

Sprinkler Fitter Level 3

Sprinkler Fitter

UNIT: C1 ORGANIZES WORK

Subunit: C1a Blueprint Reading and Sketching III

Level: Three

Duration: 23 hours

Theory: 10 hours

Practical: 13 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to complete and label basic drawings of typical sprinkler installations and to develop a materials list from information contained in construction drawings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with developing materials list from construction drawings.	15%
2. Describe the procedures used to create working plan and elevation view drawings of a typical sprinkler system installation. a. Establish design criteria b. Sprinkler head location c. Distribution piping d. Scaling and dimensioning e. Symbols and abbreviations f. Riser detail	30%
3. Describe the procedures used to modify drawings of a sprinkler system installation to create as-built drawings.	10%
4. Describe the procedures used to compile a materials list from information found on drawings.	10%
5. Identify the criteria used to estimate labour requirements.	15%
6. Describe electronic technologies for blueprints and design (e.g., 3D design, CAD, Revit).	5%
7. Demonstrate the ability to complete and label basic drawings of sprinkler installations and to develop a materials list from information contained in construction drawings.	15%

Sprinkler Fitter

UNIT: C2 COMMISSIONS SYSTEM

Subunit: C2a Commissioning

Level: Three

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of the procedures to commission water supply systems, piping installation, and detection, protection and control systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with commissioning of systems and installations.	5%
2. Identify hazards and describe safe work practices pertaining to the commissioning of water supply systems, piping installations, and detection, protection and control systems.	5%
3. Interpret codes, standards and regulations pertaining to the commissioning of water supply systems, piping installations, and detection, protection and control systems.	5%
4. Interpret information pertaining to the commissioning of water supply systems, piping installations, and detection, protection and control systems, found on drawings and specifications.	5%
5. Identify tests to be performed on water supply systems. a. Hydrostatic b. Chlorination c. Flushing d. Acceptance test of fire pump e. Component operation <ul style="list-style-type: none">• Cross connection control assemblies• Water tanks• Reservoirs	15%
6. Identify tests and checks to be performed on piping installations. a. Hydrostatic b. Pneumatic	15%

- c. Seal of penetrations
 - d. Placement of hangers, brackets, supports and restraints
 - e. Grade and elevation
 - f. Flushing
 - g. Labeling
 - h. Blank testing gaskets
 - i. Escutcheons
- 7. Identify tests and checks to be performed on detection, protection and control systems. 5%**
- a. Hydrostatic
 - b. Pneumatic
 - c. Location, operation and performance of components
 - Valves
 - Compressors
 - Quick opening devices
 - Detection devices
 - Signal initiating devices
- 8. Describe the procedures used to commission water supply systems. 5%**
- 9. Describe the procedures used to commission piping installations. 5%**
- 10. Describe the procedures used to commission detection, protection and control systems. 5%**
- 11. Demonstrate the commissioning of water supply systems, piping installations, and detection, protection and control systems. 30%**

Sprinkler Fitter

UNIT: C3 MENTORING

Subunit: C3a Journeyperson Trainer

Level: Three

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Level 1 in-school technical training offers an entry-level orientation to the challenges of apprenticeship training as it relates to the development of core tasks and skill requirements, as well as social competencies. This unit introduces senior apprentices to the responsibilities of workplace training that they will assume as supervising journeypersons. Most trades have a rich tradition of refreshing and sharing their trade skills from one generation of trade practitioner to the next. This unit orients senior apprentices to some of the practical and conceptual tools that can enable them to contribute to this trade heritage when they become certified journeypersons and, ultimately, journeyperson trainers.

The journeyperson's obligation to assist entry-level apprentices to develop skills and knowledge is complex and challenging. It involves safety considerations, employer expectations, provincial regulations, as well as the tradition of skills stewardship that links modern practice with the long history of workplace teaching and learning that defines the apprenticeable trades. The ability to offer timely and appropriate support to apprentices is itself an important area of trade learning. This unit presents material intended to help refine this ability through reflection and discussion by senior apprentices, and discussion with their in-school instructor and journeyperson trainer.

