

# Sprinkler Fitter Level 1

## Sprinkler Fitter

### UNIT A1 SAFETY RELATED FUNCTIONS

#### Subunit: A1a Safety Related Functions

**Level:** One

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

#### Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Sprinkler Fitter apprenticeship training both in school and on-the-job. Unit content is supplemented throughout technical training by trade-specific information about Sprinkler Fitter safety hazards and precautions presented in the appropriate contexts of discussion and study. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. A "Pass/Fail" grade will be recorded for the unit. A Pass mark is assumed to be 70%. Therefore 70% is the mark to be submitted to the Apprenticeship Branch clerks for inputting into computer records.**

#### Objectives and Content:

Percent of  
Unit Mark (%)

**1. Identify safety and health requirements.**

n/a

- a. Overview of The Workplace Safety and Health Act
  - Rights and responsibilities of employees under the Act
  - Rights and responsibilities of employers under the Act
  - Rights and responsibilities of supervisors under the Act
- b. Fourteen (14) regulations
- c. Codes of practice
- d. Guidelines
- e. Right to refuse
  - Explanation of right to refuse process
  - Rights and responsibilities of employees
  - Rights and responsibilities of employers
  - Rights and responsibilities of supervisors under the Act

**2. Identify personal protective equipment (PPE) and procedures.**

n/a

- a. Employer and employee responsibilities as related to personal protective equipment

- b. Standards: ANSI (U.S.A. standards), etc
- c. Work protective clothing and danger if it fits poorly
- d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)
- e. Headwear – appropriate protective headwear when required and the approved type of headwear
- f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
- g. Foot protection – when required according to safety standards
- h. Hearing protection
  - Hazards of various noise levels (hearing protection must be worn)
  - Laws
  - Types of hearing protection
- i. Respiratory protection – types, overview of proper selection
- j. Fall protection – Manitoba requirements standards guidelines
  - ANSI (U.S.A. standards), etc.
- k. Ladders and scaffolding
- l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)

- 3. Identify workplace regulations applicable to:** n/a
- a) the care and cleanliness in the working area
  - b) the safe use of chemicals
  - c) the use of scaffolding, and
  - d) the use of ladders and related equipment

- 4. Identify ergonomics.** n/a
- a. Definition of ergonomics and conditions that may affect the body
    - Working postures
    - Repetition
    - Force
    - Lifting
    - Tools
    - Identify tool and safety equipment
    - Causes of hand tool accidents
    - Equipment

- 5. Hazard recognition and control.** n/a
- a. HPA and HPR. Hazardous Products Act and Hazardous Products Regulations
  - b. Safe work practices
  - c. Basic risk assessment
  - d. Injury prevention and control measures
  - e. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them
  - f. Refrigerants
  - g. Toxic chemical (non-refrigerant)
  - h. High pressure fluids

- 6. Hazard of confined space entry.** n/a
- a. Identification of a confined space
  - b. Hazards of a confined space (including physical and biological hazards)
  - c. Working in a confined space
  - d. Emergency response plan
  - e. Self-contained breathing apparatus (SCBA)

- 7. Identify first aid/CPR.** n/a
- a. Overview of first aid regulation
  - b. Obligations of employers regarding first aid
    - Who is certified to provide first aid?
    - What to do while waiting for help?
    - Where is the first aid kit located?
  - c. Describe basic first aid requirements and techniques
    - Scope and limits of first aid intervention
    - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
    - Interface with other services and agencies (e.g., Workers Compensation claims)
  - d. Describe basic CPR requirements and techniques
    - How do you get certified?
    - Scope and limits of CPR intervention (include varieties of CPR certification)
- 8. Identify the safety requirements as they apply to WHMIS 2015 with emphasis on:** n/a
- a. WHMIS 1988 vs 2015 as system. What is same and what has changed? What is GHS?
  - b. Provincial regulation under the Safety and Health Act
    - Each province has a WHMIS regulation
  - c. Federal Hazardous Products Act
  - d. WHMIS generic training:
    - WHMIS defined and the format used to convey information about hazardous materials in the workplace
    - Information found on supplier and workplace labeling using WHMIS
    - Hazardous materials in accordance with WHMIS
    - Compliance with government safety standards and regulations
  - e. Description of WHMIS (include varieties of WHMIS Certification)
    - Typology of WHMIS labels, symbols, and classifications
    - Scope and use of Materials/Safety Data Sheets (M/SDS)
- 9. Identifying and controlling hazards.** n/a
- a. Basic control measures (injury prevention)
  - b. Safe work procedures
  - c. Explanation on the importance of industrial housekeeping
  - d. Employer responsibilities
  - e. How and where to store materials
  - f. Safety measures related to walkways, stairs and floor openings
  - g. Explanation of how to protect the worker and others when working in traffic paths
- 10. Describe the safe storage of stock equipment in service vehicles and transportation of dangerous goods.** n/a
- 11. Describe Asbestos Safety and Health Requirements.** n/a
- a. Describe what asbestos is, and why it has been used so much
  - b. Describe the potential health hazards associated with asbestos
  - c. Identify typical products and materials that contain asbestos
  - d. Describe proper precautions and work practices when working around asbestos
  - e. Describe how to recognize asbestos hazards due to damage or deterioration
  - f. Describe appropriate response to an asbestos fiber release
  - g. Describe what Workplace Safety and Health regulations, guidelines and bulletins apply to workers who work with or work around asbestos and what aspects of those

regulations, guidelines and bulletins affect you or your company

12. **Review the amendments to The Workplace Safety and Health Regulation to meet harmonization recommendations of the Occupational Safety and Health of the Canadian Association of Administrators of Labour Legislation, a cross-jurisdictional advisory and consultative body respecting shared issues relating to occupational safety and health which include:** n/a
- a. Updating first-aid kits and first-aid certifications in accordance with newly developed Canadian Standards Association standards as part of a national system for workplace first aid;
  - b. Extending baseline hearing test requirements from within 70 days of hire to up to six months and replace annual hearing reports with requirements to report every two years;
  - c. Clarifying existing requirements for the provision and use of several types of personal protective equipment including high-visibility safety apparel, hearing protection, life jackets and personal flotation devices; and
  - d. Ensuring a secondary air supply is carried on the person or within arm's reach for workers working in dangerous atmospheres.

