b>5%</b> |
| <b>13</b> | <b>Describe the procedures to commission outside exposure systems.</b>                             | <b>5%</b> |

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## Sprinkler Fitter

**Subunit: B6c Pre-Action System Installation**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of pre-action systems installation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe preaction systems, their applications and operating principles.	50%
2. Demonstrate installation requirements and associated test procedures for preaction systems.	50%

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## Sprinkler Fitter

**Subunit: B6d Deluge System Installation**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of deluge systems installation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe deluge systems, their applications and operating principles.	50%
2. Demonstrate installation requirements and associated test procedures for deluge systems	50%

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## Sprinkler Fitter

**UNIT: B7 DETECTION DEVICES (INSTALLS)**

**Subunit: B7a Detection Devices Installations I**

**Level:** Two

**Duration:** 8 hours

Theory: 5 hours

Practical: 3 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of detection systems installations.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe how to install wet and dry pilot lines.	15%
2. Describe how to install heat-actuated devices (HADs)	15%
3. Describe how to install spark detection systems	15%
4. Describe how to install air sampling systems	15%
5. Describe how to install electrical detection systems.	15%
6. Demonstrate detection systems installations.	25%

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## Sprinkler Fitter

### UNIT: B8 SIGNAL-INITIATING DEVICES (INSTALLS)

**Unit:** B8a Electrical Principles

**Level:** Two

**Duration:** 17 hours

Theory: 14 hours

Practical: 3 hours

#### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the basic concepts of electricity, and of electrical components and equipment as they relate to sprinkler system equipment.

*\*Please note: The content of the electrical section in this unit outline is not to suggest a Journeyperson Sprinkler Fitter should complete tasks normally performed by Journeyperson Electricians. The intent is to provide the Sprinkler Fitter with enough electrical knowledge so that safe decisions may be made when working on or around electrical equipment.*

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with electricity.	5%
2. Explain the basic principles of electricity.	5%
3. Explain the principles of magnetism and electromagnetism.	5%
4. Describe the types of electric current, phases and cycles.	5%
5. Explain the mathematical relationship between amps, volts, ohms and watts.	5%
6. Identify hazards and describe safe work practices pertaining to working on or around electrical equipment and sources.	10%
7. Identify electrical devices and describe their purpose.	20%
a. Circuit breakers	
b. Disconnects	
c. Overload heaters	
d. Ground fault interrupters (GFI)	
e. Fuses	
f. Contactors	
g. Transformers	
h. Solenoids	
i. Motors	

- j. Switches
- k. End of line resistors
- l. Sprinkler signaling devices

- |   |            |
|---|------------|
| <b>8. Describe series and parallel circuits.</b>  | <b>10%</b> |
| <b>9. Describe low voltage circuits.</b>  | <b>10%</b> |
| <b>10. Identify the types of electrical test meters and describe their applications and procedures for use.</b> | <b>10%</b> |
| <b>11. Describe the operation of normally open and normally closed circuits.</b>                                | <b>5%</b>  |
| <b>12. Demonstrate the use of a multi-meter.</b>  | <b>10%</b> |

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## Sprinkler Fitter

**Subunit: B8b Installs Alarm-Initiating Devices**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures and requirements to install, test and maintain alarm-initiating devices.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Demonstrate knowledge of the procedures and requirements to install, test and maintain alarm-initiating devices.</b>	<b>50%</b>
a. Define terminology associated with alarm-initiating devices	
b. Identify <b>types of alarm-initiating devices</b> and describe their characteristics, parameters and applications	
c. Identify hazards and describe safe work practices pertaining to alarm-initiating devices	
d. Interpret codes, standards and regulations pertaining to alarm-initiating devices	
e. Interpret information pertaining to alarm-initiating devices found on drawings and specifications	
f. Identify tools and equipment relating to alarm-initiating devices and describe their applications and procedures for use	
g. Describe the procedures used to install, test and maintain alarm-initiating devices	
h. Identify installation locations for alarm-initiating devices	
i. Describe operation and applications of alarm-initiating devices.	
<b>2. Installs alarm-initiating devices</b>	<b>50%</b>
a. Select and use tools and equipment	
b. Install device	
c. Determine location of alarm-initiating devices	
d. Attach devices to piping	
e. Install a means of <b>testing</b>	
f. Verify operation of devices.	

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## Sprinkler Fitter

**Subunit: B8c Installs Supervisory-Initiating Devices**

**Level:** Two

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

**Overview:**

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures and requirements to install, test and maintain supervisory-initiating devices.