This content reflects Manitoba and Canadian standards prescribed for journeyperson-level supervisory capabilities, as well as key topics in current research on the importance of workplace training in apprenticeship systems. These detailed descriptors represent suggested focal points or guidelines for potentially worthwhile exploration, and are neither mandatory nor exhaustive.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Compare/contrast role-options and responsibilities of the supervising journeyperson.	50%
a. Implicit vs. explicit standards and content: training goals are/are not codified; assessment measures are/are not used	
b. Accountability for results: e.g. journeyperson is/is not required to prepare performance evaluation that could affect apprentice's employability or wage-rate, etc.	
c. Long-term vs. short-term supervision assignments – e.g., considerable latitude/little latitude for apprentice to learn from mistakes	
d. Formally vs. informally structured – e.g. supervision assignment is part of a prescribed cycle of assignments involving coordination among multiple journeypersons; apprentice is trained according to an individual training plan negotiated with employer	
e. Types of supervisory role options and what is implied by each:	

- Journeyperson Trainer (JT) role: often initiated by someone other than apprentice, and limited to a particular skill set, task, or production requirement
- Mentor role: often initiated by apprentice, and relatively open-ended regarding content, duration, etc.
- Peer role: typically involves individual upgrading or cross-training of one journeyperson by another; can include senior apprentice assisting less-experienced trade learner
- Coordinator role: often a senior-level journeyperson appointed by an organization to assume responsibilities for monitoring progression of groups of apprentices
- Other roles: may be improvised by journeyperson, such as combination or multiple roles of the above

2. Describe and demonstrate common requirements about providing journeyperson level supervision. 50%

- a. Apprenticeship learning adapted to journeyperson supervision assignments and a journeyperson perspective
 - Application of adult education concepts to trades teaching and learning (e.g. responsibilities and expectations of senior-level apprentices)
 - Practical significance of 'styles' of adult learning and teaching
 - Helping senior-level apprentices integrate in-school technical training and on-the-job practical training experiences
 - Providing help and guidance about new tasks and skills
 - Providing help and guidance about fixing mistakes
 - Learning and teaching "the ropes" – socialization of apprentice within a community of trade practice (e.g. how to borrow a tool, interrupt a journeyperson, and seek advice of experienced co-workers)
 - Coverage and documentation of prescribed tasks and subtasks where applicable.
 - Discuss the limits of the journeyperson trainers' own responsibilities and competence (e.g. scope, willingness to train, etc.)
 - Benefits of maintaining a personal record of achievements, ideas, and needs as a journeyperson trainer (e.g. resume, portfolio, training credentials, logbook, etc.)
- b. Individual reflection and guided group discussion about personal experiences of workplace learning as an apprentice
 - Identification of best and worst practices of journeyperson trainer
 - Identification of workplace and other factors that can contribute to good and bad trades teaching/learning experiences
 - Development of professional standards and work ethics about responsibility to share one's knowledge and skill with others in the workplace (e.g., use/misuse of humour, rigour, discretion, craft-pride, etc.)
 - Qualities of a good journeyperson trainer
 - Components of workplace journeyperson training
 - Processes and recommended practices re: journeyperson training
 - Troubleshooting problems re: supervision assignments
- c. Role of assessment in supervising, coaching, or guiding other people to learn or improve their skills (e.g. formative and summative evaluation), and how this might contribute to how the journeyperson-level supervision task is approached in future
- d. Compare and contrast discussion results with current knowledge and resources about workplace training methods as they apply to journeyperson-level supervision assignments
- e. Other (as may be specified by instructor)

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UNIT: C4 FIRE PUMP UNITS

Subunit: C4a Fire Pumps and Controllers

Level: Three

Duration: 25 hours

Theory: 20 hours

Practical: 5 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of fire pumps and controllers, their operation, selection, installation, maintenance and associated testing requirements.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with fire pumps and controllers.	5%
2. Identify hazards and describe safe work practices pertaining to fire pumps and controllers.	5%
3. Interpret codes, standards and regulations pertaining to fire pumps and controllers.	5%
4. Interpret information pertaining to fire pumps and controllers found on drawings and specifications.	5%
5. Identify tools and equipment relating to fire pumps and controllers, and describe their applications and procedures for use.	5%
6. Explain head pressure as it relates to pumps.	5%
7. Explain the effects of potential problems with fire pumps and describe their solutions. a. Cavitation b. Air pockets c. Rotation d. Drivers e. Rpm f. Pressure relief valves	5%
8. Identify types of fire pumps and describe their principles of operation and applications.	5%