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## Sprinkler Fitter

**Subunit: A1b Learning About Work**

**Level:** One

**Duration:** 5 hours

Theory: 5 hours

Practical: 0 hours

### Overview:

One sign that an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill. The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and industrial/construction deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the JP's knowledge and experience. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act, regulations, Provincial Advisory Committees and the Red Seal Occupational Standards Analysis from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honored foundation of Trades journeywork.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe structure and scope of the Sprinkler Fitter trade.</b>	<b>50%</b>
a. The Apprenticeship and Certification Act <ul style="list-style-type: none"><li>• Apprenticeship and Certification Board and Provincial Advisory Committees</li><li>• General and specific trade regulation</li><li>• Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training provider)</li></ul>	
b. Uses of the Red Seal Occupational Standards (RSOS). <ul style="list-style-type: none"><li>• Technical training in-school curriculum</li><li>• On-the-job record book of hours (Manitoba blue book)</li><li>• Examinations (level placement tests, final certification examinations)</li></ul>	
c. Opportunities and future career options <ul style="list-style-type: none"><li>• Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.</li><li>• Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of</li></ul>	

leadership between management and shop floor workers.

- Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the draw-backs and benefits to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

**2. Describe two levels of workplace competency. 40%**

- a. Job competencies related to workplace culture
  - Knowledge of workplace equipment and materials
  - Skills and techniques
- b. Social competencies related to workplace culture
  - Frame of reference for evaluation workplace events
  - Language of work
  - Workplace belief systems
  - Rules and meanings
  - Multiculturalism and equity in the workplace

**3. Describe accommodation for apprentices with disabilities. 10%**

- a. Technical training
  - Requirements
  - Roles and responsibilities
  - Services and information required by persons with disabilities
- b. On-the-job
  - Requirements
  - Roles and responsibilities
  - Services and information required by persons with disabilities

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## Sprinkler Fitter

### UNIT      A2    TOOLS AND EQUIPMENT

**Subunit:**    A2a Tools and Equipment

**Level:**        One

**Duration:**    14 hours

                  Theory:        7 hours

                  Practical:        7 hours

#### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for safe use.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. <b>Define terminology associated with tools and equipment.</b>	<b>5%</b>
2. <b>Identify hazards and describe safe work procedures pertaining to tools and equipment.</b>	<b>15%</b>
3. <b>Identify types of hand tools and describe their applications and procedures for use.</b>	<b>15%</b>
4. <b>Identify types of portable and stationary power tools and describe their applications and procedures for use.</b>	<b>15%</b>
5. <b>Identify types of measuring and testing equipment and describe their applications and procedures for use.</b>	<b>10%</b>
6. <b>Identify types of powder actuated tools and describe their applications and training requirements.</b>	<b>5%</b>
7. <b>Describe the procedures used to inspect, maintain and store tools and equipment.</b>	<b>10%</b>
8. <b>Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for safe use.</b>	<b>25%</b>

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## Sprinkler Fitter

**Subunit: A2b Access Equipment**

**Level:** One

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of the selection, assembly and procedures for using access equipment.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. <b>Define terminology associated with access equipment.</b>	10%
2. <b>Identify hazards and describe safe work practices pertaining to the use of access equipment.</b>	10%
3. <b>Interpret codes, standards and regulations pertaining to the use of access equipment.</b> a. Jurisdictional limitations b. Training and Certification requirements	10%
4. <b>Identify types of access equipment and describe their applications and training requirements.</b> a. Ladders b. Scaffolding c. Swing stages d. Man lifts e. Man baskets	25%
5. <b>Describe the procedures used to inspect and maintain ladders and scaffolding.</b>	10%
6. <b>Describe the procedures used to erect, level and dismantle scaffolding.</b>	10%
7. <b>Describe the procedures used to store and secure access equipment.</b>	10%
8. <b>Demonstrate the selection, assembly and procedures for using access equipment.</b>	15%

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## Sprinkler Fitter

**Subunit: A2c Rigging, Hoisting and Lifting**

**Level:** One

**Duration:** 8 hours

Theory: 5 hours

Practical: 3 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of rigging, hoisting and lifting equipment, their applications, limitations and procedures for use. This unit will also cover knots, their applications and procedures for tying; of hand signals used for hoisting and lifting; of the procedures used to plan and perform rigging, hoisting and lifting operations; and of calculations required to perform rigging, hoisting and lifting operations.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. <b>Define terminology associated with rigging, hoisting, and lifting.</b>	<b>5%</b>
2. <b>Identify hazards and describe safe work practices pertaining to rigging, hoisting, and lifting.</b>	<b>5%</b>
3. <b>Interpret codes, standards and regulations pertaining to rigging, hoisting, and lifting.</b>	<b>5%</b>
a. Training and Certification requirements	
4. <b>Identify types of rigging, hoisting, and lifting equipment and describe their applications, limitations and procedures for use.</b>	<b>10%</b>
5. <b>Identify types of ropes and slings and describe their characteristics, safe working loads and applications.</b>	<b>5%</b>
a. Natural	
b. Synthetic	
c. Wire	
6. <b>Identify the factors to consider when selecting rigging equipment.</b>	<b>5%</b>
a. Load characteristics	
b. Environment	
c. Safety factor	
7. <b>Describe the procedures used to perform calculations related to rigging.</b>	<b>5%</b>
a. Weight of a load	
b. Center of gravity	
c. Sling angle	