**Objectives and Content:**

**Percent of  
Unit Mark (%)**

- |   |                   |
|---|-------------------|
| <p><b>1. Demonstrate knowledge of the procedures and requirements to install, test and maintain supervisory-initiating devices.</b></p> <ul style="list-style-type: none"><li>a. Define terminology associated with supervisory-initiating devices</li><li>b. Identify hazards and describe safe work practices pertaining to supervisory-initiating devices</li><li>c. Interpret codes, standards and regulations pertaining to supervisory –initiating devices</li><li>d. Interpret information pertaining to supervisory –initiating devices found on drawings and specifications</li><li>e. Identify tools and equipment relating to supervisory –initiating devices and describe their applications and procedures for use</li><li>f. Describe the procedures used to install, test and maintain supervisory –initiating devices</li><li>g. Identify installation locations for supervisory –initiating devices</li><li>h. Describe operation and applications of supervisory –initiating devices.</li></ul> | <p><b>50%</b></p> |
| <p><b>2. Installs supervisory-initiating devices</b></p> <ul style="list-style-type: none"><li>a. Select and use tools and equipment</li><li>b. Install device</li><li>c. Determine location of supervisory-initiating devices</li><li>d. Attach devices to piping</li><li>e. Install a means of <b>testing</b></li><li>f. Verify operation of devices.</li></ul>   | <p><b>50%</b></p> |

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## Sprinkler Fitter

### UNIT: B9 MATHEMATICS II

**Subunit: B9a Mathematics II**

**Level:** Two

**Duration:** 25 hours

Theory: 25 hours

Practical: 0 hours

#### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge and an understanding of the principles of mathematics. The following topics will be covered: volume measurements, capacity measurements, grade and hanger calculations, triangles and piping offsets.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe volume measurements.</b>	<b>10%</b>
a. Formula	
b. Solids, tanks and cylinders	
• Cubes	
• Flat ended cylinders	
<b>2. Describe capacity measurements.</b>	<b>10%</b>
a. Formula	
b. Solids, tanks and cylinders	
• Cubes	
• Flat ended cylinders	
<b>3. Describe grade and hanger calculations.</b>	<b>10%</b>
a. Grade on pipe	
b. Grade from percentage	
c. Progressive lengths of hanger rod	
d. Spacing for hangers	
e. Number of hangers for given lengths of pipe	
<b>4. Describe triangles.</b>	<b>2%</b>
a. Types	
• Equilateral	
• 90°	
b. Use in sprinkler installations	
c. Calculations	
• Length of sides	
• Sum of angles	

- d. Squaring
  - 3-4-5 triangle
  
- 5. **Describe piping offset calculations.** **17%**
  - a. Formula
  - b. Offset travel
    - Parallel
    - Equal spread
  
- 6. **Calculate volume measurements in imperial and SI units.** **10%**
  
- 7. **Calculate capacity measurements in imperial and SI units.** **10%**
  
- 8. **Perform grade and hanger calculations.** **10%**
  
- 9. **Perform various triangle calculations.** **3%**
  
- 10. **Perform piping offset calculation in imperial and SI units.** **18%**

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## Sprinkler Fitter

### UNIT: B10 SCIENCE II

**Subunit: B10a Science II**

**Level:** Two

**Duration:** 15 hours

Theory: 15 hours

Practical: 0 hours

#### Overview:

This Subunit is designed to provide the Sprinkler Fitter apprentice with an overview of science in the trade and industry. Topics include: science terms associated with pressure and force, density of water, density of air, relative density of water, effects of pressure on water, chemical properties of water, effects of temperature on water, flow of water, effects of volume, flow and pressure through a venture, and head pressure as it related to pumps.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. <b>Define and explain science terms associated with pressure and force.</b> a. Pascal's law	2%
2. <b>State the density of water.</b>	3%
3. <b>State the density of air.</b>	2%
4. <b>Review relative density of water.</b>	3%
5. <b>Explain the effects of pressure on water.</b>	2%
6. <b>Describe the chemical properties of water.</b>	3%
7. <b>Describe the effects of temperature on water.</b> a. Density b. Solubility c. Chemical reactions d. Expansion	10%
8. <b>Describe flow of water.</b> a. Laminar b. Turbulent c. Velocity d. Friction e. Pressure	10%

- f. Pressure drop
- g. Equivalent length
- h. Flow rate

- 9. Describe the effects of volume, flow and pressure through a venturi. 5%
- 10. Describe head pressure as it relates to pumps. 10%
- 11. Calculate the mass of the contents of various shaped solids and storage vessels using densities. 12%
- 12. Calculate head pressure in pipes and tank, total force and rate of flow through a pipe at a given pressure. 38%

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