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| 9. Identify fire pump assembly components and accessories and describe their purpose and operation. | 5% |
| 10. Explain the requirements for installation of strainers and trash screens on raw water sources. | 5% |
| 11. Identify the consideration for selecting fire pump assemblies. | 10% |
| a. Types of drivers | |
| b. Pump and pipe sizing | |
| c. Capacity of pumps | |
| d. Pressure ratings | |
| e. Pump performance | |
| f. Fire pump curve (manufacturers') | |
| g. Start mechanisms | |
| 12. Identify the installation requirements for fire and jockey pumps. | 5% |
| 13. Describe the principles of operation of controllers. | 5% |
| 14. Describe the procedures used to install, test and maintain fire pumps and their components. | 5% |
| 15. Identify the installation requirements for fuel supply and exhausts of diesel drivers for fire pumps. | 5% |
| 16. Describe the procedures used to install, inspect and test controllers. | 5% |
| 17. Explain the requirements and procedures for acceptance testing on fire pumps and their components. | 5% |
| 18. Describe the procedures used to commission fire pumps and controllers. | 5% |
| 19. Demonstrate the operation, selection, installation, maintenance and test procedures for fire pumps and controllers. | 5% |

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UNIT: C5 PRIVATE WATER SUPPLY SYSTEMS

Subunit: C5a Installs private water supply systems

Level: Three

Duration: 16 hours

Theory: 14 hours

Practical: 2 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate an understanding of private water supply systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Installs water tanks.	50%
a. Define terminology associated with water tanks	
b. Identify types of water tanks and describe their characteristics, principles of operation and applications	
c. Identify hazards and describe safe work practices pertaining to water tanks	
d. Interpret codes, standards and regulations pertaining to water tanks	
e. Identify tools and equipment relating to water tank installation and their applications and procedures for use	
f. Identify types of water connections and their associated components	
g. Identify the methods used for protection of tanks	
1. Installs related equipment.	50%
a. Identify procedures used in the installation of water tanks and related equipment	
b. Interpret codes, standards and regulations pertaining to water tank installation and related equipment	
c. Interpret information pertaining to water tank and related equipment found on drawings and specifications.	
d. Identify tools and equipment relating to water tank and related equipment installation and describe their applications and procedures for use	
e. Explain supply and discharge piping requirements	
f. Identify the arrangement of fire pump unit components.	

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UNIT: C6 WATER-BASED SYSTEMS

Subunit: C6a Water Spray Fixed Systems

Level: Three

Duration: 8 hours

Theory: 4 hours

Practical: 4 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of water spray fixed systems and their applications, operating principles, installation requirements, and associated test procedures.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with water spray fixed systems.	5%
2. Identify hazards and describe safe work practices pertaining to water spray fixed systems.	5%
3. Interpret codes, standards and regulations pertaining to water spray fixed systems.	10%
4. Interpret information pertaining to water spray fixed systems found on drawings and specifications.	10%
5. Identify tools and equipment relating to water spray fixed systems, and describe their applications and procedures for use.	5%
6. Identify types of water spray fixed systems and describe their operating principles and applications. a. Water supply required b. Design of system • Water spray nozzles • Nozzle orientation and placement c. Exposure protection	10%
7. Identify the considerations for selecting components for water spray fixed systems.	10%
8. Identify installation requirements of water spray fixed systems. a. Materials b. Supports and hangers	10%