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|---|------------|
| <b>8. Describe the considerations when rigging material or equipment for lifting.</b>   | <b>5%</b>  |
| <ul style="list-style-type: none"> <li>a. Load characteristics</li> <li>b. Equipment and accessories</li> <li>c. Environmental factors</li> <li>d. Anchor points</li> <li>e. Sling angles</li> </ul>  |            |
| <b>9. Identify types of knots and hitches used on ropes and describe their applications and procedures to tie them.</b>   | <b>10%</b> |
| <b>10. Describe the procedures used to inspect, maintain and store rigging, hoisting, and lifting equipment according to manufacturers' specifications.</b>   | <b>5%</b>  |
| <b>11. Explain sling angle when preparing for hoisting and lifting operations.</b>  | <b>5%</b>  |
| <b>12. Describe the procedures used for attaching rigging equipment to the load.</b>  | <b>5%</b>  |
| <b>13. Identify and interpret the procedures used to communicate during rigging, hoisting and lifting operations.</b>   | <b>5%</b>  |
| <ul style="list-style-type: none"> <li>a. Hand signals</li> <li>b. Electronic communications</li> <li>c. Audible/visual</li> </ul>  |            |
| <b>14. Describe the procedures used to plan and perform a lift.</b>   | <b>15%</b> |
| <ul style="list-style-type: none"> <li>a. Supervision of lift</li> <li>b. Secure work area</li> <li>c. Determine weight of the load</li> <li>d. Select equipment</li> <li>e. Determine set-up equipment</li> <li>f. Determine communication methods</li> <li>g. Set up hoisting/lifting equipment</li> <li>h. Rig material/equipment to be lifted</li> <li>i. Attach tag line</li> <li>j. Perform pre-lift checks</li> <li>k. Lift and place load</li> <li>l. Perform post-lift inspection of the load</li> <li>m. Disconnect the load</li> </ul> |            |
| <b>15. Demonstrate the use of rigging, hoisting and lifting equipment, their applications, limitations and procedures for use; of knots, their applications and procedures for tying; of hand signals used for hoisting and lifting; of the procedures used to plan and perform rigging, hoisting and lifting operations; and of calculations required to perform rigging, hoisting and lifting operations.</b>   | <b>10%</b> |

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## Sprinkler Fitter

**Subunit: A2d Brazing, Soldering and Cutting**

**Level:** One

**Duration:** 12 hours

Theory: 7 hours

Practical: 5 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of the procedures to cut steel to specifications using various equipment, and to braze and solder joints.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with brazing, soldering and cutting.	5%
2. Identify hazards and describe safe work practices pertaining to brazing, soldering and cutting.	5%
a. Personal	
b. Shop/facility	
c. Equipment	
d. Ventilation	
3. Interpret codes, standards and regulations pertaining to brazing, soldering and cutting.	5%
4. Interpret information pertaining to brazing, soldering and cutting, found on drawings and specifications.	5%
5. Identify cutting equipment, its assembly and maintenance.	5%
6. Identify materials and equipment used for brazing and soldering joints, and describe their applications.	5%
a. Materials	
• Grade	
• Size	
• Flux	
• Fillers	
b. Equipment	
7. Describe the procedures used to set-up, adjust and shut-down cutting equipment.	5%
8. Describe the procedures used to inspect and maintain cutting equipment.	5%

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| <b>9. Describe the procedures used to transport and store cutting equipment.</b>  | <b>5%</b>  |
| <b>10. Describe the procedures used to cut material using cutting equipment.</b>  | <b>5%</b>  |
| <b>11. Describe the procedures used to prepare pipe.</b>  | <b>5%</b>  |
| <b>12. Describe the procedures used to braze joints.</b>  | <b>15%</b> |
| <b>13. Describe the procedures used to solder joints.</b>   | <b>15%</b> |
| <b>14. Demonstrate the procedures to cut steel to specifications using cutting equipment, and to braze and solder joints.</b> | <b>15%</b> |

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## Sprinkler Fitter

### UNIT      A3    ORGANIZES WORK

#### Subunit:    A3a Introduction to Trade Related Documents

**Level:**      One

**Duration:** 7 hours

    Theory:          7 hours

    Practical:        0 hours

#### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of trade related documents and their applications.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with trade related documentation.</b>	<b>10%</b>
<b>2. Identify types of trade related documents and describe their applications.</b>	<b>70%</b>
a. Manufacturers' specifications	
b. Blueprints	
• Drawings	
• Addendums	
• Specifications	
• 'Request for Information' form	
• 'Request for Proposal' form	
c. Codes and standards	
• National Fire Protection Association (NFPA)	
• Authority having jurisdiction (AHJ)	
• Building codes	
• Fire codes	
d. Work orders	
• Service	
• Contract	
• Time and material	
e. Permits	
• Building	
• Safety	
f. Reference material	
• Technical bulletins	
• Manuals	
• Material Safety Data Sheets (MSDS)	

- g. Safety logs
- h. Time sheets
- i. Reports
  - Service
  - Hazard assessment
  - Safety
  - Workers' compensation
- j. Contractor's material and test certificates
  - Aboveground
  - Underground
  - Commissioning papers
  - Testing papers

**3. Explain the liabilities and responsibilities associated with completing and/or signing trade related documents. 10%**