- c. System actuation
 - d. Testing
 - e. Manufacturers' specifications/training
 - f. Handling and storage
9. **Describe the procedures used to layout and install water spray fixed systems and components.** 10%
- a. Prepares materials
 - b. Installs supports
 - c. Installs system actuation
 - d. Performs tests and makes adjustments
10. **Describe the system controls for the water spray fixed system and their installation requirements.** 5%
11. **Explain the requirements for drainage of the system.** 5%
12. **Describe the procedures used to service and maintain water spray fixed systems.** 5%
13. **Explain the requirements and procedures for acceptance testing of water spray fixed systems.** 5%
14. **Describe the procedures used to commission water spray fixed systems.** 5%

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Subunit: C6b Water Mist Systems

Level: Three

Duration: 10 hours

Theory: 7 hours

Practical: 3 hours

Overview:

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

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with water mist systems.	5%
2. Identify hazards and describe safe work practices pertaining to water mist systems.	5%
3. Interpret codes, standards and regulations pertaining to water mist systems.	10%
4. Interpret information pertaining to water mist systems found on drawings and specifications.	10%
5. Identify tools and equipment relating to water mist systems, and describe their applications and procedures for use.	5%
6. Identify types of water mist systems and describe their operating principles and applications.	10%
a. Water supply required	
b. Design of system	
c. Characteristics of water spray nozzles	
d. Exposure protection	
7. Identify the considerations when selecting components for water mist systems.	5%
8. Identify installation requirements of water mist systems.	5%
a. Materials	
b. Supports and hangers	
c. System actuation	
d. Testing	
e. Manufacturers' specifications/training	
f. Handling and storage	

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| 9. Describe the procedures used to layout and install water mist systems and components. | 10% |
| a. Prepare materials | |
| b. Install supports | |
| c. Install system actuation | |
| d. Performs tests and makes adjustments | |
| 10. Identify system controls for water mist systems and their installation requirements. | 5% |
| 11. Explain the requirements for drainage of the system. | 5% |
| 12. Describe the procedures used to service and maintain water mist systems. | 5% |
| 13. Explain the requirements and procedures for acceptance testing of water mist systems. | 5% |
| 14. Describe the procedures used to commission water mist systems. | 5% |
| 15. Demonstrate the operation, installation and test procedures for water mist systems. | 10% |

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Subunit: C6c Foam Systems

Level: Three

Duration: 17 hours

Theory: 14 hours

Practical: 3 hours

Overview:

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

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with foam systems.	5%
2. Identify hazards and describe safe work practices pertaining to foam systems.	5%
a. Environmental considerations	
• Containment	
• Disposal	
3. Interpret codes, standards and regulations pertaining to foam systems.	5%
4. Interpret information pertaining to foam systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to foam systems, and describe their applications and procedures for use.	5%
6. Identify foam systems and describe their operating principles and applications.	10%
a. Water supply required	
b. Design of system	
c. Characteristics and selection of discharge methods	
d. Exposure protection	
7. Describe the installation requirements of foam systems.	5%
a. Materials	
b. Supports	
c. System actuation	
d. Testing	
e. Manufacturers' specifications/training	
f. Handling and storage	

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| 8. Identify system controls for foam systems and describe their installation requirements. | 5% |
| 9. Identify types of concentrate used in foam systems and describe their characteristics and applications. | 5% |
| 10. Describe the procedures used to layout and install foam systems and components. | 10% |
| <ul style="list-style-type: none"> a. Foam concentrate storage tank and trim b. Reserve tank and trim c. Foam concentrate pump d. Check valves, strainers and orifice plates e. Valves <ul style="list-style-type: none"> • Wet • Dry • Pre-action/deluge f. Piping materials <ul style="list-style-type: none"> • System • Concentrate g. Cross connection control devices h. Discharge methods | |
| 11. Describe the procedures used to fill foam concentrate tanks. | 5% |
| 12. Explain the requirements for drainage of the system. | 5% |
| 13. Explain the operation of a balanced pressure proportioning system. | 5% |
| 14. Explain the operation of a pressure proportioning tank with and without diaphragm. | 5% |
| 15. Describe the procedures used to test and maintain foam systems. | 5% |
| 16. Explain the requirements and procedures for acceptance testing of foam systems. | 5% |
| 17. Describe the procedures used to commission foam systems. | 5% |
| 18. Demonstrate the operation, installation and test procedures for foam systems. | 5% |

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UNIT: C7 SPECIALTY FIRE SUPPRESSION SYSTEMS

Subunit: C7a Specialty Sprinkler Systems

Level: Three

Duration: 24 hours

Theory: 21 hours

Practical: 3 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of specialty sprinkler systems.

Objectives and Content:	Percent of Unit Mark (%)
1. Define terminology associated with specialty sprinkler systems.	10%
2. Identify sources of information relevant to specialty sprinkler systems.	15%
a. Documentation	
b. Drawings	
c. Related professionals	
d. Devices	
3. Describe the application of specialty sprinkler systems.	15
a. Identify and Interpret Codes	
b. Identify and Interpret Regulations and Standards	
c. Identify and Interpret Occupancy Classification	
4. Describe the procedures used to interpret and extract information from drawings.	20%
5. Identify the purpose of submittals and shop drawings, and describe the procedures used to interpret them.	20%
6. Identify the types of material and describe their applications and the procedures used to install them.	20%
a. Identify limitations of materials.	
b. Identify engineer's requirements	
c. Identify specific requirements for type of system installed	

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Subunit: C7b Portable Fire Extinguishers

Level: Three

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of portable fire extinguishers, their installation and requirements for testing.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with portable fire extinguishers.	5%
2. Identify hazards and describe safe work practices pertaining to portable fire extinguishers.	5%
3. Interpret codes, standards and regulations pertaining to portable fire extinguishers.	10%
4. Interpret information pertaining to portable fire extinguishers found on drawings and specifications.	5%
5. Identify tools and equipment relating to portable fire extinguishers and describe their applications and procedures for use.	5%
6. Identify the classes and types of portable fire extinguishers and describe their characteristics, operation and applications.	20%
7. Identify the installation requirements and procedures for portable fire extinguishers and cabinets when applicable.	20%
8. Describe the procedures used to inspect, test and maintain portable fire extinguishers.	10%
9. Describe the procedures used to operate portable fire extinguishers.	20%

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Subunit: C7c Dry and Wet Chemical Extinguishing Systems

Level: Three

Duration: 18 hours

Theory: 11 hours

Practical: 7 hours

Overview:

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

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with dry and wet chemical extinguishing systems.	5%
2. Identify hazards and describe safe work practices pertaining to dry and wet chemical extinguishing systems.	5%
3. Interpret codes, standards and regulations pertaining to dry and wet chemical extinguishing systems.	5%
4. Interpret information pertaining to dry and wet chemical extinguishing systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to dry and wet chemical extinguishing systems, and describe their applications and procedures for use.	5%
6. Identify types of dry and wet chemical extinguishing agents and systems and describe their characteristics and applications.	5%
7. Describe the operating principles of dry and wet chemical extinguishing systems.	15%
a. Methods of dispensing dry and wet chemicals	
• Hand hose line systems	
• Fixed piping systems	
b. Action of expellant gas	
c. Extinguishing properties	
8. Describe fixed pipe systems.	5%
a. Total flooding	
b. Local application	

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| 9. Identify installation requirements of dry and wet chemical extinguishing systems. | 15% |
| a. Materials | |
| b. Supports and hangers | |
| c. System actuation | |
| d. Testing | |
| e. Manufacturers' specifications/training | |
| f. Handling and storage | |
| 10. Describe the procedures used to install dry and wet chemical extinguishing systems. | 5% |
| 11. Explain the requirements and procedures for acceptance testing of dry and wet chemical extinguishing systems. | 5% |
| 12. Describe the procedures used to commission dry and wet chemical extinguishing systems. | 5% |
| 13. Demonstrate the operation, installation and test procedures of dry and wet chemical extinguishing systems. | 20% |

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Subunit: C7d Clean Agent and Carbon Dioxide Extinguishing Systems