**4. Describe the procedures used to complete trade related documents. 10%**

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## Sprinkler Fitter

**Subunit: A3b Blueprint Reading and Sketching I**

**Level:** One

**Duration:** 28 hours

Theory: 21 hours

Practical: 7 hours

**Overview:**

Upon completion of this unit the apprentice will demonstrate knowledge of sprinkler system blueprints and sketches, and the procedures to read and interpret basic sprinkler system blueprints, and to draw and label orthographic and isometric drawings.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with blueprint reading and sketching as they pertain to sprinkler systems.	5%
2. Explain the fundamentals of orthographic and isometric projections.	10%
3. Identify types of lines found on sprinkler system blueprints.	10%
a. Visible line	
b. Hidden line	
c. Central line	
d. Dimension line	
e. Extension line	
f. Section cutting line	
g. Material section line	
4. Identify symbols found on sprinkler system blueprints.	10%
5. Identify types of views found on sprinkler system blueprints.	10%
a. Plan	
b. Elevation	
6. Describe the procedures used to interpret dimensions on blueprints.	10%
a. Floor plans	
b. Elevations	
c. Sections	
d. Details	
7. Identify types of scales and describe their characteristics and applications.	5%
a. Metric scale rule (S.I.)	
b. Architect scale rule (imperial)	



- c. Engineer scale rule
  - d. Typical scales
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- 8. **Identify types of sketching and drawing equipment, and describe their applications and procedures for use.** 5%
  - 9. **Describe the procedures used to interpret a site plan in both metric and imperial units.** 5%
  - 10. **Describe the procedures used to draw and label three basic views of an object.** 5%
  - 11. **Describe the procedures used to draw and label single line piping drawings using 90° elbows and tees.** 5%
    - a. Orthographic
    - b. Isometric
  - 12. **Demonstrate the use of sprinkler system blueprints and sketches, and the procedures to read and interpret basic sprinkler system blueprints, and to draw and label orthographic and isometric drawings.** 20%

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## Sprinkler Fitter

**Subunit: A3c Job Planning I**

**Level:** One

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of the procedures to plan and organize jobs.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with job planning activities.</b>	<b>16%</b>
<b>2. Identify sources of information relevant to job planning.</b>	<b>16%</b>
a. Documentation	
b. Drawings	
c. Related professionals	
d. Clients	
<b>3. Describe the considerations for determining job requirements.</b>	<b>16%</b>
a. Personnel	
b. Tools and equipment	
c. Materials	
d. Permits	
<b>4. Describe the procedures used to plan job tasks.</b>	<b>16%</b>
a. Scheduling	
b. Estimating	
c. Coordinating site access	
<b>5. Describe the procedures used to receive and verify delivered materials.</b>	<b>16%</b>
<b>6. Describe the procedures used to store, organize and maintain inventory.</b>	<b>20%</b>

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## Sprinkler Fitter

### UNIT      A4    COMMUNICATION

**Subunit:**    A4a Communication

**Level:**      One

**Duration:** 14 hours

    Theory:      14 hours

    Practical:    0 hours

#### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of effective communication practices and of communication equipment and their applications as they pertain to the Sprinkler Fitter trade.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with effective communication practices.</b>	<b>30%</b>
<b>2. Describe effective communication practices.</b>	<b>30%</b>
a. Clients/general contractors	
b. Building owner/representative	
c. Co-workers	
d. Related industry people	
• Manufacturers	
• Suppliers	
• Consultants	
• Engineers	
• Other tradespeople	
<b>3. Describe the importance of effective communication practices.</b>	<b>10%</b>
a. Respectful	
b. Organized	
<b>4. Explain the importance of the coaching and mentoring relationship between journey person and apprentice.</b>	<b>10%</b>
<b>5. Identify the types of communication methods and equipment and describe their applications.</b>	<b>10%</b>
<b>6. Describe the procedures used to communicate with other tradespeople.</b>	<b>10%</b>

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## Sprinkler Fitter

### UNIT A5 PIPE, TUBE AND FITTINGS (PREPARE)

#### Subunit: A5a Plastic Pipe and Fittings Preparation

**Level:** One

**Duration:** 28 hours

Theory: 14 hours

Practical: 14 hours

#### Overview:

Upon completion of this Subunit the apprentice will demonstrate knowledge of plastic pipe and their fittings and their preparation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with plastic pipe and fittings.	5%
2. Identify hazards and describe safe work practices associated with plastic pipe and fittings.	10%
3. Interpret codes, standards and regulations pertaining to plastic pipe and fittings.	15%
4. Interpret information pertaining to plastic pipe and fittings found on drawings and specifications.	5%
5. Identify the considerations when selecting plastic pipe and fittings.	10%
a. Types	
b. Pressure and temperature ratings	
c. Sizes	
d. Manufacturers' specifications	
6. Identify tools and equipment relating to plastic pipe and fittings, and describe their applications and procedures for use.	12%
7. Identify the types of fittings and solvents used with plastic pipe and describe their applications.	13%
8. Describe the procedures used to join plastic pipe using the solvent welding process.	15%
a. Safety requirements	
b. Fabrication process and materials	
c. Drilling and cleaning	

- d. Assembly
- e. Ventilation
- f. Cure times
- g. Testing
- h. Allowing for pipe expansion and contraction

**9. Describe the procedures used to handle and store plastic pipe, fittings and solvents. 15%**

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## Sprinkler Fitter

**Subunit: A5b Steel Pipe and Fittings Preparation**

**Level:** One

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of threaded, flanged, grooved, and welded steel pipe and fittings and their associated joining techniques, and of the procedures to prepare steel pipe to be welded, to thread and/or groove steel pipe, to join steel pipe and their preparation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with steel pipe and fittings.	5%
2. Identify hazards and describe safe work practices associated with steel pipe and fittings.	5%
3. Interpret codes, standards and regulations pertaining to steel pipe and fittings.	5%
4. Interpret information pertaining to steel pipe and fittings found on drawings and specifications.	5%
5. Identify tools and equipment used to prepare and thread steel pipe, and describe their applications and procedures for use.	5%
a. Hand tools	
b. Nipple chucks	
c. Thread cutting lubricants	
d. Pipe cutters	
e. Reamers	
f. Threaders	
6. Identify tools and equipment used to prepare and groove steel pipe, and describe their applications and procedures for use.	5%
a. Hand tools	
b. Pipe cutters	
c. Reamers	
d. Cut groovers	
e. Roll groovers	
f. Diameter/depth tape	