Level: Three

Duration: 20 hours

Theory: 14 hours

Practical: 6 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of clean agent and carbon dioxide extinguishing systems, their applications and operating principles, installation requirements and associated test procedures.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with clean agent and carbon dioxide extinguishing systems.	5%
2. Identify hazards and describe safe work practices pertaining to clean agent extinguishing systems.	5%
3. Interpret codes, standards and regulations pertaining to clean agent and carbon dioxide extinguishing systems.	5%
4. Interpret information pertaining to clean agent and carbon dioxide extinguishing systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to clean agent and carbon dioxide extinguishing systems, and describe their applications and procedures for use.	5%
6. Identify clean agent and carbon dioxide extinguishing systems and describe their operating principles and applications. <ul style="list-style-type: none"> a. Design of system b. Exposure protection c. Methods of system operation <ul style="list-style-type: none"> • Local application • Total flooding • Hand directed operation 	10%
7. Identify clean agent and carbon dioxide extinguishing system components and describe their purpose and operation. <ul style="list-style-type: none"> a. Alarms and indicators b. Life safety provisions c. Discharge nozzles d. Piping and fittings 	10%

- e. Supports
- f. Tanks and manifolds
- g. Release mechanisms
- h. Detection devices
- i. Pressure relief venting

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| 8. Identify types of clean agent and carbon dioxide extinguishing systems and describe their characteristics and applications. | 5% |
| 9. Describe the procedures used to install and test clean agent and carbon dioxide extinguishing systems according to manufacturers' recommendations. | 10% |
| 10. Describe the procedures used to service, maintain and remove clean agent and carbon dioxide extinguishing systems according to manufacturers' specifications. | 10% |
| 11. Identify the considerations and limitations pertaining to halon systems. | 10% |
| 12. Explain the requirements and procedures for acceptance testing of clean agent and carbon dioxide extinguishing systems. | 5% |
| 13. Describe the procedures used to commission clean agent and carbon dioxide extinguishing systems according to manufacturers' specifications. | 5% |
| 14. Demonstrate the operation, installation and test procedures for clean agent and carbon dioxide extinguishing systems. | 10% |

Apprenticeship Manitoba Sprinkler Fitter

UNIT: C8 DETECTION DEVICES (INSTALLS)

Subunit: C8a Detection Devices Installations II

Level: Three

Duration: 4 hours

Theory: 4 hours

Practical: 0 hours

Overview:

Upon completion of this Subunit of instruction the apprentice will demonstrate knowledge of the procedures to install, test and maintain detection devices.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with detection devices.	10%
2. Identify hazards and describe safe work practices pertaining to detection devices.	10%
3. Interpret codes, standards and regulations pertaining to detection devices.	10%
4. Interpret information pertaining detection devices found on drawings and specifications.	10%
5. Identify tools and equipment relating detection devices, and describe their applications and procedures for use.	10%
6. Identify types of detection devices and describe their characteristics, parameters and applications.	10%
a. Wet and dry pilot lines	
b. Heat-actuated detectors (HADs)	
c. Spark detection	
d. Air sampling and distribution piping	
e. Electrical detection	
f. Photo cells	
7. Demonstrate the procedures used to install spark detection systems.	10%
8. Describe the procedures used to install air sampling systems.	10%
9. Describe the procedures used to install electrical detection systems.	10%
10. Demonstrate the testing and maintenance of detection devices.	10%

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UNIT: C9 INSPECTION, TESTING and MAINTENANCE

Subunit: C9a Inspection, Testing and Maintenance

Level: Three

Duration: 35 hours

Theory: 28 hours

Practical: 7 hours

Overview:

Upon completion of this Subunit of the apprentice will demonstrate knowledge of the inspection, testing and maintenance procedures and requirements for fire protection/suppression systems and their components, the relationship between sprinkler systems and fire alarm panels, and the procedures to troubleshoot and correct system failures.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with inspection, testing and maintenance of fire protection/suppression systems and their components.	5%
2. Identify hazards and describe safe work practices pertaining to the inspection, testing and maintenance of fire protection/suppression systems and their components.	5%
3. Interpret codes, standards and regulations pertaining to inspection, testing and maintenance of fire protection/suppression systems and their components.	5%
4. Identify tools and equipment relating to inspection, testing and maintenance of fire protection/suppression systems, and describe their applications and procedures for use.	5%
5. Explain the liabilities and responsibilities for the inspection, testing and maintenance of fire protection/suppression systems. <ul style="list-style-type: none"> a. Manufacturer b. Installer c. Authority having jurisdiction (AHJ) d. Building owner/representative e. Fire watch 	5%
6. Identify frequency of inspection, testing and maintenance of fire protection/suppression systems and components.	5%
7. Identify requirements for inspecting and testing systems that have been altered or repaired.	5%
8. Identify types of fire panels and signals, and describe their operation and purpose. <ul style="list-style-type: none"> a. Panels <ul style="list-style-type: none"> • Alarm 	5%

- Release
 - Annunciator
- b. Signals
- Trouble
 - Alarm
 - Supervisory
9. **Identify the testing requirements for signaling devices.** 5%
10. **Describe the procedures used to shut down and reactivate sprinkler systems and associated alarms and supervisory devices.** 5%
11. **Describe the procedures used to inspect, test and maintain water-based fire protection/suppression systems and components.** 5%
- a. Wet pipe
 - b. Dry pipe
 - c. Antifreeze
 - d. Standpipe and hose valves
 - e. Pre-action
 - f. Deluge
 - g. Combined dry pipe/pre-action
12. **Identify the requirements for inspecting, testing and maintenance of specialty fire protection/suppression systems and components.** 5%
13. **Describe the procedures used to flush sprinkler systems.** 5%
- a. Hydraulic
 - b. Hydro-pneumatic
14. **Describe the procedures used to inspect, test and maintain fire pumps and components.** 5%
15. **Describe the procedures used to inspect, test and maintain hydrants and fire department connections.** 5%
16. **Identify common causes of fire protection/suppression system failures.** 5%
17. **Identify the classifications of needed corrections and repairs, and explain the associated requirements.** 5%
- a. Impairment
 - b. Critical deficiency
 - c. Non-critical deficiency
 - d. Recommendations
18. **Describe the procedures used to troubleshoot water-based fire protection/suppression systems and perform the related repair procedures.** 5%
19. **Identify the requirements for inspecting backflow preventers.** 5%
20. **Demonstrate the inspection, testing and maintenance procedures for fire protection/suppression systems and their components and the procedures to troubleshoot and correct system failures.** 5%

Sprinkler Fitter

UNIT: C10 MATHEMATICS III

Subunit: C10a Mathematics III

Level: Three

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate an understanding of the principles of mathematics. The following topics will be covered: review of level one and level two mathematics, piping offsets, length of travel for basic and other offsets.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Review mathematics units A9a and B9a as necessary.	20%
2. Describe piping offsets.	30%
a. Formula	
b. Length of travel	
c. Basic	
d. Other	
• Parallel	
• Equal spread	
• Unequal spread	
• Rolling	
3. Calculate length of travel for basic offsets in imperial and SI units.	30%
4. Calculate length of travel for various other offsets in imperial and SI units.	20%

Sprinkler Fitter

UNIT: C11 Science III

Subunit: C11a Science III and Basic Hydraulic Calculations

Level: Three

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of science in the trade and industry. Topics include: principles of electricity, direct and alternate current flow of electricity, simple electrical circuits, electromagnetic devices, pressure and tamper switches, and the importance and purpose of hydraulic calculations and the factors involved.

Objectives and Content:

**Percent of
Unit Mark (%)**

- | | |
|--|-----------|
| 1. Describe the basic principles of electricity. | 2% |
| a. Electron theory | |
| b. Amps | |
| c. Volts | |
| d. Ohms | |
| 2. Explain the principles of direct current flow of electricity. | 3% |
| 3. Explain the principles of alternating current flow of electricity. | 2% |
| 4. Draw simple electrical circuits. | 3% |
| a. Series | |
| b. Parallel | |
| 5. Explain the principles of electromagnetic devices. | 3% |
| a. Transformers | |
| b. Solenoids | |
| 6. Describe the operation and function of flow, pressure and tamper switches. | 2% |
| 7. Define terminology associated with hydraulic calculations as they apply to the Sprinkler Fitter trade. | 3% |
| a. Hydraulic calculation | |
| b. Equivalent length | |
| c. Friction loss | |
| d. Static pressure | |
| e. Residual pressure | |
| f. Hand hose allowance | |