7. **Identify tools and equipment used to prepare steel pipe for welding and describe their applications and procedures for use.** 5%
8. **Identify tools and equipment used to prepare and flange steel pipe and describe their applications and procedures for use.** 5%
9. **Identify tools and equipment used to drill steel pipe and describe their applications and procedures for use.** 5%
10. **Describe the procedures used to calculate piping offsets.** 5%
- a. Length of travel
  - b. Unequal spread
  - c. Equal spread
  - d. Rolling offset
11. **Identify piping components and describe their purpose and relationships.** 5%
- a. System risers
  - b. Risers
  - c. Feed mains
  - d. Cross mains
  - e. Branch lines
  - f. Headers
  - g. Arm overs
  - h. Sprigs
12. **Identify the considerations when selecting steel pipe.** 5%
- a. Schedule numbers and grades
  - b. Pressure ratings
  - c. Pipe sizes and lengths
  - d. End finishes
  - e. Protective coatings and linings
  - f. Codes
  - g. Manufacturers' specifications
  - h. Manufacturing techniques
13. **Identify types of threaded pipe fittings, and describe their characteristics and applications.** 5%
- a. Malleable
  - b. Cast iron
  - c. Steel
  - d. Galvanized
  - e. Stainless
14. **Identify types of flanges and their associated fittings and gaskets, and describe their characteristics and applications.** 5%
- a. Materials
  - b. Flange markings
  - c. Gasket specifications
  - d. Manufacturers' specifications
15. **Identify types of grooved and grip style pipe fittings and gaskets, and describe their characteristics and applications.** 6%
- a. Materials and types
  - b. Markings

- c. Pressure and temperature ratings
  - Working pressures
- d. Colour coding of gaskets
- e. Joining techniques

- 16. Describe the procedures used to join threaded pipe and install fittings on pipe. 8%**
- 17. Describe the procedures used to join grooved and grip style fittings to pipe. 8%**
- 18. Describe the procedures used to prepare steel pipe to be welded. 8%**

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## Sprinkler Fitter

### UNIT      A6    PIPE, TUBE AND FITTINGS (INSTALLS)

**Subunit:**    A6a Plastic Pipe and Fittings Installation

**Level:**      One

**Duration:**  14 hours

                  Theory:    7      hours

                  Practical:  7      hours

**Overview:**

Upon completion of this Subunit the apprentice will demonstrate knowledge of plastic pipe and fittings installation.

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
1.    Describe the procedures to work with plastic pipe and fittings, and their associated joining techniques.	50%
2.    Demonstrate the ability to work with plastic pipe and fittings, and their associated joining techniques.	50%

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## Sprinkler Fitter

**Subunit: A6b Steel Pipe and Fittings Installation**

**Level:** One

**Duration:** 17 hours

Theory: 10 hours

Practical: 7 hours

**Overview:**

Upon completion of this Subunit the apprentice will demonstrate knowledge of steel pipe and fittings installation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe the procedures to work with threaded, flanged, grooved, and welded steel pipe and their fittings and associated joining techniques, and the procedures to prepare pipe to be welded, to thread and/or groove pipe, and to join pipe.	50%
2. Demonstrate the ability to work with threaded, flanged, grooved, and welded steel pipe and their fittings and associated joining techniques, and the procedures to prepare pipe to be welded, to thread and/or groove pipe, and to join pipe.	50%

\*\*\*

## Sprinkler Fitter

**UNIT: A7 PIPING COMPONENTS**

**Subunit: A7a Hangers, Supports and Bracing**

**Level: One**

**Duration: 10 hours**

Theory: 7 hours

Practical: 3 hours

**Overview:**

Upon completion of this unit the apprentice will demonstrate knowledge of the procedures to select, locate and install hangers, supports and bracing, and to install fasteners and inserts.

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
1. Define terminology associated with hangers, support and bracing.	5%
2. Identify hazards and describe safe work practices pertaining to hangers, support and bracing.	5%
3. Interpret codes, standards and regulations pertaining to hangers, support and bracing.	15%
4. Interpret information pertaining to hangers, support and bracing found on drawings and specifications.	5%
5. Describe the procedures used to perform grade and hanger calculations.	10%
a. Grade on pipe	
b. Grade from percentage	
c. Progressive lengths of hanger rod	
d. Number of hangers for given length and type of pipe	
e. Trapeze	
6. Identify tools and equipment relating to hangers, support and bracing, and describe their applications and procedures for use.	5%
7. Identify types of hangers used in the installation of pipe, tube and tubing and describe their characteristics and applications.	5%
8. Identify hanger requirements for various systems.	5%
9. Identify types and sizes of hanger rods and describe their characteristics and applications.	5%
10. Identify types of sway/seismic bracing and describe their purpose and	5%

applications.

- |  |     |
|--|-----|
| 11. Identify types of protective materials applied to hangers and describe their purpose applications.                         | 5%  |
| 12. Identify types of fasteners and inserts, and describe their characteristics and applications.                              | 5%  |
| 13. Describe the procedures used to install hangers, support and bracing.  | 10% |
| 14. Describe the procedures used to install fasteners and inserts.   | 5%  |
| 15. Demonstrate the ability to select, locate and install hangers, supports and bracing, and to install fasteners and inserts. | 10% |

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## Sprinkler Fitter

**Subunit: A7b Automatic Sprinkler Heads**

**Level:** One

**Duration:** 17 hours

Theory: 14 hours

Practical: 3 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of background/history of sprinkler heads and their selection, installation and removal according to code and/or manufacturers' specifications.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology and history associated with automatic sprinkler heads.	5%
2. Identify hazards and describe safe work practices pertaining to automatic sprinkler heads.	5%
3. Interpret codes, standards and regulations pertaining to automatic sprinkler heads.	15%
4. Interpret information pertaining to automatic sprinkler heads found in drawings, specifications and listings.	10%
5. Identify tools and equipment relating to automatic sprinkler heads, and describe their applications and procedures for use.	5%
6. Explain the history and theory behind sprinkler heads and systems.	5%
7. Identify the materials used to manufacture automatic sprinkler heads and describe their characteristics and applications.	5%
8. Identify categories of automatic sprinkler heads and describe their characteristics and applications.	5%
a. Solder	
b. Bulb	
b. Open	
9. Identify performance characteristics that apply to automatic sprinkler heads.	10%
a. Deflector design/spray patterns	
b. Orifice sizes	
c. Temperature rating	
d. Temperature sensitivity	
e. Orientation	

- |  |            |
|--|------------|
| <b>10. Identify factors that affect maximum ceiling temperature.</b>   | <b>5%</b>  |
| <b>11. Identify temperature ratings and colour coding.</b>   | <b>5%</b>  |
| a. Fusible link  |            |
| b. Frangible bulb  |            |
| c. Decorative  |            |
| <b>12. Identify the considerations when selecting automatic sprinkler heads.</b>   | <b>5%</b>  |
| <b>13. Describe the methods used to protect, handle and care for automatic sprinkler heads prior to, and during, the installation and removal processes.</b> | <b>10%</b> |
| a. Shipping  |            |
| b. Unpacking/packing   |            |
| c. Care and storage  |            |
| d. Protective caps   |            |
| <b>14. Demonstrate the ability to select, install and remove automatic sprinkler heads.</b>  | <b>10%</b> |

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## Sprinkler Fitter

### UNIT A8 WATER-BASED SYSTEMS (includes signal-initiating devices installation)

#### Subunit: A8a Dry Pipe Sprinkler Systems

**Level:** One

**Duration:** 28 hours

Theory: 14 hours

Practical: 14 hours

#### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of dry pipe sprinkler systems, their operation and characteristics, and of the procedures to install dry pipe systems and components according to code requirements and regulations.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with dry pipe sprinkler systems.	2%
2. Identify hazards and describe safe work practices pertaining to dry pipe sprinkler systems.	2%
3. Interpret codes, standards and regulations pertaining to dry pipe sprinkler systems.	10%
4. Interpret information pertaining to dry pipe sprinkler systems found on drawings and specifications.	2%
5. Identify tools and equipment relating to dry pipe sprinkler systems, and describe their applications and procedures for use.	2%
6. Identify types of dry pipe sprinkler systems and describe their operating principles and characteristics.	2%
7. Identify dry pipe sprinkler system components and describe their location, purpose and operation. a. Fire department connection b. Test connections and drains c. Alarm devices d. Control valves e. Dry pipe valves f. Regulated air supply g. Quick opening devices	10%

- h. Anti-flooding devices
  - i. Auxiliary drains
  - j. Drum drips
  - k. High/low supervisory devices
  - l. Pressure gauges
8. **Identify dry pipe valves to be trimmed and describe their components and relevant design characteristics.** 5%
  9. **Identify the considerations and requirements for installing auxiliary drains on dry pipe sprinkler systems.** 3%
  10. **Describe the procedures used to layout and install dry pipe sprinkler systems and components.** 3%
  11. **Describe the procedures used to install dry pipe valve trim.** 4%
    - a. Location of valves
    - b. Trim and accessories required
      - Single systems
      - Multiple systems
  12. **Explain the requirements and procedures for acceptance testing of dry pipe systems.** 3%
  13. **Describe the procedures used to commission dry pipe systems.** 2%
  14. **Demonstrate the ability to work with dry pipe sprinkler systems, their operation and characteristics, and the procedures to install dry pipe systems and components according to code requirements.** 50%

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## Sprinkler Fitter

**Subunit: A8b Wet Pipe Sprinkler Systems**

**Level:** One

**Duration:** 11 hours

Theory: 6 hours

Practical: 5 hours

**Overview:**

Upon completion of this unit the apprentice will demonstrate knowledge of wet pipe sprinkler systems and their operation and characteristics, and of the procedures to install wet pipe systems and components according to code requirements and regulations.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with wet pipe sprinkler systems.	5%
2. Identify hazards and describe safe work practices pertaining to wet pipe sprinkler systems.	5%
3. Interpret codes, standards and regulations pertaining to wet pipe sprinkler systems.	10%
4. Interpret information pertaining to wet pipe sprinkler systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to wet pipe sprinkler systems, and describe their applications and procedures for use.	5%
6. Identify types of wet pipe sprinkler systems, and describe their operating principles and characteristics.	5%
7. Identify wet pipe sprinkler system components and describe their location, purpose and operation. <ul style="list-style-type: none"> <li>a. Fire department connection</li> <li>b. Test connections and drains</li> <li>c. Alarm devices</li> <li>d. Control valves</li> <li>e. Alarm check valve or listed water flow alarm device</li> <li>f. Relief valves</li> </ul>	10%
8. Identify alarm valves to be trimmed and describe their components and relevant design characteristics.	5%
9. Describe the procedures used to layout and install wet pipe sprinkler systems and components.	10%

- |   |            |
|---|------------|
| <b>10. Describe the procedures used to install wet alarm valve trim.</b>  | <b>5%</b>  |
| a. Location of valves   |            |
| b. Trim and accessories required  |            |
| • Single systems  |            |
| • Multiple systems  |            |
| <b>11. Identify the considerations and requirements for installing auxiliary drains on wet pipe sprinkler systems.</b>  | <b>5%</b>  |
| <b>12. Describe the methods used to prevent false alarms.</b>   | <b>5%</b>  |
| a. Excess pressure pumps  |            |
| b. Retarding chamber  |            |
| c. Flow switch retard   |            |
| d. External bypass  |            |
| <b>13. Explain the requirements and procedures for acceptance testing of wet pipe sprinkler systems.</b>  | <b>5%</b>  |
| <b>14. Describe the procedures used to commission wet pipe sprinkler systems.</b>   | <b>5%</b>  |
| <b>15. Demonstrate the ability to work with wet pipe sprinkler systems and their operation and characteristics, and the procedures to install wet pipe systems and components according to code requirements.</b> | <b>15%</b> |