- g. Design densities
 - h. Design area
 - i. System demand
- 8. Describe the flow of water. 2%**
- a. Laminar
 - b. Turbulent
 - c. Velocity
 - d. Friction
 - e. Pressure
 - f. Pressure drop
 - g. Equivalent length
 - h. Flow rate
- 9. Calculate water pressure problems. 40%**
- a. Effect of change of height on pressure
 - b. Effect of friction loss on pressure
- 10. Discuss the systems layout of a hydraulically calculated sprinkler system. 2%**
- a. NFPA codes and regulations
 - b. Water service requirements
 - c. Type of pipe
 - Pipe sizes
 - Branch lines
 - Cross mains
 - d. Design densities, design area
 - e. Minimum operating pressure
- 11. Describe the effects of volume, flow and pressure through a venturi. 2%**
- 12. Describe the importance of water densities over a prescribed area. 3%**
- 13. List and describe the classification of occupancies. 2%**
- 14. Identify applicable codes and regulations regarding the layout for hydraulic calculated sprinkler system. 3%**
- 15. Determine available water supply. 2%**
- 16. Identify system requirements regarding pipe sizes, branch lines and cross mains. 3%**
- a. Wet
 - b. Dry
 - c. Pre-action/deluge
- 17. Identify sprinkler heads that can be used with this system. 2%**
- 18. Identify minimum operating pressure of system. 3%**
- 19. Identify type of piping to be used. 2%**
- 20. Explain requirements for future additional heads. 3%**

21. Describe procedures used to perform a flow test at municipal hydrants. 2%
22. Describe the occupancy hazard design requirements for pipe schedule systems. 3%

Apprenticeship Manitoba

Sprinkler Fitter

UNIT: C12 PRE-IP REQUIREMENTS

Subunit: C12a Pre-Certification Review

Level: Three

Duration: 40 hours

Theory: 40 hours

Practical: 0 hours

Overview:

This Subunit offers senior apprentices a systematic review of skills and knowledge required to pass the Interprovincial 'Red Seal' Examination. It promotes a purposeful personal synthesis between on-the-job learning and the content of in-school technical training. The unit includes information about the significance of Red Seal Interprovincial certification and the features of the Interprovincial exam. No testing is prescribed for this unit. Instead, a "Pass/Fail" grade will be awarded upon completion of the unit.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
<p>1. Describe the significance, format and general content of Interprovincial (Red Seal) Examinations for the trade of Sprinkler Fitter.</p> <ul style="list-style-type: none">a. Scope and aims of Red Seal system; value of certificationsb. Obligations of candidates for IP certification<ul style="list-style-type: none">• Relevance of IP examinations to current, accepted trade practices; industry-based national validation of test items• Supplemental Policy (retesting)• Confidentiality of examination contentc. Multiple-choice format (four-option) item format, Red Seal/Apprenticeship Branch standards for acceptable test itemsd. Government materials relevant to the IP examinations for apprentice Sprinkler Fitters<ul style="list-style-type: none">• Red Seal Occupational Standard (RSOS); prescribed scope of the skills and knowledge which comprise the trade• RSOS "Pie-chart" and its relationship to content distribution of IP examination items• Manitoba Apprentice Technical Training, especially the RSOS, as these relate to apprentice's coverage of the skills and knowledge of his/her trade	
<p>2. Identify resources, strategies and other considerations for maximizing successful completion of written exams.</p> <ul style="list-style-type: none">a. Personal preparedness<ul style="list-style-type: none">• Rest• Nutrition• Personal study regimen• Prior experience in test situations (e.g. Unit Tests)	

- b. Self-assessment, consultation and personal study plan
 - Self-assessment of individual strengths/weaknesses in trade-related skills and knowledge
 - Approved textbooks
 - Study groups
- 3. **Review program content regarding common occupational skills.**
- 4. **Review program content regarding math, science and blueprint reading.**
- 5. **Review program content regarding water supply installation.**
- 6. **Review program content regarding piping installation.**
- 7. **Review program content regarding installation of detection, protection and control systems.**
- 8. **Review program content regarding service of fire protection systems.**