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## Sprinkler Fitter

**Subunit: A8c Antifreeze Sprinkler Systems**

**Level:** One

**Duration:** 3 hours

Theory: 3 hours

Practical: 0 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of antifreeze sprinkler systems and their operation and characteristics, and of the procedures to install and maintain antifreeze sprinkler systems according to code requirements and regulations.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with antifreeze sprinkler systems.	5%
2. Identify hazards and describe safe work practices pertaining to antifreeze sprinkler systems.	5%
3. Interpret codes, standards and regulations pertaining to antifreeze sprinkler systems.	10%
4. Interpret information pertaining to antifreeze sprinkler systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to antifreeze sprinkler systems, and describe their applications and procedures for use.	5%
6. Identify the considerations for determining the need for freezing protection of sprinkler systems and controls. <ul style="list-style-type: none"> <li>a. Location</li> <li>b. Cost</li> <li>c. Accessibility</li> </ul>	5%
7. Identify antifreeze sprinkler systems and their components, and describe their purpose and applications.	5%
8. Identify types of antifreeze solutions and describe their characteristics and applications. <ul style="list-style-type: none"> <li>a. Used with potable water supply</li> <li>b. Used with non-potable water supply</li> </ul>	10%
9. Describe the requirements and procedures used to handle, store and dispose of antifreeze.	5%

- |  |            |
|--|------------|
| <b>10. Identify installation requirements for antifreeze sprinkler systems.</b>  | <b>10%</b> |
| a. Antifreeze loop   |            |
| b. Cross connection control  |            |
| <b>11. Identify valves required for antifreeze sprinkler systems.</b>  | <b>5%</b>  |
| a. Type  |            |
| b. Location  |            |
| c. Test connections  |            |
| <b>12. Describe the procedures used layout and install antifreeze sprinkler systems.</b>   | <b>5%</b>  |
| <b>13. Describe the procedures used to test and maintain antifreeze sprinkler systems.</b>   | <b>5%</b>  |
| <b>14. Explain the requirements and procedures for acceptance testing of antifreeze sprinkler systems.</b>   | <b>5%</b>  |
| <b>15. Describe the procedures used to commission antifreeze sprinkler systems.</b>  | <b>5%</b>  |
| <b>16. Describe the ability to work with antifreeze sprinkler systems and their operation and characteristics, and the procedures to install antifreeze systems and components according to code requirements.</b> | <b>10%</b> |

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## Sprinkler Fitter

**Subunit: A8d Detection and Signal-Initiating Devices**

**Level:** One

**Duration:** 14 hours

Theory: 11 hours

Practical: 3 hours

**Overview:**

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

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with detection and signal-initiating devices.	10%
2. Identify hazards and describe safe work practices pertaining to detection and signal-initiating devices.	10%
3. Interpret codes, standards and regulations pertaining to detection and signal-initiating devices.	10%
4. Interpret information pertaining detection and signal-initiating devices found on drawings and specifications.	10%
5. Identify tools and equipment relating detection and signal-initiating 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. Identify types of signal-initiating devices and describe their characteristics, parameters and applications.	10%
a. Alarm-initiating	
b. Supervisory-initiating	
8. Describe the procedures used to install, test and maintain detection devices according to manufacturers' specifications.	10%

9. Describe the procedures used to install, test and maintain signal-initiating devices according to manufacturers' specifications. 10%
10. Demonstrate the installation, testing and maintenance of detection and signal-initiating devices. 10%

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## Sprinkler Fitter

**Subunit: A8e Pre-action Systems**

**Level:** One

**Duration:** 8 hours

Theory: 5 hours

Practical: 3 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge of pre-action systems, their applications and operating principles, and of installation requirements and associated test procedures for pre-action systems.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with pre-action systems.	5%
2. Identify hazards and describe safe work practices pertaining to pre-action systems.	5%
3. Interpret codes, standards and regulations pertaining to pre-action systems.	5%
4. Interpret information pertaining to pre-action systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to pre-action systems, and describe their applications and procedures for use.	5%
6. Identify types of pre-action systems, and describe their operating principles and applications. a. Non-interlock b. Single interlock c. Double interlock	10%
7. Identify types of alarms that pre-action valves will operate.	5%
8. Identify trim components used on pre-action valves and describe their design variations and applications.	10%
9. Identify supplemental fire detection systems and describe their operating principles and applications. a. Electric b. Pneumatic c. Hydraulic	10%
10. Identify the system controls required for pre-action systems.	5%

- |   |           |
|---|-----------|
| <b>11. Identify the installation requirements for pre-action systems and components.</b>            | <b>5%</b> |
| a. Materials  |           |
| b. Hangers, supports and bracing  |           |
| c. System actuation   |           |
| d. System supervision   |           |
| e. Testing  |           |
| f. Manufacturers' specifications  |           |
| <b>12. Explain the requirements for drainage of pre-action systems.</b>                             | <b>5%</b> |
| <b>13. Describe the procedures used to layout and install pre-action systems.</b>                   | <b>5%</b> |
| <b>14. Describe the procedures used to trim pre-action valves.</b>                                  | <b>5%</b> |
| <b>15. Describe the procedures used to install system controls required for pre-action systems.</b> | <b>5%</b> |
| <b>16. Describe the procedures used to service and maintain pre-action systems.</b>                 | <b>2%</b> |
| <b>17. Explain the requirements and procedures for acceptance testing pre-action systems.</b>       | <b>3%</b> |
| <b>18. Describe the procedures used to commission pre-action systems.</b>                           | <b>2%</b> |
| <b>19. Describe the operation, installation and test procedures for pre-action systems.</b>         | <b>3%</b> |

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## Sprinkler Fitter

**Subunit: A8f Deluge Systems**

**Level:** One

**Duration:** 14 hours

Theory: 10 hours

Practical: 4 hours

### Overview:

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

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with deluge systems.	5%
2. Identify hazards and describe safe work practices pertaining to deluge systems.	5%
3. Interpret codes, standards and regulations pertaining to deluge systems.	5%
4. Interpret information pertaining to deluge systems found on drawings and specifications.	5%
5. Identify tools and equipment relating to deluge systems, and describe their applications and procedures for use.	5%
6. Identify types of deluge systems and describe their operating principles and applications.	10%
7. Identify types of alarms that deluge valves will operate.	5%
8. Identify trim components used on deluge valves and describe their design variations and applications.	10%
9. Identify supplemental fire detection systems and describe their operating principles and applications.	10%
10. Identify the system controls required for deluge systems.	5%
11. Identify the installation requirements for deluge systems and components.	5%
a. Materials	
b. Hangers, supports and bracing	
c. System actuation	
d. Testing	

e. Manufacturers' specifications

- |   |           |
|---|-----------|
| <b>12. Explain the requirements for drainage of deluge systems.</b>                             | <b>5%</b> |
| <b>13. Describe the procedures used to layout and install deluge systems.</b>                   | <b>5%</b> |
| <b>14. Describe the procedures used to trim deluge valves.</b>                                  | <b>5%</b> |
| <b>15. Describe the procedures used to install system controls required for deluge systems.</b> | <b>5%</b> |
| <b>16. Describe the procedures used to service and maintain deluge systems.</b>                 | <b>2%</b> |
| <b>17. Explain the requirements and procedures for acceptance testing deluge systems.</b>       | <b>3%</b> |
| <b>18. Describe the procedures used to commission deluge systems.</b>                           | <b>2%</b> |
| <b>19. Describe the operation, installation and test procedures for deluge systems.</b>         | <b>3%</b> |

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## Sprinkler Fitter

**UNIT: A9 MATHEMATICS I**

**Subunit: A9a Mathematics I**

**Level:** One

**Duration:** 14 hours

Theory: 14 hours

Practical: 0 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate knowledge and an understanding of the principles of mathematics. Topics include: simple arithmetic, number conversions, linear, perimeter and area, percentage values and real values from percentage values.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Describe linear, perimeter and area.	10%
2. State the formulas for calculating the perimeter of flat plane.	15%
3. State the formula for calculating the area of a flat plane.	15%
4. State the formulas for calculating the surface area of regular shaped solids, tanks and cylinders.	15%
5. Practice simple arithmetic.	5%
a. Add, subtract, multiply and divide whole numbers	
b. Add, subtract, multiply and divide decimal numbers	
c. Add, subtract, multiply and divide fractions	
d. Add, subtract, multiply and divide using a basic calculator	
e. Add, subtract, multiply and divide mixed numbers	
6. Practice number conversions.	15%
a. Convert fractional values to decimal values (from fractional one sixteenth)	
b. Convert decimal values to fractional values	
c. Convert fractional inches to decimal inches (from fractional sixteenths)	
d. Convert decimal inches to fractional inches	
e. Interconvert meters, centimeters and millimeters	
7. Calculate the perimeter of shapes in both imperial and metric units.	5%
a. Rectangles	

- b. Squares
  - c. Circles
- 8. Calculate the area of shapes in both imperial and metric units. 10%**
- a. Rectangles
  - b. Squares
  - c. Circles
- 9. Calculate surface area of regular shaped tanks and cylinders in both imperial and metric units. 10%**
- a. Rectangular tanks

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## Sprinkler Fitter

**UNIT: A10 SCIENCE I**

**Subunit: A10a Science I**

**Level: One**

**Duration: 14 hours**

Theory: 14 hours

Practical: 0 hours

### Overview:

Upon completion of this unit the apprentice will demonstrate of science in the trade and industry. Topics include: properties of water, soldering, brazing and uses of fluxes, freezing and heating of water, pressure and atmosphere, pressure and water, pressure with pipes and tanks, properties of atmosphere, altitude and atmospheric pressure, and interconvert gauge and absolute pressures.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define and explain science terms associated with the properties of water.</b>	<b>15%</b>
a. Adhesion	
b. Cohesion	
c. Surface tension	
d. Capillarity	
e. Density	
f. Head pressure/water column	
<b>2. Explain the applications of the principles of: adhesion, cohesion, surface tension and capillarity in Sprinkler Fitter trade with reference to soldering, brazing and use of fluxes.</b>	<b>15%</b>
<b>3. State the relative density of water.</b>	<b>15%</b>
<b>4. State the effects of freezing and heating water.</b>	<b>5%</b>
a. Chemical properties	
b. Physical properties	
<b>5. Define and explain science terms associated with pressure and the atmosphere.</b>	<b>5%</b>
a. Relative density	
b. Water pressure	
c. Properties of atmosphere	
d. Atmospheric pressure	

- |  |            |
|--|------------|
| <b>6. Define and explain the effects of pressure on water.</b>   | <b>5%</b>  |
| <b>7. Explain the transmission of pressure within pipes and tanks.</b>                                   | <b>10%</b> |
| <b>8. List and describe the properties of atmosphere as it relates to the trade of Sprinkler Fitter.</b> | <b>5%</b>  |
| <b>9. Describe the effects of altitude on atmospheric pressure.</b>                                      | <b>5%</b>  |
| <b>10. Demonstrate the conversion of gauge and absolute pressures in both imperial and metric units.</b> | <b>20%</b> |

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